

Handbook of Research on

Financial Management During Economic Downturn and Recovery

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Nuno Miguel Delicado Teixeira and Inês Lisboa



Handbook of Research on Financial Management During Economic Downturn and Recovery

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List of Contributors

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Assensoh-Kodua, Akwesi / <i>Durban University of Technology, South Africa</i>	305
Avci, Pinar / <i>Tekirdağ Namık Kemal University, Turkey</i>	41
B. K., Sunitha / <i>Center for Management Studies, Jain University (Deemed), India</i>	343
Berkhouch, Mohammed / <i>LISAD Laboratory, ENSA, Ibn Zohr University, Agadir, Morocco</i>	476
Brites, Rui / <i>Polytechnic Institute of Setúbal, Portugal</i>	1
Carvalho, Luísa / <i>Polytechnic Institute of Setúbal, Portugal</i>	359, 462
Conceição, Jeremias Amado / <i>ISCAC, Polytechnic of Coimbra, Coimbra Business School, Portugal</i>	374
Couto, João Pedro / <i>School of Engineering, University of Minho, Portugal</i>	248
Dias, Rui Teixeira / <i>Polytechnic Institute of Setúbal, Portugal</i>	359, 389, 462
Dionísio, Andreia / <i>CEFAGE, IIFA, Universidade de Évora, Portugal</i>	411
Dominguinhos, Pedro / <i>Polytechnic Institute of Setúbal, Portugal</i>	59
Dultra-de-Lima, Ronaldo Gomes / <i>Universidade Presbiteriana Mackenzie, Brazil</i>	233
El Boukfaoui, My Youssef / <i>Faculty of Sciences and Techniques, Cadi Ayyad University, Morocco</i>	445
Felício, Teresa / <i>ISEG, University of Lisbon, Portugal</i>	77
Ferreira, José Vaz / <i>Faculty of Economics, University of Coimbra, Portugal</i>	248
Ferreira, Paulo / <i>Polytechnic Institute of Portalegre, Portugal</i>	411, 445
Formigoni, Henrique / <i>Universidade Presbiteriana Mackenzie, Brazil</i>	218
Fradinho, Rute / <i>Caixa Geral de Depósitos, Portugal</i>	291
Galvão, Rosa / <i>Polytechnic Institute of Setúbal, Portugal</i>	20, 153
Godinho, Teresa / <i>Polytechnic Institute of Setúbal, Portugal</i>	1
Gomes, Conceição / <i>Centre for Tourism Research (CiTUR), Development and Innovation, School of Tourism and Maritime Technology, Polytechnic of Leiria, Portugal</i>	94
Gonçalves, Wellington / <i>Universidade Federal do Espírito Santo, Brazil</i>	218
Guedes, Maria João / <i>ISEG, University of Lisbon, Portugal</i>	77
Heblikar, Sowjanya / <i>Jain University (Deemed), India</i>	428
Honda, Marcelo / <i>Agrindus S/A, Brazil</i>	233
Horak, Jakub / <i>Institute of Technology and Business, Czech Republic</i>	126
Horta, Milene / <i>Caixa Geral de Depósitos, Portugal</i>	291
K, Sunitha B / <i>Jain University (Deemed), India</i>	428
K., Sunitha B. / <i>Center for Management Studies, Jain University (Deemed), India</i>	323
Khandelwal, Dikshant / <i>Center for Management Studies, Jain University (Deemed), India</i>	343
Leote, Francisco José Mendes / <i>College of Business and Administration, Polytechnic Institute of Setúbal, Portugal</i>	20

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Lisboa, Inês / CARME, School of Management and Technology, Polytechnic of Leiria, Portugal	1, 94, 199
Lisboa, João Veríssimo / Faculty of Economics, University of Coimbra, Portugal	248
Machova, Veronika / Institute of Technology and Business, Czech Republic	126
Mata, Carlos / Polytechnic Institute of Setúbal, Portugal	59
Mehta, Mehak / Center for Management Studies, Jain University (Deemed), India	323
Mendes, Caropol Capembute / School of Engineering, Institute of Coimbra, Portugal	248
Mendonça Neto, Octávio Ribeiro de / Universidade Presbiteriana Mackenzie, Brazil	233
Menon, Anirudh / Center for Management Studies, Jain University (Deemed), India	343
Montenegro, Vargas Bonfim / ISCAC, Polytechnic of Coimbra, Coimbra Business School, Portugal	374
Mourato, Joaquim / Instituto Politécnico de Portalegre, Portugal	59
Neves, Maria Elisabete Duarte / ISCAC, Polytechnic of Coimbra, Coimbra Business School, Portugal & University of Trás-os-Montes and Alto Douro, Portugal	374
Nisiyama, Edelcio Koitiro / Insper Instituto de Ensino e Pesquisa, Brazil	233
Nunes, Sandra / Polytechnic Institute of Setúbal, Portugal	59
Oyadomari, José Carlos Tiomatsu / Universidade Presbiteriana Mackenzie, Brazil	233
Ozili, Peterson K. / Central Bank of Nigeria, Nigeria	275
Pardal, Pedro / Polytechnic Institute of Setúbal, Portugal	389
Parisi, Claudio / Universidade Presbiteriana Mackenzie, Brazil	233
Pereira, Éder / Instituto Federal de Educação do Maranhão, Brazil	445
Pinto, Murillo Jose Torelli / Universidade Presbiteriana Mackenzie, Brazil	112
Pires, Maria Clara Pereira / Polytechnic Institute of Beja, Portugal	291
Ramamohan, Manish / Center for Management Studies, Jain University (Deemed), India	323
Santos, Márcia Cadete / Polytechnic Institute of Setúbal, Portugal	59
Saraiva, Tânia Mafalda Antunes / ISEG, University of Lisbon, Portugal	77
Segura, Liliane Cristina / Universidade Presbiteriana Mackenzie, Brazil	112, 218
Suthar, Kailash Multanmal / Center for Management Studies, Jain University (Deemed), India ..	343
Teixeira, Ana Bela de Sousa Delicado / Polytechnic Institute of Setúbal, Portugal	153
Teixeira, Nuno Miguel / Center for Research in Business and Administration, School of Business Sciences, Polytechnic Institute of Setúbal, Portugal	1, 20, 59, 199
Tilfani, Oussama / Faculty of Sciences and Techniques, Cadi Ayyad University, Morocco	445
Varshney, Dipika / Jain University (Deemed), India	428
Vasco, Cristina / Institute of Employment and Professional Training, Portugal	389
Vrbka, Jaromir / Institute of Technology and Business, Czech Republic	126
Zatta, Fernando Nascimento / Universidade Presbiteriana Mackenzie, Brazil	218

Table of Contents

Preface	xxiv

Section 1 Economy

Chapter 1

The Impact of European Funds in View of Company Value Creation	1
<i>Nuno Miguel Teixeira, Center for Research in Business and Administration, School of Business Sciences, Polytechnic Institute of Setúbal, Portugal</i>	
<i>Inês Lisboa, CARME, School of Management and Technology, Polytechnic of Leiria, Portugal</i>	
<i>Rui Brites, Polytechnic Institute of Setúbal, Portugal</i>	
<i>Teresa Godinho, Polytechnic Institute of Setúbal, Portugal</i>	

Chapter 2

Entrepreneurship and Unemployment: Government Grants and Challenges in a Pandemic Context ..	20
<i>Francisco José Mendes Leote, College of Business and Administration, Polytechnic Institute of Setúbal, Portugal</i>	
<i>Nuno Miguel Teixeira, Polytechnic Institute of Setúbal, Portugal</i>	
<i>Rosa Galvão, Polytechnic Institute of Setúbal, Portugal</i>	

Chapter 3

Structures and Functions of Holding Companies in Different Countries	41
<i>Pınar Avci, Tekirdağ Namık Kemal University, Turkey</i>	

Section 2 Organizations

Chapter 4

Financial Capacity During a Pandemic Crisis: Insights From the Non-Profit Sector.....	59
<i>Márcia Cadete Santos, Polytechnic Institute of Setúbal, Portugal</i>	
<i>Sandra Nunes, Polytechnic Institute of Setúbal, Portugal</i>	
<i>Pedro Dominginhos, Polytechnic Institute of Setúbal, Portugal</i>	
<i>Joaquim Mourato, Instituto Politécnico de Portalegre, Portugal</i>	
<i>Carlos Mata, Polytechnic Institute of Setúbal, Portugal</i>	
<i>Nuno Miguel Teixeira, Center for Research in Business and Administration, School of Business Sciences, Polytechnic Institute of Setúbal, Portugal</i>	

Chapter 5

Does the Capital Structure of New Ventures Differ as a Response to a Financial Crisis? Capital Structure Responsiveness of Portuguese New Ventures to an Economic Downturn..... 77

Maria João Guedes, ISEG, University of Lisbon, Portugal

Tânia Mafalda Antunes Saraiva, ISEG, University of Lisbon, Portugal

Teresa Felício, ISEG, University of Lisbon, Portugal

Chapter 6

The Impact of Macroeconomic Factors on the Hotel Industry Through the Financial Leverage Trends: The Portuguese Case..... 94

Luís Lima Santos, Centre for Tourism Research (CiTUR), Development and Innovation, School of Tourism and Maritime Technology, Polytechnic of Leiria, Portugal

Conceição Gomes, Centre for Tourism Research (CiTUR), Development and Innovation, School of Tourism and Maritime Technology, Polytechnic of Leiria, Portugal

Inês Lisboa, CARME, School of Management and Technology, Polytechnic of Leiria, Portugal

Chapter 7

Financial Analysis During the Pandemic and New Consumption: Oil and Gas Sector..... 112

Liliane Cristina Segura, Universidade Presbiteriana Mackenzie, Brazil

Murillo Jose Torelli Pinto, Universidade Presbiteriana Mackenzie, Brazil

Chapter 8

Financial Management for the Successful Company Value..... 126

Jakub Horak, Institute of Technology and Business, Czech Republic

Veronika Machova, Institute of Technology and Business, Czech Republic

Jaromir Vrbka, Institute of Technology and Business, Czech Republic

Chapter 9

Analyzing the Impact of the COVID-19 Pandemic on Value Creation: The Case of Euronext Lisbon 153

Rosa Galvão, Polytechnic Institute of Setúbal, Portugal

Ana Bela de Sousa Delicado Teixeira, Polytechnic Institute of Setúbal, Portugal

Chapter 10

Impact of the COVID-19 Pandemic on the Financial Statements of Portuguese Stock Index 20 Companies..... 174

Maria Teresa V. D. Alves, ESCE, Polytechnic Institute of Setúbal, Portugal

Chapter 11

The Impact of Working Capital Management on Firm Operational Performance Through Business Cycles: Evidence From Portugal..... 199

Inês Lisboa, CARME, School of Management and Technology, Polytechnic of Leiria, Portugal

Nuno Miguel Teixeira, Center for Research in Business and Administration, School of Business Sciences, Polytechnic Institute of Setúbal, Portugal

Chapter 12

Idle Costs in the Pandemic.....	218

Liliane Cristina Segura, Universidade Presbiteriana Mackenzie, Brazil

Fernando Nascimento Zatta, Universidade Presbiteriana Mackenzie, Brazil

Henrique Formigoni, Universidade Presbiteriana Mackenzie, Brazil

Wellington Gonçalves, Universidade Federal do Espírito Santo, Brazil

Chapter 13

Cost Managerial Analysis to Prevent Arbitrary Cost Reductions in Times of Significant Crisis.....	233

José Carlos Tiomatsu Oyadomari, Universidade Presbiteriana Mackenzie, Brazil

Edelcio Koitiro Nisiyama, Insper Instituto de Ensino e Pesquisa, Brazil

Octávio Ribeiro de Mendonça Neto, Universidade Presbiteriana Mackenzie, Brazil

Claudio Parisi, Universidade Presbiteriana Mackenzie, Brazil

Marcelo Honda, Agrindus S/A, Brazil

Ronaldo Gomes Dultra-de-Lima, Universidade Presbiteriana Mackenzie, Brazil

Chapter 14

The Uncertainty of the Organizational Environment as Cause of Unfavorable Budget Deviations in the Projects of Portuguese Construction Companies.....	248

Caropol Capembute Mendes, School of Engineering, Institute of Coimbra, Portugal

João Veríssimo Lisboa, Faculty of Economics, University of Coimbra, Portugal

João Pedro Couto, School of Engineering, University of Minho, Portugal

José Vaz Ferreira, Faculty of Economics, University of Coimbra, Portugal

Section 3 Financial Institutions

Chapter 15

Economic Policy Uncertainty in Banking: A Literature Review.....	275

Peterson K. Ozili, Central Bank of Nigeria, Nigeria

Chapter 16

The Short-Term Effects of the Pandemic (COVID-19) on Banks With Activity in Portugal: Particularly With Regard to Capital Buffer.....	291

Maria Clara Pereira Pires, Polytechnic Institute of Beja, Portugal

Milene Horta, Caixa Geral de Depósitos, Portugal

Rute Fradinho, Caixa Geral de Depósitos, Portugal

Chapter 17

Credit Risk Aversion Model During Economic Downturns and Recovery	305

Akwesi Assensoh-Kodua, Durban University of Technology, South Africa

Chapter 18

FinTech and Sustainable Development: A Comparative Study of Indian and Chinese FinTech Ecosystems.....	323

Manish Ramamohan, Center for Management Studies, Jain University (Deemed), India

Mehak Mehta, Center for Management Studies, Jain University (Deemed), India

Sunitha B. K., Center for Management Studies, Jain University (Deemed), India

Chapter 19

Blockchain Technology in Securitization in India.....	343

Anirudh Menon, Center for Management Studies, Jain University (Deemed), India

Dikshant Khandelwal, Center for Management Studies, Jain University (Deemed), India

Kailash Multanmal Suthar, Center for Management Studies, Jain University (Deemed), India

Sunitha B. K., Center for Management Studies, Jain University (Deemed), India

Section 4 Financial Markets

Chapter 20

Foreign Exchange Market Shocks in the Context of the Global Pandemic (COVID-19).....	359

Rui Teixeira Dias, Polytechnic Institute of Setúbal, Portugal

Lúisa Carvalho, Polytechnic Institute of Setúbal, Portugal

Chapter 21

Performance of Exchange-Traded Funds in Europe: Beta-Performance Ratio.....	374

Maria Elisabete Duarte Neves, ISCAC, Polytechnic of Coimbra, Coimbra Business School, Portugal & University of Trás-os-Montes and Alto Douro, Portugal

Jeremias Amado Conceição, ISCAC, Polytechnic of Coimbra, Coimbra Business School, Portugal

Vargas Bonfim Montenegro, ISCAC, Polytechnic of Coimbra, Coimbra Business School, Portugal

Chapter 22

Do the Stock Market Indices Follow a Random Walk?	389

Cristina Vasco, Institute of Employment and Professional Training, Portugal

Pedro Pardal, Polytechnic Institute of Setúbal, Portugal

Rui Teixeira Dias, Polytechnic Institute of Setúbal, Portugal

Chapter 23

Using Mutual Information to Analyse Serial Dependence: The Effects of COVID-19.....	411

Andreia Dionísio, CEFAGE, IIFA, Universidade de Évora, Portugal

Paulo Ferreira, Polytechnic Institute of Portalegre, Portugal

Chapter 24

A Study on the Performance of Indian Mutual Funds in Recent Years 428

Dipika Varshney, Jain University (Deemed), India

Sowjanya Heblikar, Jain University (Deemed), India

Sunitha B K, Jain University (Deemed), India

Chapter 25

How Does COVID-19 Impact the Efficiency of the Chinese Stock Market? A Sliding Windows

Approach..... 445

Paulo Ferreira, Polytechnic Institute of Portalegre, Portugal

Éder Pereira, Instituto Federal de Educação do Maranhão, Brazil

Oussama Tilfani, Faculty of Sciences and Techniques, Cadi Ayyad University, Morocco

*My Youssef El Boukfaoui, Faculty of Sciences and Techniques, Cadi Ayyad University,
Morocco*

Chapter 26

The Relationship Between Gold and Stock Markets During the COVID-19 Pandemic: An

Econophysical Approach 462

Rui Teixeira Dias, Polytechnic Institute of Setúbal, Portugal

Luísa Carvalho, Polytechnic Institute of Setúbal, Portugal

Chapter 27

Distributional Uncertainty for Spectral Risk Measures 476

Mohammed Berkouch, LISAD Laboratory, ENSA, Ibn Zohr University, Agadir, Morocco

Compilation of References 495

About the Contributors 556

Index..... 562

Detailed Table of Contents

Preface	xxiv

Section 1 **Economy**

Chapter 1

The Impact of European Funds in View of Company Value Creation	1

Nuno Miguel Teixeira, Center for Research in Business and Administration, School of Business Sciences, Polytechnic Institute of Setúbal, Portugal

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Over the last few years, business management has become quite complex, leading to constant risks in the business context resulting from economies' globalization, not only by the frequent change in the organizations' proprietary structure, but also due to technological innovation and competitiveness in the global market. The sum of all the factors referred to above and the actual pandemic situation has substantially increased the level of risk in current or strategic management decisions taken within the scope of the organizations' activity. Thus, the aim of this research is to study the impact of EU funds on Portuguese companies by analyzing companies that have benefited from European incentives under the innovation incentive system, since it covers financing investments of global and strategic nature in productive areas. In this sense, the sample includes the companies that had projects approved in 2014 and aims to verify the impact of these incentives on the capacity of value creation, as well as on job creation and internationalization level in years of 2015, 2016, 2017, and 2018.

Chapter 2

Entrepreneurship and Unemployment: Government Grants and Challenges in a Pandemic Context ..	20

Francisco José Mendes Leote, College of Business and Administration, Polytechnic Institute of Setúbal, Portugal

Nuno Miguel Teixeira, Polytechnic Institute of Setúbal, Portugal

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The COVID-19 pandemic is having a very negative economic and social impact on Portugal's economy, with the year 2020 expected to represent the largest economic recession since the 1970s. According to the Bank of Portugal forecasts, employment is expected to fall significantly, with the unemployment

rate estimated at around 10%, with a special focus on young graduates. Simultaneously, several research papers have revealed the importance of entrepreneurship in job creation and economic development, highlighting the role of entrepreneurial ecosystems and government support for creating successful businesses. In this sense, this study has as its main objective to characterize a support program to the investment of young unemployed entrepreneurs and evidence its potential impact on Portugal's economic growth and social progress.

Chapter 3

Structures and Functions of Holding Companies in Different Countries 41

Pınar Avci, Tekirdağ Namık Kemal University, Turkey

The word “holding” is an English word. Some researchers state that this word derives from the root “hold” and means to hold management as “to hold and control,” while others state that it means to own a stock with the phrase “shareholder” or “to hold and control.” The word “holding” used by the countries of the world for business groups is expressed in different words by different countries. The following words are used: “holding” in Turkey, “chaebol” in South Korea, “keiretsu” in Japan, and “grupos economicos” in Latin America. At the same time, business groups are referred to as Qiye Jituan in China, Guanxi Qiye in Taiwan, Grupos in Spain, and Konzerne in Germany. In addition to these words mentioned, an American term “conglomerate” (holding) is sometimes stated in the alternative with business groups.

Section 2 Organizations

Chapter 4

Financial Capacity During a Pandemic Crisis: Insights From the Non-Profit Sector..... 59

Márcia Cadete Santos, Polytechnic Institute of Setúbal, Portugal

Sandra Nunes, Polytechnic Institute of Setúbal, Portugal

Pedro Dominginhos, Polytechnic Institute of Setúbal, Portugal

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This chapter seeks to provide empirical evidence of the financial shocks that non-profits experienced during the coronavirus disease-19 (COVID-19) pandemic lockdown period. The research included a literature review of the main up-to-date publications to understand non-profits' financial vulnerabilities. The statistical analyses' results facilitate a fuller understanding of the impacts that the abrupt loss of clients, volunteers, and employees due to the pandemic has had on non-profits' finances. These results are discussed in light of the previous studies. Through computer-assisted text analysis, this study examined non-profit managers' perceptions of the most significant challenges faced by these organisations in the pandemic's initial phase. The findings reveal a dramatic situation characterised by a decrease in revenues and increase in expenses, in which non-profits regulated by Portugal's social welfare private institutions statutes were the most strongly affected. The most salient challenges identified include technological preparedness, safety assurance, and physical distancing.

Chapter 5

Does the Capital Structure of New Ventures Differ as a Response to a Financial Crisis? Capital Structure Responsiveness of Portuguese New Ventures to an Economic Downturn..... 77

Maria João Guedes, ISEG, University of Lisbon, Portugal

Tânia Mafalda Antunes Saraiva, ISEG, University of Lisbon, Portugal

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The Portuguese economy has experienced a recent economic recession that forced firms to look for different ways to finance themselves in order to be able to respond and overcome the crisis. This study investigates whether the capital structure of new ventures differ as a response to the crisis. Drawing on a panel of 75,826 Portuguese new ventures (241,284 venture-year observations) established between 2006 and 2015 and followed until 2017, the results show that new ventures capital structure responds to economic downturns. New ventures founded during the crisis have higher values of debt-ratio, for both total and short-term debt ratio, higher profitability, higher growth, and lower tangibility. Furthermore, ventures that are financed mainly with equity resort to less short-term debt have higher profitability and liquidity but experience lower growth. This study informs managers, practitioners, and policymakers that new ventures' capital structure is responsive to an economic downturn and has implications for the establishment of ventures during recessionary periods.

Chapter 6

The Impact of Macroeconomic Factors on the Hotel Industry Through the Financial Leverage

Trends: The Portuguese Case..... 94

Luís Lima Santos, Centre for Tourism Research (CiTUR), Development and Innovation,

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In Portugal, news shows that the impact of COVID-19 in the hospitality sector was more noticeable compared to other sectors. This chapter aims to understand the historical trends of hotel industry financial leverage and to analyse the impact of macroeconomic factors on it. Based on the Portuguese reality, it aims to propose a model to be used by managers and shareholders to control the effect of financial leverage over their companies. Two issues are supporting this study: one is if companies evaluate the impact of the chosen financing sources on shareholders' return; another is to understand whether there is a change in the financial leverage effect, either due to macroeconomic factors or due to cyclical factors not controlled by the market, such as the current pandemic (COVID-19) which demands new challenges to companies. Results highlight that the perception of financial leverage by hotel managers is crucial in crisis situations, as the current case of the pandemic caused by COVID-19.

Chapter 7

Financial Analysis During the Pandemic and New Consumption: Oil and Gas Sector..... 112

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The economic consequences of the COVID-19 pandemic are not yet known. It is, however, observed that the consumptions in the world have changed dramatically in 2020, and it will keep changing as the pandemic evolves. It is already observed that in consumer confidence, there is a change in the use of energy and petroleum. People are not moving a lot during this pandemic, and they also discovered that they might stay this way in some occasions. It is affecting the petrol sector, maybe one of the most affected in the pandemic, because of the social isolation. This chapter analyzed 44 companies from the oil and gas sector around the world in relation to their financial distress. The Altman's Z-score was the methodology used, and the mean of the sector was compared with the five most distressed firms and the five least distressed. It is possible to observe that the sector suffered with this pandemic, and most of the companies are already in financial distress.

Chapter 8

Financial Management for the Successful Company Value..... 126

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This chapter deals with the issue of valuation of business entities. Based on literary research, which forms the basis of the chapter, two practical examples are given. The aim of the first example is to evaluate the financial situation of the concrete company for the period of 2007-2019 using valuation tools (financial analysis, creditworthiness and bankruptcy models, EVA). The purpose is to capture the course of an expansion disrupted by the great financial crisis that erupted in 2008 and to monitor the gradual return of corporate activities. The results of the analysis show that the financial crisis initially had a significant impact on the company but was nevertheless averted. The aim of the second example is, with the help of neural networks, to determine the relationship between the value generators of a company and EVA equity of small and medium-sized enterprises operating in rural areas of the Czech Republic in the period of 2013-2017. It is found that successful companies are distinguished from unsuccessful ones by the degree of human capital involvement.

Chapter 9

Analyzing the Impact of the COVID-19 Pandemic on Value Creation: The Case of Euronext

Lisbon 153

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Operating in an already challenging business environment, companies have faced yet another difficulty since March 2020, when the World Health Organization (WHO) declared a global pandemic situation related to the COVID-19 disease. The study's purpose was to analyze the value creation in Euronext Lisbon companies from the first semester of 2019 to the first semester of 2020. The aim was also to identify the areas with the most impact on value creation. To measure value creation, the indicator economic value added (EVA®) was used. The results revealed that the capacity to create value decreased for all companies. The variables included in the study that showed a statistically significant relationship with EVA® were operating profit, sales revenue, and cost of equity. This pandemic situation poses a significant threat to value creation, enhancing the idea that, more than ever, business management needs to focus on long-term value creation strategies.

Chapter 10

Impact of the COVID-19 Pandemic on the Financial Statements of Portuguese Stock Index 20

Companies..... 174

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COVID-19 emerged and spread all over the world. Portugal was no exception. Rules and measures applied, regarding the impacts of the pandemic, have affected the economy and, naturally, the entities life. The main objective of this chapter is to investigate the standards and rules entities have to obey and orientations that they have to follow vis a vis COVID-19, and to understand how COVID-19 has impacted interim financial statements of the entities included in the selected sample. Then it seeks to measure entities financial health using financial ratios and Zmijewski model and to compare those entities in order to try to find any relation among financial health and the disclosures made about COVID-19. It verifies that, as a rule, entities have followed the necessary procedures and that COVID-19 has had an impact, specially over credit risk, revenues, and expenses, and that the financially healthier entity is a quite transparent one.

Chapter 11

The Impact of Working Capital Management on Firm Operational Performance Through Business

Cycles: Evidence From Portugal..... 199

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This chapter aims to analyze the impact of working capital management on firm's profitability, considering economic downturn and boom periods. Analyzing Portuguese firms from 2006-2019 results show that cash conversion cycle, as well as days sales outstanding, days sales inventories, and days payment outstanding decreased after 2009 due to the international financial crisis. When the length of cash conversion cycle increases, firm return on assets also increases. This situation happens especially in recession periods, when sales decrease. Results also exhibit singularities across industries. In some sectors, the impact of working capital management in firm return is positive, while in industries with greater cash conversion periods, the impact is negative. The findings also reveal the impact of financial debt and economic growth on operational profitability. Managers need to focus on short-term financing practices to increase firm profits and create value.

Chapter 12

Idle Costs in the Pandemic..... 218

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This chapter focuses on a crucial crisis issue with consequences that have affected many companies worldwide, the spread of the COVID-19 pandemic. Deliveries were cancelled, and many companies closed their facilities completely around the world. Taking into account the capacity and structural nature of fixed costs, activity-based cost estimation may be more appropriate than traditional cost estimation to create the capacity to manage production cost structures to eliminate possibilities for idle costs, as these

are a function of using the capacity offered to the installation. This chapter theoretically presents the relationship between the main costs of idleness, crisis, and profitability as a measure of the company's value. This is important, as the company's value can be delayed by the occurrence of a crisis, and the health pandemic has created a field emerging from research with advances in strategic cost management.

Chapter 13

Cost Managerial Analysis to Prevent Arbitrary Cost Reductions in Times of Significant Crisis..... 233

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This chapter presents an innovative cost categorization model that can help understand costs in terms of their causes. The model incorporates categories that are now scattered in the literature, develops the categories more broadly, and connects with management control tools to monitor these costs. The model was applied in a Brazilian dairy company and made it possible for managers to discuss strategic aspects, hitherto not addressed in routine discussions. The model contributes to the literature by filling a gap in textbooks and contributes to practice by providing a cost categorization model, enabling the controller and finance professional to avoid arbitrary cost reductions, so common in times of crisis. However, they hinder the long-term performance of companies.

Chapter 14

The Uncertainty of the Organizational Environment as Cause of Unfavorable Budget Deviations in the Projects of Portuguese Construction Companies..... 248

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Construction companies are increasingly concerned with new strategic guidelines and ways of managing project budgets to improve their competitiveness and sustainability. Thus, with this work, the authors analyse the relationship of the uncertainty of the organizational environment with other constructs, as causes of unfavorable budgetary deviations in the projects of Portuguese construction companies. For its development, quantitative research methods and techniques were adopted. The results presented in the study show a high correlation between the five first-order constructs (internal environment, external environment, time/delay, project process/monitoring, and project financing) justified by the literature review and justify the perception regarding the uncertainty in the organizational environment and other constructs as factors that determine the causes of unfavorable budgetary deviations in construction companies' projects. It should be noted that the objectives outlined for this study were achieved by providing complementary knowledge in this area of research.

Section 3 Financial Institutions

Chapter 15

- Economic Policy Uncertainty in Banking: A Literature Review 275
Peterson K. Ozili, Central Bank of Nigeria, Nigeria

This chapter is a survey of the most important research in the economic policy uncertainty literature. Economic policy uncertainty, although still under-researched relative to mainstream topics in economics and finance, has recently received increased scholarly attention. Through synthesizing common themes in the literature, the chapter highlights the progress made so far and suggests some avenues for future research that allow future researchers to position their research and differentiate themselves from other studies in the literature. The chapter finds that economic policy uncertainty affects banks through a reduction in credit supply and loan re-pricing. High economic policy uncertainty compels bank managers to discretionary distortion of bank financial reporting in ways that help them to mitigate the depressing effect of economic policy uncertainty on banks' financial statements.

Chapter 16

- The Short-Term Effects of the Pandemic (COVID-19) on Banks With Activity in Portugal:
Particularly With Regard to Capital Buffer..... 291
Maria Clara Pereira Pires, Polytechnic Institute of Beja, Portugal
Milene Horta, Caixa Geral de Depósitos, Portugal
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In this chapter, the authors assess the short-term effects of the pandemic (COVID-19) on banks with activity in Portugal. Namely, with regard capital buffer, it is intended to describe, in a succinct way, the measures taken by Portugal government to minimize the crisis effects. On the other hand, researchers divided the factors that can influence bank capital buffer in several groups, namely management efficiency, credit quality, and profitability. The panel dataset is composed of report annual data of 18 banks operating in Portugal, representing about 98% of the Portuguese banking product. The dependent variable is the capital buffer (BUF). The results show that credit quality (ICV), management efficiency (CTIN), and profitability (ROA and ROE) have a significant impact on bank capital buffer. Banks that have good credit quality indicators (ICV), management efficiency (CTIN), capital adequacy, and capital buffer (BUFF) will be better prepared to face the pandemic that is just taking its first steps.

Chapter 17

- Credit Risk Aversion Model During Economic Downturns and Recovery 305
Akwesi Assensoh-Kodua, Durban University of Technology, South Africa

Credit defaulting in the financial sector is a worldwide delinquency that has become a nightmare for this sector. The search for a solution to root out this problem remains a big challenge for academics, the financial sectors, and the governments. For instance, per the American Bankers Association's (ABC) Consumer Credit Delinquency Bulletin, unserviced bank cards plunged two basis points to 2.96% of all accounts between July-August 2019. This value remained below the 15-year average of 3.68%. (Per ABC, delinquency is a late payment that is 30 days or more overdue.) Though these terrifying statistics sounds like good news, the Trans Union's Industry Insights Report found that the unserviced credit card rate reached 1.81% in the third quarter of 2019, rising from 1.71% for the third quarter of 2018. These figures from the credit bureau are based on accounts that are 90 days or more overdue.

Chapter 18

FinTech and Sustainable Development: A Comparative Study of Indian and Chinese FinTech Ecosystems.....	323

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The landscape of the financial industry has witnessed a massive revolution in recent years as a result of the growth of IT. The potential of FinTech innovations is a game changer allowing a scope to align itself to meet the needs of environmental sustainability. The increasing levels of human consumption are unsustainable for the world which needs to be addressed. The world needs to lead the way by rethinking many of its industries which are causing havoc for the survival of ecosystems and ensure that they operate in accordance with the 17 Sustainable Development Goals of the United Nations. The synergy of FinTech and sustainability will help to offer a tradable, measurable, and allocable venue to move citizens towards a sustainable and financially stable future. This chapter aims to justify that the future of finance is FinTech and study the ecosystem of FinTech in India and China to understand its implications, which can help for the development in the financial sector and in making the world a sustainable, habitable planet.

Chapter 19

Blockchain Technology in Securitization in India.....	343

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Blockchain and securitization's benefits go beyond the benefits of loan originating, underwriting, rating assignment and reviews, loan servicing, smart contracts, secondary market trading. This research is based on the qualitative data collected from external sources. The focus is on using secondary data from over 30 research papers, articles, and professional experiments that have been taken into account, and the formulas and conditions gathered from them have been experimented with the Indian economic scenario. The understanding is that securitization has always been a challenge in a country like India, but with the wide range of benefits from the 'blockchain', it can help improve the challenges and ensure a wider scope of securitization in a country like India, emphasizing that blockchain gives an elevated level of information security which brings about lower ingenuity trouble and disposes of administrative failures from the cycle of securitization.

Section 4

Financial Markets

Chapter 20

Foreign Exchange Market Shocks in the Context of the Global Pandemic (COVID-19).....	359

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This chapter analyzes the efficiency, in its weak form, in the international exchange markets from January 1st, 2019 to July 21st, 2020. The results show that the foreign exchange markets show very high levels of integration, which may jeopardize portfolio diversification as well as possible hedging operations.

The detrended fluctuation analysis (DFA) shows that the EUR.GBP, GBP.USD, USD.REAL foreign exchange markets show some signs of (in)efficiency showing persistence in yields, while the EUR.JPY, EUR.USD, JPY.CHF, USD.CHF, USD.JPY markets show signs of anti persistence (i.e., the existence of short memories). The USD.BITCOIN, USD.CAD markets do not reject the random walk hypothesis, that is, they are in equilibrium. By way of conclusion, the authors show that the uncertainty of the 2020 pandemic crisis has affected the memory properties of the foreign exchange markets since some returns can be expected, creating opportunities for arbitrage and abnormal profits.

Chapter 21

Performance of Exchange-Traded Funds in Europe: Beta-Performance Ratio..... 374

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In this study, the authors analyzed the performance of the exchange traded funds (ETFs) of the European iShares family, using risk-adjusted performance measures: Sharpe index, Treynor index, Sortino index, and Jensen's alpha. They also checked the beta-performance ratio and conjectured that ETFs with the highest betas are the ones that perform best. From the results obtained, they conclude that all ETFs had an average return lower than that of the respective benchmark. Using the Sharpe index, they found that no ETF performed better than its benchmark. As for the Treynor index, two ETFs, namely Belgium and Switzerland, performed better than the respective benchmark. As with the Sharpe index, for the Sortino index, no ETF exceeded its benchmark. As for the beta-performance relationship, the results indicated the existence of the low-risk anomaly.

Chapter 22

Do the Stock Market Indices Follow a Random Walk? 389

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This chapter aims to test the hypothesis of an efficient market, in its weak form, in the stock markets of Brazil, China, South Korea, USA, Spain, Italy, in the period from December 2, 2020 to May 12, 2020. The results show that the market efficiency hypothesis is rejected in all markets. In corroboration the DFA exponents show long memories, which put in question the market efficiency, in its weak form, suggesting that the stock markets analyzed show some predictability. In conclusion, investors should avoid investing in stock markets, at least while this pandemic lasts, and invest in less risky markets in order to mitigate risk and improve the efficiency of their portfolios.

Chapter 23

Using Mutual Information to Analyse Serial Dependence: The Effects of COVID-19..... 411

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The main objective of this research is to analyse the serial dependence of high frequency data for G7 stock indices. The authors use two different periodicities, and with linear and nonlinear approaches, they evaluate the stock markets' behaviour and conclude about the higher or lower dependence levels of the stock markets in the periods before and after the COVID-19 pandemic declaration. They use mutual information and the global correlation coefficient based on that measure, comparing results with the linear coefficient. The results are clear, showing that nonlinear dependence exists and could be an important factor in terms of historical information, especially for very high frequency data. Results are mixed in regard to the effect of the pandemic declaration in the dependence of stock markets.

Chapter 24

A Study on the Performance of Indian Mutual Funds in Recent Years..... 428

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The Indian mutual fund industry is an integral part of the Indian financial industry. The mutual fund industry has a significant impact on the Indian economy. This study aims at understanding the growth and performance of mutual fund industry and understanding the cause and effect through empirical research. For this research, published papers have been studied and analysed to give a better understanding of the industry. This study records the performance of Indian mutual funds from the year 2015-2020. It analyses the performance of the debt, equity, and ETF mutual funds. The challenges are huge, but the investors have shown a matured behaviour. The 2020 pandemic has allowed investors to balance their portfolios by removing poor performing mutual fund holdings.

Chapter 25

How Does COVID-19 Impact the Efficiency of the Chinese Stock Market? A Sliding Windows

Approach..... 445

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The spread of COVID-19, first in China and then all over the world, has had a major impact on economic and financial systems. In this chapter, the authors focus their analysis on the Chinese stock market since it was the first to be affected with relevant time to react. They use the detrended fluctuation analysis with a sliding windows approach and with minute-based data to analyse the impact of COVID-19 on the efficiency of the Chinese stock market. The results show that the Chinese stock market suffered from some kind of turbulence with high levels of dependence, but the market reacted quickly and after that turbulence recovered the efficiency pattern. This is a very relevant result that shows that this particular stock market quickly reacts to turbulent periods, very important information for investors.

Chapter 26

The Relationship Between Gold and Stock Markets During the COVID-19 Pandemic: An Econophysical Approach	462

Rui Teixeira Dias, Polytechnic Institute of Setúbal, Portugal

Luísa Carvalho, Polytechnic Institute of Setúbal, Portugal

This chapter aims to analyze portfolio diversification in the US, Europe, UK, Hong Kong, China, Japan, and the gold market (XAU) from January 2019 to July 2020. The results indicate that the markets have very significant causalities, which may call into question efficient portfolio diversification strategies. The DFA exponent coefficients suggest that the random walk hypothesis is rejected in certain markets, which has implications for investors, since some returns can be expected, creating opportunities for arbitrage and abnormal profits. These findings also open space for market regulators to take action to ensure better information among international financial markets. In conclusion, the authors believe investors should diversify their portfolios and invest in less risky markets in order to mitigate risk and improve portfolio efficiency.

Chapter 27

Distributional Uncertainty for Spectral Risk Measures	476

Mohammed Berkouch, LISAD Laboratory, ENSA, Ibn Zohr University, Agadir, Morocco

Spectral risk measures, primarily introduced as an extension for expected shortfall, constitute a prominent class of risk measures that take account of the decision-makers risk-aversion. In practice, risk measures are often estimated from data distributions, and due to the uncertain character of the financial market, one has no specific criterium to pick the appropriate distribution. Therefore, risk assessment under different possible scenarios (such as financial crises or outbreaks) is a source of uncertainty that may lead to concerning financial losses. The chapter addresses this issue, first, by adapting a robust framework for spectral risk measures, by considering the whole set of possible scenarios instead of making a specific choice. Second, the author proposes a variability-type approach as an alternative for quantifying uncertainty, since measuring uncertainty provides us with information about how far our risk measurement process could be impacted by uncertainty. Furthermore, the stated theory is illustrated with a practical example from the NASDAQ index.

Compilation of References	495

About the Contributors	556

Index.....	562

Preface

This book shares relevant information in the economic and financial areas, focusing on detail challenges and opportunities of pandemic situations in companies, market, and economy. Crisis situations lead to innovation, reorganizing and reinventing the companies. Therefore, the way companies are managed and change their business models, cause a huge impact in financial management, financial markets, and the economy as well.

This book calls the attention for the more relevant challenges to companies, financial institutions, financial markets and to governments, in order to guarantee funds and, simultaneously, the economic and social development, with new competences, innovations, new ways of investments, financings, entrepreneurship, business models, internationalization and with new public policies. It not only intends to help companies to understand how to deal with uncertainty, but also financial investors and the government that need to support the economy specially in recession periods.

The specificities of different markets and firms are addressed. The book cover examples of different financial markets, types of firms (listed and non-listed firms, profit and non-profit organization, financial and non-financial firms, different industries), and government. Moreover, different countries and markets are addressed as for example, Portugal, Brazil, Czech Republic, China, India, Japan, Hong Kong, US. and UK. Covering such a great diversity, this book gives an overall picture of what is going on in the world with regards to macroeconomic factors impact in economic and financial fields.

The topics covered in this book, its main conclusions and suggestions for future research are of a great value for academics and students of master and doctoral degrees since not only show a synthesis of literature review and makes contributions to the field, but as well shows lacunes in the literature which can be topics of future research to expand international knowledge.

Several topics regarding the company's sustainability, the growth of economies and the future of the societies are analyzed. In detail the book covers topics such as:

- Risk and uncertainty in pandemic situations;
- Capital structure and financial capacity;
- Costs structures;
- Budget deviation;
- Financial management;
- Financial value creation;
- The impact of European funds to creation of business value;
- Economic changes and its impacts in companies;
- Financial instruments;

Preface

- Financial markets;
- Market reactions;
- Credit risk and uncertainty;
- New ways of living and doing businesses;
- Countries dynamics.

The 27 chapters are organized in: economy, organizations, financial institutions, and financial markets.

ECONOMY

Chapter 1 studies the impact of European funds on Portuguese companies. Analyzing companies that have benefited from European incentives under the Innovation Incentive System, the chapter aims to verify the impact of these incentives on the capacity of value creation, as well as on job creation and internationalization level.

Chapter 2 characterizes a support program to the investment of young unemployed entrepreneurs in Portugal. Main conclusions evidence the potential of this investment program on Portugal's economic growth and social progress.

Chapter 3 analyses the structures and functions of the holding companies operating as business groups in several countries (Turkey, the USA, South Korea, Japan, China, Belgium, France, Germany, the UK and Russia). The chapter shows that with rapidly development of the economic system, the number of holding firms is increasing.

ORGANIZATIONS

Chapter 4 analyzes the impact of covid-19 and the lockdown period in non-profit firms. Based on a survey of Portugal's non-profit organizations, the authors show that these organizations experienced an increased demand for aid in the form of food, shelter and other basic necessities due to increased unemployment or salary cuts.

Chapter 5 studies whether the capital structure of new ventures differ due to economic downturns. Analyzing Portuguese new ventures, the work shows that new ventures are mainly financed through equity and less with short-term debt, but in crisis periods its indebtedness increased.

Chapter 6 intends to understand the historical trends of hotel industry financial leverage, and to analyse the impact of macroeconomic factors on it. The chapter also proposes an analysis model to be used by managers and shareholders to control the effect of financial leverage over their companies.

Chapter 7 uses the Altman's Z-score to analyze firm's probability of bankruptcy and found that with the pandemic situation, most of firms from the oil and gas industries (located in the 5 continents: Europe, North America, South America, Africa, and Asia) are already in financial distress. The work also shows that the consumption habits are changing, with great impact in this sector.

Chapter 8 presents a literature review about how to financial evaluate firms using standard and innovative (superficial intelligence) methods. Moreover, two specific examples of firms from the Czech Republic are presented.

Chapter 9 analyzes the value creation in Euronext Lisbon companies from the 1st semester of 2019 to the 1st semester of 2020. The pandemic situation led to a decreased in the capacity to create value for all companies.

Chapter 10 analyzes the standards and rules entities have to obey and orientations that they have to follow vis a vis Covid-19, and to understand how Covid-19 has impacted interim financial statements of the entities included in the selected sample. Using financial ratios and Zmijewski model, the chapter aims to compare those entities in order to try to find any relation among financial health and the disclosures made about Covid-19.

Chapter 11 analyzes the impact of working capital management on firm's profitability, considering economic downturn and boom periods. Analyzing Portuguese firms results show that when the length of cash conversion cycle increases, firm's return on assets also increases, especially in recession periods. Results also exhibit singularities across industries.

Chapter 12 presents a literature review about idle costs and the relationship between these costs, crisis periods and profitability to measure firm's value. This work suggests that the reduction of idle capacity may help managers to align the demand for production and the occupation of resources such as facilities, and equipment and labour as a business strategy.

Chapter 13 purposes an innovative cost categorization model that can help understand costs in terms of their causes. With a case study of a Brazilian dairy company the authors show the benefit of this cost categorization model, to avoid arbitrary cost reductions, so common in times of crisis.

Chapter 14 analyze the impact of macroeconomic factors on unfavorable budget deviations in projects of Portuguese firms from the construction sector. This work shows which factors are more relevant to explain budget deviations and calls the need of firms to control budgets to avoid loss of value.

FINANCIAL INSTITUTIONS

Chapter 15 presents the most important research in economic policy uncertainty topic. The chapter shows that economic policy uncertainty is a macroeconomic phenomenon that impacts banks through the reduction of credit supply and loans reprice.

Chapter 16 present the impact of the pandemic on the economic and financial performance of the main banks in Portugal in 2020 and study, with a panel data, some variables that can influence a bank capital buffer and the reply to the challenges related to the actual crise.

Chapter 17 presents a credit risk management model based on preventive controls (to predict credit delinquency) to help to reduce the financial sector's susceptibility. The author shows that banks need to be careful to manage credit in order to survive especially in periods of economic downturn.

Chapter 18 shows the need to rethink industries to assure the survival of ecosystems and to make the world more sustainable. By studying the ecosystem of FinTech in India and China the authors prove the potential of Fintech innovation, its implications, and how it can help the financial sector and the world.

Chapter 19 presents the main advantages of developing blockchain technology in securitization of assets in India's financial markets. In addition to conducting a literature review on the topic, it addresses the main challenges for its implementation and its potential impact on the development of the financial market.

FINANCIAL MARKETS

Chapter 20 tests the integration and efficiency, in its weak form, in major international exchange rates in the period of pandemic situation caused by covid-19. The results suggest that foreign exchange markets, for the most part, exhibit high levels of integration, rejecting the random walk hypothesis.

Chapter 21 analyzes the performance of the Exchange Traded Funds (ETFs) of the European iShares family, using risk-adjusted performance measures: Sharpe Index, Treynor Index, Sortino Index, and Jensen's alpha. Results show that all ETF's had an average return lower than that of the respective benchmark.

Chapter 22 tests the hypothesis of an efficient market, in its weak form, in the stock markets of Brazil, China, South Korea, USA, Spain, Italy, in the period from December 2, 2020 to May 12, 2020. The market efficiency hypothesis is rejected in all markets, suggesting that the stock markets analyzed show some predictability.

Chapter 23 analyses the serial dependence of high frequency data for G7 stock indices. Both linear and nonlinear approaches are used to evaluate the stock markets' behaviour. The authors show that results are mix regarding the effect of the pandemic declaration in the dependence of stock markets.

Chapter 24 presents the growth of the mutual fund industry and contribute to understand the evolution of the different types of mutual fund, such as debt oriented mutual, and the impact of the pandemic situation on the performance of the financial market.

Chapter 25 analyses the impact of Covid-19 on the efficiency of the Chinese stock market, the first market affected by this pandemic situation. Using the Detrended Fluctuation Analysis, with a sliding windows approach and with minute-based data results show that the Chinese stock market suffered from some kind of turbulence, with high levels of dependence, but the market reacted quickly and after that turbulence recovered the efficiency pattern.

Chapter 26 analyzes portfolio diversification in the US, Europe, UK, Hong Kong, China Japan and the Gold Market (XAU) in the period of pandemic situation caused by covid-19. Main conclusions show that the markets have very significant causalities, which may call into question efficient portfolio diversification strategies. Moreover, the random walk hypothesis is rejected in certain markets.

Chapter 27 adapts a robust framework for spectral risk measures, by considering the whole set of possible scenarios, and proposes a variability-type approach as an alternative for quantifying uncertainty. A practical example from the NASDAQ index is addressed.

All of the above-mentioned chapters work together to present a combined image of macroeconomic cycles impact on economic and financial areas.

Finally, we would like to thank all authors for the participation on this book as well as reviewers who gave valuable insights to authors to improve the work's quality, and IGI Global staff for their continuous support during the development of the book.

Section 1

Economy

Chapter 1

The Impact of European Funds in View of Company Value Creation

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ABSTRACT

Over the last few years, business management has become quite complex, leading to constant risks in the business context resulting from economies' globalization, not only by the frequent change in the organizations' proprietary structure, but also due to technological innovation and competitiveness in the global market. The sum of all the factors referred to above and the actual pandemic situation has substantially increased the level of risk in current or strategic management decisions taken within the scope of the organizations' activity. Thus, the aim of this research is to study the impact of EU funds on Portuguese companies by analyzing companies that have benefited from European incentives under the innovation incentive system, since it covers financing investments of global and strategic nature in productive areas. In this sense, the sample includes the companies that had projects approved in 2014 and aims to verify the impact of these incentives on the capacity of value creation, as well as on job creation and internationalization level in years of 2015, 2016, 2017, and 2018.

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INTRODUCTION

Globalization has brought density and greater uncertainty to business management. That happened perhaps mostly because of increasing technological innovation and competitiveness, but certainly also because of recurrent transformation in the organizations' proprietorship structure. Thus, all these aspects have noticeably amplified risk, both in current as in strategic management choices. Value creation has nowadays won important relevance in the context of organizations' activity, since it validates companies' ability to reward investors, both internal and external, bearing in mind total investment.

According to Neves (2011), the existing intensifying interest about creating value stretched out simple profits' analysis. This happens due to progressive consensus about real benefit of financial results, that can only lead to both wealth and imperishability of an organization when rewarding total invested capital along with value creation.

Portuguese companies have been assisted by EU funds over the past few decades precisely to enhance competitiveness and capability to create value, in this increasingly international context. Literature has not developed many studies on the impact of these funds on national companies, despite the relevance of the subject. Regarding the ongoing pandemic situation and the expected gigantic negative impact on organizations, on employment and on economy, this is an issue which got sustained magnitude.

The purpose of this research work is, thus, to understand the stimulus provoked by EU funds on Portuguese corporations, by analyzing figures about those that have been helped by European incentives under the Innovation Incentive System. This choice was made bearing in mind that this Program comprises financing investments both global and strategic, in productive areas. In this sense, the sample includes all the 166 companies that had projects approved in 2014 and aims to verify value creation ability, as well as job creation and internationalization level. To achieve our goal, we use both economic and financial data for the financial years of 2015, 2016, 2017 and 2018 and several statistical techniques, such as means deviation and multivariate linear regression.

Besides this introduction, the work has four parts: theoretical framework, on which we exploit the substance of investment decision through the analysis of various studies about the impact of subsidies on companies' performance, value creation and capital cost; the empirical study, which comprehends a more detailed portrayal of purposes and research methodology; results' analysis and discussion and general work conclusions.

THEORETICAL FRAMEWORK

The Importance of Investment Decision

From a microeconomic perspective, Martins et al. (2009) interpret the concept of investment as funds application that generate financial surpluses, aiming the maximization of company value, in a given time horizon.

Investment may happen for many different reasons, such as improvement pursuit, market demand, technological innovation, cost reduction or productivity gains, the use of synergies to achieve scale economies, and profitability expansion (Teixeira & Amaro, 2013).

Solnik (1995) states that investment may also happen due to a considerable capital hold producing a certain long-term profitability, even though hypothetical and risky. But, according to Pettinger (2006)

investment is simply anything related to profitability expectations. And that is the reason why people invest capital, time, energy and personal commitment, as well as resources, in enterprises.

According to Araújo (1999), investments are very important for a company's future, because it provides the necessary resources to achieve competitive market advantages and business resilience. Investments also enable activity growth and, eventually, market share growth. But, if poorly prepared, investments may also quicken companies' decline. Thus, according to Marques (2014), to invest, recovery expectation must be real, as also, in the long term, must be results that justify the cost to invest, through a compensation that overcomes it.

About this, Neves (2011) states that investment decisions are based on the company's mission and strategy, which should focus on value creation for owners considering, therefore, profitability as well as potential associated risks.

According to Soares et al. (2015), investment decisions should take place only after a careful and circumstantial analysis of industry structure and internal resources. Strategic investment options should focus on strengths and weaknesses, threats and opportunities facing the company. Such an analysis should also assess whether the investments to be made will ensure economic and financial benefits over the years, able to cover operational cost and, at the same time, ensure value creation for investors.

For Teixeira and Amaro (2013), business strategic investment decisions aim its financial sustainability over time. They condition both production capacity as well as competitive advantages creation, typically involving large amounts of capital from the owners or medium-term financing sources negotiation that will condition treasury for a long time.

Hence, decisions on investment projects should engage cautious economic and financial analysis, as impulsive decisions might condition competitive capacity, through the development of skills not valued by the market or financial bottleneck, through treasury deficits (Teixeira & Amaro, 2013).

Investment Grants

Investment grants represent an important financing source concerning companies' development. This type of funding may total or partially assure strategical assets acquisitions' coverage to pursuit competitive advantages creation and business sustainability. By doing so, investment grants allow to diversify financing sources and to reduce capital cost, by reducing the need for internal or external capital entries.

Basically, investment grants may be non-reimbursable or reimbursable. Non-reimbursable grants finance corporate investments with no capital repayment nor capital remuneration. Reimbursable grants refer to making capital available to finance investments, which will subsequently be repaid to the entities that granted them. Usually, reimbursable grants also have no associated capital remuneration and the repayment of outstanding capital only begins after two-year or three-year of grace period, to allow companies to reach its full rhythm, generating financial surpluses capable of securing payments. It should be noted that, sometimes, such reimbursable grants are distributed with the possibility of becoming, in whole or in part, in non-refundable grants. This premise is usually associated with the achievement of economic targets by beneficiary companies, as this is what contributes to the country's economic development. In Portugal, this hypothesis is a part of the Innovation Incentive System, where companies may eventually turn 75% of reimbursable subsidies into non-repayable.

Impact of Investment Grants

Despite the importance of investment grants for companies' development and modernization, there are not many empirical studies looking into the outcome on performance.

Beason and Weinstein (1996) studied support instruments to industrial policy in Japan and did not see any evidence of increased productivity in companies that had benefited from these procedures.

Lee (1996) noted the impacts of the Korean government's industrial policy on productivity growth in the manufacturing industry and has highlighted the fact that tax incentives and subsidized credit were not related to production factors' efficiency.

Bergström (2000) looked at the impact of subsidies on business productivity in Sweden. He assumed that there was a positive correlation between grants and productivity, because it would be associated with companies' technological modernization and scale economies. The correlation between grants and the increase in companies' value has been confirmed. Furthermore, the author found that companies' productivity increased in the first year after the grant, but that this was not observed in the following years, calling into question the efficiency of its use.

Roper and Hewitt-Dundas (2001), when researching two sets of companies, one from Northern Ireland and another from the Republic of Ireland, showed that government aid granted to sample companies had not had an impact on their turnover growth, nor on profitability. These government support had only had a significant impact on job creation. Despite job creation social importance, researchers warned about growing fixed staff expenses, which could have noxious implications, in the medium and long term, on companies' competitive position, because of the negative effect that over-workers would have on productivity and jobs to be created.

On one hand, Tzelepis and Skuras (2006) in a study about the impact of subsidies on corporate financial performance, concluded that those had only a growth effect. On the other hand, a mid-term evaluation study on COMPETE- Operational Program Competitiveness Factors, prepared by Augusto Mateus & Associated and PricewaterhouseCoopers (PwC), in 2013, backs the existence of incentive systems for businesses, as, despite much of the supported investment being on reequipment, will often lead to resizing and/or internal reorganization processes, with potential benefits on business cost-effectiveness.

Another study by Cerqua and Pellegrini (2014) about Italian companies, concluded that grants impact on employment, investment and turnover was positive and statistically significant. However, the effect on productivity was virtually nil. These authors suggested that it could have been a certain encouragement to companies to hire, to get higher funding, misleading them to exceed the ideal number of workers. Such behaviour would tend to affect companies' efficiency levels, in the long term. And Carvalho (2014) found that subsidies under the Innovation Incentive System had not had a significant impact on the gross margin of the companies that had received them.

Finally, Teixeira et al. (2020), studied companies that benefited from EU funds in 2014 under the Innovation Incentive System. The research results showed that companies under study presented greater value creation and employment capacity and internationalized the activity in the financial year of 2016. However, only job creation and internationalization presented statistically relevant differences compared to the values of 2014 (which was the year of EU funds receiving).

The research results on the impact of grants on corporate financial performance have, therefore, been inconclusive, and there is different evidence on their importance to beneficiary companies' competitiveness.

Financial Performance Assessment

According to Teixeira and Amaro (2013) traditionally, the concept of financial performance is related to accounting information provided by Financial Statements, as is the case of the Balance Sheet, Profit and Loss Account and Cash Flow Statement. In addition, the same authors report that financial performance condenses management decisions' impact on generating results capacity, profitability vis-vis investments made, the company's cash situation and also its financial sustainability over time.

Thus, the assessment of financial performance of for-profit entities is one of the most important perspectives, as it summarizes the impact of all management decisions on value creation capacity.

However, according to Neves (2011) there is currently an increasing concern about creating value over the mere profits' analysis. In other words, it is increasingly consensual that profits can only be beneficial to organization's prosperity and perpetuity if rewarding total invested capital and providing value creation by exceeding investment cost.

Not forgetting the relevance of the traditional analysis of financial performance through ratios and indicators, which continues to be an important instrument to support financial diagnosis, this is not in itself a sufficiently adequate method for the evaluation of strategies (Neves, 2012). In this perspective, there is a greater focus on the concern and improvement of systems that encourage top managers, as well as their respective business units, to be increasingly concerned with the ability to create financial value, ensuring, in a business universe more diversified and complex, the financial sustainability of the company and the creation of wealth for investors (Teixeira and Amaro, 2013).

Thus, the performance evaluation based on the creation of value, presents a great advantage over the traditional evaluation of the financial performance, because it includes the remuneration required by the owners, allowing a more complete view of the capacity to create profitability and of the financial sustainability of the companies. (Teixeira et al., 2012).

Nowadays, there are numerous perspectives for financial performance assessment, but there is no unanimity as to suitable indicators. Thus, Teixeira and Amaro, (2013) recommend organizing different financial performance indicators assessment, pursuing value creation, according to the following perspectives:

1. Accounting results;
2. Profitability;
3. Cash flows.

Indicators of Assessment of Financial Performance Through the Logic of Value Creation

Value creation evaluation can be done by isolating indicators into three distinct groups, these being results indicators, profitability indicators and cash flows indicators (Teixeira et al., 2012).

Firstly, we would like to clarify that any of the indicators mentioned, which measures value creation, can be calculated in two perspectives: that of the owners and that of the company (Neves, 2012). This work focuses on the company's activity capacity to create value, regardless investor type. Thus, the study focuses on the overall business capacity to release results able to exceed desired investment remuneration both to owners as to financial partners, and not only the expectations of the first.

Starting with results indicators, it considers activity created results in relation to the cost associated with the necessary investment. These indicators are Economic Value Added (EVA) and Cash Value Added (CVA), which assess companies' ability to generate supranormal profits.

EVA is an assessment measure for company's financial performance, which seeks to weigh management value creation. This value is created whenever the business generates greater result than capital cost. It is determined by the difference between net operating income (NOI) and the results required by both owners and creditors. Thus, it corresponds to business results surplus in relation to funders required result (Neves, 2018).

$$\text{EVA} = \text{NOI} - \text{Investment} \times \text{Capital cost} \quad [1]$$

In this way, it should be concluded that EVA is the created value in view of the opportunity cost of the an organization invested capital, all financial costs (debt and equity) being included in its calculation, clearly differentiating itself from the traditional measures of assessment of an organization's financial performance such as ROI-Return On Investment (Silva & Queirós, 2010)

CVA is an indicator that allows financial performance evaluation of an organization, combining the advantages of measures based on supranormal profits with cash flows concept (Young & O'Byrne, 2001). According to Neves (2012), CVA calculation formula is identical to that of EVA, the difference being in the replacement of Net Operating Income (NOI) by Liquid Operating Means (LOM-net operating tax results, plus non-payable costs). It should be noted that this indicator includes non-payable costs as period results, (as it represents tax-accepted costs), but not requiring any monetary exit from the company. This means that those costs contribute to self-financing creation that should be considered in the ability to release business surpluses. Furthermore, by doing so, results do not depend on the different accounting policies adopted by companies, about depreciation and amortization, impairments and provisions (Teixeira & Amaro, 2013).

$$\text{CVA} = \text{LOM} - \text{Investment} \times \text{Capital cost} \quad [2]$$

or

$$\text{CVA} = \text{EVA} + \text{Non-payable costs} - \text{Investment} \times \text{Capital cost} \quad [3]$$

Being similar indicators in logic and calculation formula, Young and O'Byrne (2001) draw attention to the fact that EVA has the advantage of highlighting business capability to cover all activity costs.

With regard to value creation indicators based on profitability, we underline Supranormal Profitability (SP) and Cash Flow Return On Investment (CFROI).

SP bases on the comparison between generated profitability and investment capital cost, practically starting from the same principles as EVA (Teixeira, 2008). Generating profitability is represented by ROI, as it observes the relationship between activity created results and the necessary investment. As for capital cost, its calculation will be discussed later.

$$\text{SP} = (\text{ROI} - \text{Capital cost}) \times \text{Investment} \quad [4]$$

Thus, through formula analysis, it can be concluded that there is value creation if created profitability exceeds capital cost. This margin, multiplied by the amount of investment, shows value creation capacity in monetary units, and must have an identical result to EVA (Teixeira, 2013).

As for CFROI, it emerged as an alternative to ROI and was created by CSFB-Holt Value Associates (Neves, 2011). However, it is the most difficult indicator to operationalize. Its objective is to determine an internal return rate (IRR) that takes into account investment current value (non-current assets and existing business working capital needs), its useful life and the yearly net operational means, which are considered as a reference for the following financial years. In addition to these procedures, values should be calculated at current prices. In the last year, the residual value of existing assets is considered to determine the IRR for the analyzed time period (Neves, 2012). In practice calculation formula is as follows:

$$CFROI = - EACP + NOMCP / (1+IRR) + \dots + NOMCP / (1 + IRR)^n + RV / (1 + IRR)^n \quad [5]$$

Where: EACP-Economic assets at current prices; NOMCP-Net operating free means at current prices; RV-Residual value

Thus, due to the way it is calculated, several criticisms are pointed out to this indicator (Neves, 2011):

1. The way inflation has an impact on each type of asset is very subjective, and it is very difficult to operationalize its effect for determining value creation;
2. Assuming net tax release means are always equal over the years is an utopia, which does not represent companies' real surpluses creation capacity during the analyzed period;
3. Working capital investment is not considered in the predictable years, because it is assumed that it also does not change its value regarding the year considered as investment, which is also not correct;
4. Thus, an IRR is being determined regarding potential results and not on cash flows, which does not meet the one advocated by financial theory.

In practice, CFROI is calculated through similar procedures as to investment projects evaluation, having as main difference the fact that it does not work with cash flows but rather, with free means. In this way, it intends to verify investments possible profitability, considering current activity capacity, to generate assets expected lifetime financial surpluses.

As far as cash flows are concerned, they are a powerful financial planning and control instrument, allowing investors to observe business real capacity to create cash flows and not being influenced by accounting record criteria, such as depreciation and depreciation and impairments, which influence the level of generated surpluses, when they are measured through results or liberated means (Esperança & Matias, 2009). Thus, they allow a clear view of companies cash situation, representing the actual investment or organization monetary flows and are calculated by the difference between all entries and withdrawals of funds (Silva & Queirós, 2010).

Michael Jensen (1986) in a research work called "Agency Cost Of Free Cash Flow, Corporate Finance, and Takeovers", considered cash flows fundamental to financial performance assessment and introduced the concept of Free Cash Flow, highlighting Free Cash Flow to Firm (FCFF) or Operational Cash Flow, in business valuation.

Operating Cash Flow (OCF) illustrates business generated surplus after covering investments in non-current assets and operational working capital needs, without considering the form of selected funding (Neves, 2012). Therefore, the OFC is determined as follows:

$$\text{OCF} = \text{OI} \times (1-t) + \text{D} + \text{P} - \Delta\text{WCN} - \text{I} \quad [6]$$

Where: OI-Operational Income; t-Tax rate; D-Depreciation and amortization; P-Provisions and Impairment; ΔWCN -Working Capital Needs variation; I-Fixed capital investment (Exploration).

So, the OCF highlights operational activity flowing funds which are available to cope with required compensation by different investors, owners and financial institutions.

Finally, in order to measure creating value capacity, it is essential to consider invested capital cost, i.e. investors required remuneration. Thus, Neves (2011) recommends the use of economic value created (EVC) and internal rate of effective return (IRRE) indicators, which are indicators based on historical cash flows. Its calculation is based on the capitalization of the various cash flows to the end of the last year under analysis, verifying generated profitability throughout previously designed investments implementation.

Thus, EVC and IRRE allow bridging the gap between estimated investments' evaluation and its implementation control, by comparing the estimated values of NPV and IRR (net present value and internal return rate) with created cash flows, considering required compensation. EVC and IRRE can be calculated as follows:

$$\text{EVC} = \text{OCF}_1 \times (1 + \text{cost of capital})^{(n-1)} + \text{OCF}_2 \times (1 + \text{cost of capital})^{(n-2)} + \dots + \text{OCF}_n$$

$$0 = \text{OCF}_1 \times (1 + \text{IRRE})^{(n-1)} + \text{OCF}_2 \times (1 + \text{IRRE})^{(n-2)} + \dots + \text{OCF}_n \quad [7]$$

In conclusion, we can verify that all indicators of value creation, although starting from different bases (results, profitability, and cash flows), always aim to verify business ability to generate higher remuneration compared with required capital cost of different investors, owners and financial institutions.

In this sense, the concept of capital cost will be addressed next.

Capital Cost concept

Capital cost concept is usually associated with the return that a particular investment should provide, defined as investors required remuneration rate, taking into account its business risk. At company level, the concept of "cost of capital" relates to investor decisions on the assets in which to invest and how to finance them, bearing in mind maximizing organizational value (Teixeira, 2008).

Business activity can be essentially supported through debt financing and equity, both having associated a specific cost, which varies depending on different investors incurred risk. Usually, owners demand higher reward. This is because they have a greater concern with business management, and because they risk, in case of bankruptcy, to have access to existing assets only after the fulfilment of third parties' obligations. Based on this idea of different costs for the various sources of financing, arose the concept of weighted average cost of capital. It is better known for its English designation, WACC - *weight average cost of capital*. Its calculation formula is as follows (Teixeira, 2008):

$$\text{WACC} = (E/A) \times K_e + (L/A) \times K_d \times (1 - t) \quad [7]$$

Where: E-» Equity; A-» Liquid Asset; K_e -» Cost of Equity; P-» Liabilities; K_d -» Cost of debt financing; t-» Income tax effective rate.

Having this formula as a reference, the optimal capital structure (or optimal indebtedness level) is the one that minimizes wacc and consequently maximizes company value.

WACC comprises the sum of equity and liabilities costs, duly biased by its weight in net assets financing. This information may help managers considering cheaper financing sources, lowering the cost of capital. By decreasing the value of the WACC, management may also contribute to value creation by reducing the cost of financial surpluses investment increases value (Teixeira et al., 2012).

The cost of financing sources is often determined by contracted interest rates applied by financial institutions, or through the relationship between periodic financial expenses and paid liabilities at the end of the previous year (Neves, 2012).

With regard to the cost of equity, in the case of listed companies, it is represented by the expected profitability, determined through the *Capital Asset Price Model* (CAPM), which measures the remuneration to be required by owners on market profitability basis and securities associated risk. In other cases, it may be calculated by reference to the average profitability of own capital in the activity sector, or the addition of premium risk to the company financing bank cost (Neves, 2018). In this regard, Damodaran (2020) and specialized organizations, such as COFACE, suggest the use of risk premiums as a reference, according to the risk of the countries where they operate.

EMPIRICAL STUDY

European Union Funds in Portugal

Portugal benefited from the Portugal 2020 - PT2020 Program (2014-2020), the Community framework that took place until last year. This program comes through a Partnership Agreement established between Portugal and the European Commission, through which Portugal received a total of €25 billion by 2020, with the aim of stimulating growth and job creation in the country, being properly aligned with the principles of the Europe 2020 Strategy, which is based on Smart, Sustainable and Inclusive Growth (www.portugal2020.pt, 2018).

Portugal 2020 (PT2020) brings together the five European Structural and Investment Funds (ESI Funds) - the three Cohesion Policy Funds (European Social Fund, European Regional Development Fund and Cohesion Fund), the European Agricultural Development Fund and the European Fund for Maritime Affairs and Fisheries (www.portugal2020.pt, 2018). The ESI Funds are the European Union (EU) regional policy financial instruments to fight against asymmetries amongst the various countries and regions, thus contributing to achieve economic, social and territorial cohesion in the European integration process (www.portugal2020.pt, 2018).

In order to operationalize the implementation of European funds, with a particular focus on business initiative, *Portaria* No. 57-A/2015 of 27 February, article 3rd approved the Specific Regulation on the Field of Competitiveness and Internationalization (RECI), defining investment typologies covered by the companies incentives system provided for in the RECI:

1. Business innovation and entrepreneurship;
2. Qualification and internationalization;
3. Research and technological development.

The objective of the System of Incentive to Business Innovation and Entrepreneurship, according to articles 19th and 20th of RECI, is to boost innovation in Portuguese businesses. This Incentive System seeks production forms for new goods, services and processes that are capable of supporting their own progression in the value chain through international markets orientation strengthening. It also aims technological improvements encouragement, production units creation, qualified entrepreneurship stimulation, and investment structuration in new potential growth areas.

The Qualification and Internationalization Incentive System aims, according to Article 40th and 41th of the RECI, small and medium-sized enterprises (SME) competitiveness promoting by increasing productivity, flexibility and responsiveness and active global market SME presence. It supports investment in dynamic competitiveness factors, including industrial property, brand creation, laboratory capabilities creation or strengthening, organization and management, information and communication technologies' implementation, quality, environment, innovation, digital economy, among other.

The Incentive System for Research and Technological Development defined in Articles 60th and 61th of the RECI consists of research and technological development projects (R&DT) and technological demonstration, led by SME, and can be developed in cooperation with National Technical and Scientific System entities. These projects shall involve industrial research and/or experimental development activities, leading to new products, processes or systems' creation or to the introduction of significant improvements in existing ones.

Managing Authorities of Operational Programs or other competent entities are in charge of reviewing all the applications, serializing it and punctuating it according to each contest criteria. Applications whose decision is favorable have access to two types of EU support: non-reimbursable grants and reimbursable allowances, usually with several years of grace period and the possibility of being partly transformed into non-reimbursable if the applicable foreseen economic targets are met.

Research Objectives and Methodology

The general goal of this research work is to verify whether allocated EU funds have had a positive impact on Portuguese companies' financial value creation.

Taking into account the existing results on the subject in analyzed studies and the outlined strategy under Portugal 2020, EU funds are expected to contribute to greater Portuguese companies' profitability creation, as well as employment and greater internationalization capacity. These expectations rely on the fact that better capital access supposedly eases strategic investments financing, which are fundamental for creating sustainable competitive advantages.

To achieve the overall objective set, we studied companies that obtained EU funds under the Innovation Incentives System (SI Innovation) in 2014. We chose to analyze companies that benefited from this incentive system, because SI Innovation finances productive crosscutting projects in different organizational areas. Other incentive systems focus on specific corporation areas, not having such a comprehensive impact on their activity.

For the analyzed years, the study focused on both economic and financial values of 2014, 2015, 2016, 2017 and 2018 financial years. As a rule, companies had 24 months to make the investment and

The Impact of European Funds in View of Company Value Creation

so we looked at those that benefited from funds in 2014, hoping that the next financial years (2015 and especially 2016, 2017 and 2018), could show a positive impact on activity value creation in companies under study. Thus, the sample consists of 166 companies.

Information sources used were, firstly, economic and financial data from the SABI database - Iberian Balance Sheet Analysis System, to understand which companies received incentives in 2014 and afterwards, incentive amounts, from the Portugal 2020 website.

Thus, based on incentive companies in 2014 under SI Innovation, and the overall objective defined, we formed four research hypotheses to support study's development:

H1: The 2016, 2017 and 2018 EVA are significantly higher than the 2014 EVA.

H2: The number of people employed in 2016, 2017 and 2018 are significantly higher than in 2014.

H3: The level of internationalization in 2016, 2017 and 2018 are significantly higher than in 2014.

H4: The allocation of EU funds presents a positive relationship with financial value creation, job creation and internationalization capacity.

With regard to considered financial concepts throughout this work to determine studied companies' value creation capacity, and due to their importance for reliability research, we find important to detail used economic and financial items calculation.

The indicator used to measure value creation capacity was EVA. This option reflects the fact that this indicator allowed us to easily assess value creation, being calculated through financial statements contained data.

As for EVA determination, we used Net Income Without Financial Leverage as business results (NIWFL), in order to include all economic flows except those associated with financial decision. We obtained the NIWFL by applying the following formula:

$$\text{NIWFL} = (\text{OR} + \text{Financial income}) \times (1 - t) \quad [8]$$

Where: NIWFL - net results without financial leverage; OR-operational results; t-effective rate tax

To investment determination, we used total net asset value, to include all investments made in the activity.

Regarding the cost of capital (equity and debt capital), we determined it through WACC, calculating the following variables: effective tax rate (t), cost of debt capital (Kd), cost of equity (Ke), invested capital, liabilities and equity.

Effective tax rate was calculated using the correlation between the amount of corporate income tax - IRC and results before taxes - RAI (Neves, 2011).

Debt capital cost was obtained through the correlation between financial expenses recorded in the income statement and the value of liabilities in each economic year (Neves, 2011).

Equity cost was calculated by adding premium risk to debt capital cost, determined according to the preceding paragraph. Risk premium was determined according to the amounts made available on Aswath Damodaran's (2020) website, relatively to countries risk. To Portugal, the premium risk considered is 4.86%.

For invested capital amounts (represented in this case by total net assets), equity and liabilities, we used those of companies' annual balance sheet.

As for the statistical techniques used, and considering defined hypotheses, we highlight some. First, we used descriptive statistics to better characterize the selected sample relatively to its economic and financial data.

In hypothesis 1, to find out the significant differences in EVA values from 2015, 2016, 2017 and 2018 compared to 2014, we used means' differences tests for paired (related) samples. These tests focused on the indicator used to measure value creation (EVA), as well as on the different items that make it up, particularly on NIWFL, investment and WACC. By doing so, we expected to get a more detailed view of the differences in financial value creation by studied companies, between all the years 2018 and 2014.

Also, in hypothesis 1, we used multivariate regression models to study the economic items influencing NIWFL formation and investment value, in order to explain in more detail, EVA formation of the various companies analyzed.

The model can be generically displayed by the following formula:

$$Y = \beta_0 + \beta_1 X_1 + \dots + \beta_k X_k + E \quad [9]$$

Where: Y = dependent variable @ created value - EVA; β = Constant; $X_1, \dots, X_k$ = independent variables; E = mediation error.

The independent variables used for the study include K factors ($K = 1, \dots, n$) and refer to economic and financial data that may condition value creation.

Within the model that aims to study the relationship between EVA and economic items, independent variables are constituted by gross margin variations (operating income - cost of sold goods and consumed materials), financial income, personnel costs, amortizations and depreciation, income taxes and other operational costs, including external supplies and services, impairment, among others. As for the model that aims to study the relationship between EVA and financial items, the independent variables are represented by variations in non-current assets, inventories, third-party debts, other current assets, equity, provisions, non-current liabilities, and current liabilities.

Finally, in hypothesis 1, there were still possible differences in value creation level, both in activity sectors as in regions where studied companies are implanted.

As regards hypotheses 2 and 3, we carried out means differences tests to enable possible job increases and studied companies' internationalization level in all years, compared to 2014 economic year data.

With regard to hypothesis 4 that aims to measure the relationship between allocated incentives and the financial value creation, job creation and internationalization level, we have carried out simple linear regression models, to evidence the type of relationship (significant or not) between the different studied variables (EVA, employees' number, internationalization-weight level of international turnover compared to total turnover - and amount of incentives received by companies).

Analysis and Discussion of Research Results

After sample analysis, consisting of 166 companies, we observed that several supported projects by SI Innovation have not been properly implemented over the years under study. In addition, we have verified the existence of some outliers in terms of economic and financial data. Thus, the final sample integrated only 147 companies.

Under hypothesis 1 we want to verify whether the 2015, 2016, 2017 and 2018 EVA's exceeded 2014, within companies that obtained Community incentives under SI Innovation.

The Impact of European Funds in View of Company Value Creation

In this sense, we performed a sample related means differences parametric test (student T). In 2015, 2016, 2017 and 2018 studied companies presented an EVA with an average value of EUR 500.885, EUR 562.375, EUR 501.893, and EUR 605.298, respectively, while in 2014 the same indicator achieved EUR 224.354. Although, on average, the 2015, 2016, 2017 and 2018 EVA's have much higher values than in 2014, the difference found is statistically significant only in 2015, 2016 and 2018 (the significance degree is 0,036, 0,082 and 0,093, respectively).

Thus, in statistical terms, we can suggest that companies that obtained Community incentives under IS Innovation, had a significant increase on their capacity to create economic value.

Table 1. Statistics from EVA

Variable	Average 2014 (euros)	Average 2015 (euros)	Average 2016 (euros)	Average 2017 (euros)	Average 2018 (euros)
EVA (p-value)	224.354	500.885 (0,036)	562.375 (0,082)	501.893 (0,16)	605.298 (0,093)

To observe in greater detail EVA evolution from 2014 to 2018, we also performed means differences tests for the remaining variables that condition its calculation: NIWFL, WACC and investment level.

The following table presents the mean values in all years of studied variables and the significance level of performed means differences tests (t tests pairs).

Table 2. Statistics from NIWFL, WACC and investment level.

Variables	Average 2014 (euros)	Average 2015 (euros)	Average 2016 (euros)	Average 2017 (euros)	Average 2018 (euros)
NIWFL (p-value)	1.167.423	983.431 (0,537)	1.174.977 (0,981)	1.016.803 (0,64)	1.216.195 (0,881)
WACC (p-value)	5,12%	2,80% (0,108)	2,99% (0,144)	2,74% (0,102)	2,81% (0,115)
Investment (p-value)	13.559.280	15.255.920 (0,00)	16.365.920 (0,00)	17.208.041 (0,00)	18.308.609 (0,00)

As we can see, in t tests pairs, the level of significance is only relevant in the differences in investment values, which will be directly associated with the execution of projects supported under SI Innovation. However, significance level in the tests of differences in WACC are almost relevant to an $\alpha < 0.1$ (0,108 in 2015, 0,102 in 2017 and 0,115 in 2018) which means that the cost of capital decreased from 5% in 2014 to 2.81% in 2018, having even reached the value of 2.74% in 2017. In relation to NIWFL, there are no significant differences in the values in all years studied.

Previously we had verified that EVA achieved a positive evolution from 2014 to 2018. By analyzing the variables that constitute EVA, we observed a negative evolution at the results and investment level, but on the other hand we saw an average decrease in the cost of capital used from 5% to 2.8%. This reduction in the cost of funding sources has contributed to mitigating the negative impact of NIWFL developments and investment and to an absolute increase in EVA indicator, from 2014 to 2018.

Then, to better characterize the studied companies value creation origin, between 2014 and 2018, we performed two multiple linear regression models with EVA variation as a dependent variable, using as independent variables economic items variations (included in the income statement) and financial items (included in the balance sheet).

The regression models elaborated were subject to the tests recommended by Pinto and Curto (1999), which intended to confirm its validity. Therefore, we consider relevant the following comments:

1. Linearity of the relationship between the variables of the model: no linear relationship was found between the residues and the estimated values of the dependent variables;
2. Homogeneity of variance: heterocedasticity was detected in both models. As such, the White test was performed to verify variables significance with the robust standard deviations;
3. Normality of errors: none of the models held a normal distribution. However, given the size of the sample studied, more than 30 units, we can consider the results robust (Moutinho & Hutcheson, 2008);
4. Multicollinearity: the observation of Pearson's correlation coefficients, as well as the values of the VIF indicator, allowed us to verify that the other operational costs (in economic variables) and the value of non-current assets (in financial variables), presented strong relationships with remaining studied variables. Thus, in the model that studied economic variables, gross margin was used instead of operating income and sold goods and consumed materials costs; in the model that studied financial variables, we chose to withdraw non-current asset, since it was already an expected basis that presented a strong relation with EVA. Making these adjustments, the final worked models did not present any multicollinearity problem.

At the economic variables level, we found that the headings with the greatest impact on EVA were gross margin, staff costs and, in 2017, financial expenses. In 2018, the gross margin and tax variation were almost significant to an $\alpha < 0.1$. In relation to the models, they were relevant in all years.

Table 3. Statistics of the regression model of economic variables with robust standard deviations (coefficients and p-values)

Dependent variable - EVA Variation	2015	2016	2017	2018
1. R ² Adjusted	= 0,391 (0,000)*	= 0,622 (0,000)*	= 0,647 (0,000)*	= 0,706 (0,000)*
2. Gross margin variation	= 0,336 (0,005)*	= 0,428 (0,001)*	= 0,465 (0,015)**	= 0,246 (0,115)
3. Personnel costs variation	= -0,487 (0,133)	= -1,22 (0,021)**	= -1,187 (0,007)*	= -0,022 (0,966)
4. Amort. and depreciation variation	= -0,4 (0,233)	= -0,286 (0,501)	= -0,22 (0,566)	= -0,436 (0,399)
5. Financial income variation	= 5,122 (0,468)	= 2,036 (0,605)	= -0,739 (0,748)	= 1,220 (0,589)
6. Financial costs variation	= -7,501 (0,242)	= -4,942 (0,223)	= -6,552 (0,020)**	= -3,303 (0,20)
7. Taxes variation	= 0,452 (0,401)	= 0,398 (0,541)	= 0,498 (0,479)	= 1,513 (0,104)

In financial variables, the model showed that, in addition to the value of non-current assets, none of the items studied presented a statistically significant relationship with the variation occurred in EVA from 2014 to 2016.

The Impact of European Funds in View of Company Value Creation

Table 4. Statistics of the regression model of financial variables with robust standard deviations (coefficients and p-values)

Dependent variable - EVA Variation	2015	2016	2017	2018
1. R ² Adjusted	= 0,153 (0,000)*	= 0,369 (0,000)*	= 0,194 (0,000)*	= 0,313 (0,000)*
2. Inventories variation	= -0,075 (0,556)	= 0,079 (0,799)	= -0,022 (0,954)	= -0,114 (0,753)
3. Third-party debts variation	= 0,211 (0,127)	= 0,276 (0,218)	= 0,095 (0,62)	= 0,153 (0,301)
4. Other current assets variation	= 0,404 (0,083)***	= 0,318 (0,164)	= 0,174 (0,414)	= 0,209 (0,334)
5. Equity variation	= 0,124 (0,069)***	= 0,038 (0,821)	= -0,154 (0,328)	= -0,076 (0,56)
6. Non-current liabilities variation	= -0,075 (0,373)	= -0,313 (0,229)	= -0,297 (0,226)	= -0,056 (0,706)
7. Current liabilities variation	= -0,142 (0,342)	= -0,099 (0,547)	= -0,021 (0,893)	= 0,007 (0,954)
8. Provisions variation	= 1,168 (0,221)	= 1,69 (0,598)	= 0,004 (0,999)	= -0,120 (0,968)

Thus, it is observed that, in addition to the value of the investment (non-current assets), which had a very strong relationship with EVA, and therefore was removed from the model, are fundamentally economic items (gross margin, personnel costs and financial costs), which condition NIWFL creation and which have a greater impact on EVA developments.

Finally, also under hypothesis 1, to better characterize financial value creation resulting from incentives under SI Innovation allocation, we studied eventual differences in created EVA within different regions and sectors of analyzed companies.

Although there are differences in mean EVA values by region and by activity sector, it does not have a statistically relevant level of significance. Within regions, the ANOVA test and the Kruskal Wallis test performed showed p-values above 0,1 (only in 2018 the Lisbon region has relevant differences compared to Center and Multi regions in the Kruskal Wallis test); in the activity sectors, the same tests were done, but no relevant difference was found.

The following tables present the mean values of EVA found in each region and in each sector of activity.

Table 5. Average EVA values by region

Region	Number of companies	2014	2015	2016	2017	2018
Alentejo	7	217.028	- 2.429	139.072	203.262	267.246
Algarve	1	1.119.146	1.408.047	1.377.700	1.308.851	2.230.701
Center	50	531.867	835.277	713.486	721.920	910.976
Lisbon	2	93.488	236.559	453.326	50.428	219.248
Multi - Regions	1	46.239	426.984	438.491	236.863	853.622
North	80	15.451	273.044	505.930	383.420	464.388

Analyzing the values, one can verify that regions with higher EVA were (besides the project of Algarve region) the Center, the Multi regions and the North of Portugal, which also present by far the largest applications number.

Table 6. Average EVA values in 2016 per sector of activity

Activity Sector	Number of companies	2014	2015	2016	2017	2018
Manufacturing (NACE code 1)	50	-147.350	287.528	220.039	94.602	27.,683
Manufacturing (NACE code 2)	68	567.808	767.223	954.060	867.452	867.127
Utilities (NACE code 3)	14	106.493	116.824	175.619	49.095	251.300
Hotel and restaurant business (NACE code 5)	10	-59.577	71.330	235.692	410.013	840.328
Services (NACE code 6 and 9)	3	-43.379	-77.823	-74.728	8.991	882

As for activity sectors, code 2 NACE activities (Manufacturing) and Hotel and restaurant business have the highest EVA values.

About research hypothesis 2 and 3, which intend to verify employment increase and internationalization level of companies receiving incentives under SI Innovation in 2014, differences in means tests were also carried out between 2014 values and every other year.

In both cases, we found that differences that occurred among years under analysis are statistically relevant in all years, about employees' number increasing. In relation to the internationalization level impact, values increased since 2014 and there are relevant p-values in 2016 and 2018. On what concerns employees' number, it is noted that companies that benefited from incentives allocated under SI Innovation in 2014 created more jobs and improved international markets entrance capacity. It is possible to observe that the employees number growth has significant p-values each year.

The following table highlights number of employees' average values and internationalization level, between 2014 and 2018.

Table 7. Average values and p-values of the number of employees and the level of internationalization

Indicators	2014	2015	2016	2017	2018
Number of employees	120	126 (0,000)*	134 (0,000)*	143 (0,000)*	155 (0,000)*
Level of internationalization	47,99%	47,43% (0,682)	50,81% (0,045)**	50,10% (0,234)	52,59% (0,027)**

Finally, to validate investigation hypothesis number 4, simple linear regression models were performed between each year's received grants value and EVA occurred variation, from 2014 to 2018, employees' number and internationalization level.

According to Pearson's correlation coefficients presented in the table below, connection between received subsidies value and under study variables is quite weak. It's only possible to observe some significant relation with the grants and all years' number of employees' variation (for a p-value <0,1) and with 2017 EVA (for a p-value <0,1).

Table 8. Regression adjusted R2 and p-values between grants received and EVA, number of employees and internationalization level

Variables	2015	2016	2017	2018
EVA	-0,007 (0,934)	-0,004 (0,492)	0,016 (0,069)	0,001 (0,275)
Number of employees	0,013 (0,092)***	0,014 (0,079)***	0,019 (0,056)***	0,018 (0,061)***
Level of internationalization	-0,007 (0,758)	-0,007 (0,773)	-0,004 (0,510)	-0,005 (0,601)

In conclusion, and generically speaking, companies that have obtained incentives under SI Innovation improved their capacity to create value, to create jobs and to internationalize business from 2014 to 2018. However, it is not possible to statistically show that the improvement in the activity of these companies is directly related to the allocation of EU funds to carry out strategic investments in non-current assets. Thus, such evolution would be associated with other factors and, eventually, with Portuguese economy evolution.

Other important conclusion is that, unmistakably, EU funds contribute to employment increasing. So, they can have a huge role on struggling against pandemic situation negative impact in the Portuguese economy recovery, in the next couple of years.

CONCLUSION

This work aimed to highlight the impact of Community EU funds on the capacity to create financial value in Portuguese companies and to understand if they can have an important role stressing pandemic situation negative impact.

To do so, we have developed a theoretical framework focusing on several important topics for research, namely companies' investments worth, financial performance assessment concepts, value creation logic, metrics to value creation and capital cost. In addition, we have looked at several studies with similar research purposes to understand used methodologies and achieved research results.

As regards the developed study, we analysed all the 166 companies that benefited from EU funds in 2014 under the Innovation Incentive System. To measure value creation capacity, we used EVA indicator, since it allows to easily measure created value in each period and can directly be obtained from companies' financial statements.

The research results show that studied companies presented a greater value creation and employment capacity, as well as activity internationalizing capacity in the next financial years. Yet, the statistical tests performed did not show a direct relationship between companies' best performance in all three indicators and the subsidies received, and hypothesis 4 of investigation was not verified.

However, the statistics showed, clearly, that companies receiving EU funds significantly increased their number of employees in studied time period, which can suggest that EU funds might have a huge immediate role in fighting against the negative impact of the pandemic situation.

In addition, it was observed that the greatest conditioning (by positive) of value creation was capital cost, which decreased from 2014 to 2018, and that the economic items that had the greatest impact on

EVA were namely, gross margin, personnel costs and financial costs. Finally, there were no statistically relevant differences in EVA from the various regions and activity sectors.

As regards the investigation's limitations, it is noteworthy that there is little research work dealing with this issue, which makes it difficult to take a more complete view of the conclusions on the impact of EU funds on companies' performance.

A future research may be enriched by analyzing more companies in different time periods, in order to have a more overall picture of EU funds importance in creating Portuguese companies' financial value.

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Chapter 2

Entrepreneurship and Unemployment: Government Grants and Challenges in a Pandemic Context

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ABSTRACT

The COVID-19 pandemic is having a very negative economic and social impact on Portugal's economy, with the year 2020 expected to represent the largest economic recession since the 1970s. According to the Bank of Portugal forecasts, employment is expected to fall significantly, with the unemployment rate estimated at around 10%, with a special focus on young graduates. Simultaneously, several research papers have revealed the importance of entrepreneurship in job creation and economic development, highlighting the role of entrepreneurial ecosystems and government support for creating successful businesses. In this sense, this study has as its main objective to characterize a support program to the investment of young unemployed entrepreneurs and evidence its potential impact on Portugal's economic growth and social progress.

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INTRODUCTION

The covid-19 pandemic is having a very negative economic and social impact on Portugal's economy, with the year 2020 expected to represent the largest economic recession since last century's 70's decade. According to the Bank of Portugal forecasts, employment is expected to fall significantly, with the unemployment rate estimated at around 10%, with a special focus on young graduates.

Simultaneously, several research papers (for example, Decker et al., 2014; Momani, 2017; Schwetzer et al., 2019; Neumann, 2020) have suggested the importance of entrepreneurship in job creation and economic development, highlighting the role of entrepreneurial ecosystems and government support for creating successful businesses.

In this sense, this study has as main objective to characterize a support program to the investment of young unemployed entrepreneurs and evidence its potential impact on Portugal's economic growth and social progress.

At the same time, with the development of this research work, we intend to contribute to identify profiles of entrepreneurs and projects that could be a reference in terms of the capacity to create economic value and, thus, design government support programs that respond more effectively to challenges posed by the pandemic.

For the development of this work, we used the multiple case study methodology, based on the analysis of candidatures to the *Investe Jovem* and *Investe Artes e Ofícios* programs.

This work contributes to the identification of the profile of promoters and projects that compete for government support in the areas of entrepreneurship and unemployment. An overview of the projects type that can potentially contribute to the creation of sustainable businesses is presented. In turn, information can contribute to the adjustment to the efficient distribution of government grants, with a focus on promoting social progress and combating the challenges caused by crises.

Thus, besides a theoretical framework where the main aspects about entrepreneurship, its importance for economic growth, the conditioning factors of the entrepreneurial ecosystem, and the contribution of different Government supports will be characterized. This paper will also present some statistics revealing the global pandemic's impact on unemployment growth in Portugal and characterize an investment support program for business creation by young unemployed. Finally, an analysis is performed of the applications submitted over the years 2015 to 2019 in the Greater Lisbon region, the expected economic impact of these projects, and the main challenges to face in order to adapt the support programs for entrepreneurship in a global pandemic situation.

LITERATURE REVIEW

Entrepreneurship and Entrepreneurial Networks

Until the 1970s, in the 20th century, economists argued that corporate financial success depended on each industry's ability to create entry barriers for new competitors. These barriers were fundamentally related to economies of scale, caused by the amounts of capital needed for the activity and the capacity to obtain lower unit costs with the highest production levels (Teixeira, Costa & Lisboa, 2019).

However, in 1972, Hunt showed that there was heterogeneity within an industry and that groups of companies could be formed according to the strategy adopted.

Thus, each group's business success within an industry depended on its ability to create mobility barriers and avoiding competition from companies with different strategies (Teixeira et al., 2019).

However, several studies in the last decades have shown that competition is stronger within groups themselves than between groups, which has highlighted the increasing importance of the unique characteristics of each company and its leaders, reinforcing the role of the entrepreneur as a driver of economic development (Teixeira et al., 2019).

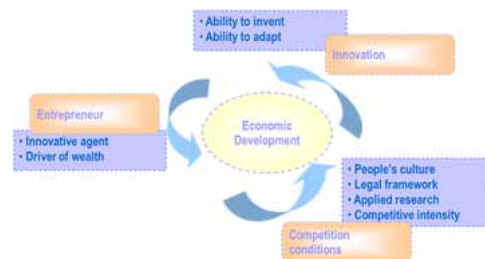
In 1911, Schumpeter wrote the book – The Theory of Economic Development - in which he characterized capitalism as an essentially dynamic, self-adaptive economic system, generator of a process he called “creative destruction”. In this process of capitalist development, the central figure was the entrepreneur.

Thus, the entrepreneur's importance and the creation of new businesses for economic progress reveals itself by his capacity to innovate and generate profits through innovation, creating competitive advantages difficult to imitate and greater wealth creation through his companies' activity. Therefore, it was not only about managing costs and quantities produced but also launching new products, processes, techniques, forms of organization, etc., which created returns through internal resources above opportunity costs (Murteira, 2002).

However, the surrounding conditions and freedom of competition were fundamental to provide the opened context to business energy, generating the entrepreneur's creator act - innovation and wealth creation (Murteira, 2002). So, based on this vision, the economic development is the result of the innovation capacity that comes from the interaction between the conditions of the ecosystem and the activity of entrepreneurs. This is a dynamic process that is expected to have the capacity to renew itself cyclically, making economic development sustainable.

Figure 1. Principles of economic development success

Source: own elaboration



According to this vision, the entrepreneur is the person responsible for the company's strategy, for its management, which establishes the relationship between the surrounding context and the adequacy of its organization's internal resources to take advantage of an opportunity that the market offers. Alternatively, it is the person who detects an opportunity to create or offer a product or service and constitutes a business entity to develop this new activity or idea (Teixeira, 2013).

However, entrepreneurship's success equally depends on the context conditions that should contribute to innovation development in its various aspects, namely products, processes, organizational, and marketing (Teixeira, 2013).

Thus, the concept of entrepreneurship has been developed over the last decades, existing diverse literature on it and various perspectives for its definition.

Entrepreneurship and Unemployment

The authors Schumpeter (1934) and Drucker (1985) relate entrepreneurship to innovation, and the entrepreneur is fundamental to define the concept of entrepreneurship. The identification and the capacity for business opportunities development is the basis for an alternative perspective to define entrepreneurship (Shane & Venkataramann, 2000). Gartner (1989) mentions that entrepreneurship is associated with the creation of new companies or businesses. Finally, the researchers of the behavioral area define entrepreneurship based on the individual characteristics of the entrepreneur's personality and of a values system associated with him, highlighting the importance of the combination of three essential factors (McClelland, 1972; Fillion, 1999):

- Specific personal qualities;
- Technical knowledge of management;
- Experience in management practice.

Thus, regardless of the definition to be adopted, entrepreneurship is closely related to the initiative's final objective, creating new businesses.

Thus, considering the focus of the different definitions of entrepreneurship previously presented, it can be suggested that the research on this subject and the creation of companies focuses essentially on two main perspectives (Liao & Welsch, 2005).

The first one focuses on the entrepreneur's figure and the person's entrepreneurial propensity and capacity. The research about a person's entrepreneurial propensity approaches his psychological and behavioral characteristics. Regarding research about the entrepreneurial capacity, it highlights the importance of entrepreneurial social networks in the entrepreneurial process and in the creation and development of a new business (Ostgaard & Birley, 1996; Johannisson, 1998; Greve & Salaff, 2003; Li et al., 2013).

The second perspective puts the focus in context, highlighting the influence of the environment to contribute to the development of entrepreneurial initiatives and the existence of several external variables that condition the potential of new business ideas, such as market attractiveness (size, competitive intensity, among other aspects), government policies, economic cycles, and technological innovations.

The Entrepreneurial Ecosystem

Most research in the field of entrepreneurship has investigated the importance of entrepreneurs for economic development and the most important individual characteristics for business success.

However, it is essential to study entrepreneurship from a systemic and interdisciplinary perspective that focuses on interrelated aspects that generally condition the success of companies' creation (Qian, Acs, and Stough, 2013; Acs, Autio and Szerb, 2014). The link between context, collaborative networks, and entrepreneurship has been investigated over the years, as is the case with the works of Hoang and Antoncic (2003), O'Donnell, Gilmore, Cummins and Carson (2001), and Thornton and Flynn (2003). However, there is the conviction that the study of the importance of the surrounding environment in entrepreneurial activity has not yet been satisfactorily developed and valued (Gustafsson & Autio, 2011; Qian et al., 2013; Acs et al., 2014; Schwetzer et al., 2019; Neumann, 2020). As such, it is essential to perform a more detailed analysis of how the cultural, social, political, and economic contexts and processes inherent to a location influence entrepreneurial activity.

In this sense, several researchers have highlighted the importance of studying the characteristics and behaviors of individuals or companies created (Shane, 2003; Shane & Venkataraman, 2000) together

with the regional, time, and social configurations where these projects are inserted (Autio et al., 2014; Van de Ven, 1993; Zahra & Wright, 2011; Zahra et al., 2014; Schwetzer et al., 2019; Neumann, 2020).

Thus, assuming that entrepreneurship contributes decisively to promoting economic growth, it is essential to know the context conditions that favor the existence of well-developed entrepreneurial ecosystems and facilitate the creation of successful businesses (Isenberg, 2010).

The OECD (2013) points out some characteristics such as regional agglomeration (Fujita, & Thisse, 2002), the existence of innovative regional agglomerations (Saxenian, 1994), industrial agglomerations (Feldman, Francis, & Bercovitz, 2005; Porter, 1990) and national innovation systems (Lundvall, 1992), which have positively conditioned local economic development policies.

The term entrepreneurial ecosystem emerged with the work of Prahalad (2005) and Cohen (2006) and was associated with the conditions under which the individual, companies, governments, civil society, and other partners collaborated regionally to support business activities in order to foster economic wealth and social prosperity in a given region.

Mason and Brown (2014, p.5) define entrepreneurial ecosystems as “a set of interconnected entrepreneurial actors (both potential and existing), entrepreneurial organizations (e.g., companies, venture capitalists companies, business angels, banks), institutions (universities, public sector agencies, financial bodies) and entrepreneurial processes (e.g., high growth companies, levels of ‘blockbuster entrepreneurship’, number of serial entrepreneurs, degree of sell-out mentality within companies and levels of entrepreneurial ambition) which formally and informally merge to connect, mediate and govern the performance within the local entrepreneurial environment”.

Stam and Spigel (2017, p.1) define entrepreneurial ecosystems as “a set of actors and interdependent factors coordinated in order to enable productive entrepreneurship within a given territory”.

Isenberg (2010) defines entrepreneurial ecosystems as a network of relationships that allows for interactions between various institutional and individual actors to promote innovative business creation and regional economic growth.

Despite different perspectives on the definition of entrepreneurial ecosystems, a common link is the existence of several regional actors with different valences, who establish partnerships, create synergies and continually reinforce their competitive advantages, promoting innovation and growth (Stam, 2015).

Given the relationship between entrepreneurship and entrepreneurial ecosystems, next, the main characteristics associated with entrepreneurial ecosystems are presented.

Characterization of Entrepreneurial Ecosystems

According to the previous topic, entrepreneurial ecosystems encompass the presence of different entities with different characteristics, which collaborate amongst each other to boost entrepreneurial activity through the sharing of resources and the creation of synergies that favor the creation and development of new businesses (Malecki, 2018).

Thus, entrepreneurial ecosystems can present differentiated characteristics, resulting from the very specificities of the entities involved and the way they collaborate in the region (Malecki, 2018). For example, they can develop through a reference university's skills, large companies, an industry, or a network of small and medium-sized companies linked to an economic activity specific to the region (Spigel, 2015).

This way, the characteristics of ecosystems are associated with the history, culture, and economic evolution of the region where they are inserted, creating an individual and unique identity that is not

easily copied or replicated due to the specificities of the region where the ecosystem is intended to develop (Isenberg, 2011). The entrepreneurial ecosystem assumes the characteristics of a living organism (Isenberg, 2010; WEF, 2013; Stam, 2015; Schwetzer et al., 2019; Neumann, 2020), where constant exchanges and flows of resources, such as information and capital, occur (Shaw & Allen, 2016).

Isenberg (2011; 2014) proposes an entrepreneurial ecosystem model composed of six areas: public policies, financial capital, culture, support institutions, human resources, and markets.

Spigel (2015), Schwetzer et al. (2019) and Neumann (2020), however, mention the importance of three regional resources for the increase of entrepreneurship and economic growth: cultural understandings and shared institutional environments that facilitate cooperation and develop practices such as knowledge sharing and mobility between companies; social networks within regions that create mechanisms for knowledge spill overs between companies and universities and connect entrepreneurs to financiers; government policies and universities that can support through the training of skilled workers and entrepreneurs, the financing of specific programs to support entrepreneurship, networking, and knowledge-sharing events and the facilitation of incubation facilities, providing the reduction of activity costs.

Besides, Stam (2015) highlights the importance of entrepreneurs leading the creation of the ecosystem and contributing to its development through a virtuous recycling process that contributes to creating successful entrepreneurship models in the region and the sustainability of the ecosystem itself.

Summarizing, the different views on entrepreneurial ecosystems' characteristics highlight the importance of their features being aligned and integrated into local/regional realities.

This research paper will focus on the importance of government programs to support entrepreneurship, studying a specific case of financial support from the Portuguese Government to entrepreneurship developed by young unemployed and artisans, highlighting its main characteristics, impacts, and challenges in a global pandemic situation.

GOVERNMENT SUPPORT FOR ENTREPRENEURSHIP AND COMPANIES' CREATION

According to Costa, Teixeira and Valente (2017), several programs support entrepreneurship and the creation and development of new companies, with very diversified objectives and actions.

Generally, the support programs for entrepreneurship and business creation contribute with two types of elements: 'soft' and 'hard' (Valente, 2015).

Soft elements include consulting services, support for social network integration, management training, support for business plan elaboration, support for intellectual property or prototype development. Hard elements include physical spaces, such as incubators and science and technology parks, financing through public incentives to acquire equipment, and the providing of guarantees for obtaining loans or subsidize interest on bank loans (Valente, 2015).

Also, according to Valente (2015), the results of some studies show that soft supports, which aim knowledge transfer to entrepreneurs about the different aspects associated with business management, have a more significant impact on the success of new companies than hard supports related to the assignment of physical spaces or with obtaining financing.

However, several studies (e.g., Orange, 2007; Valente, 2015; Costa et al., 2017; Schwetzer et al., 2019; Neumann, 2020) refer to the importance of existing both support types simultaneously, which may

contribute to enhance the management of different fundamental areas for the creation and development of new businesses, especially in the early stages of companies launching.

Next, in order to highlight the importance that government support to entrepreneurship may have in this period of economic crisis, some statistics are presented regarding the impact of the global pandemic on the level of unemployment in Portugal, highlighting the figures on youth unemployment and qualified human resources.

Unemployment in Portugal in the pandemic situation

As previously mentioned, the pandemic is having a rather negative impact on Portugal's economy and unemployment. Table 1 and figure 2 below shows the unemployment statistics from December 2019 to November 2020 (the latest official available data from the Employment and Vocational Training Institute (IEFP)).

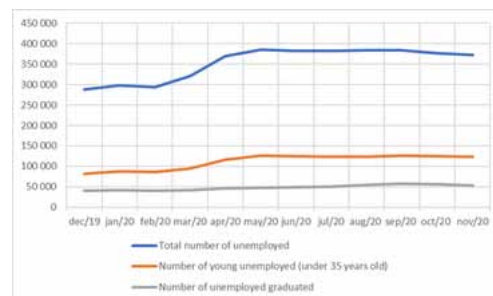
Table 1. Number of unemployed in Portugal (December 2019 - November 2020)

Indicators	dec/19	jan/20	feb/20	mar/20	apr/20	may/20	jun/20	jul/20	aug/20	sep/20	oct/20	nov/20
Nº of unemployed	288 176	297 931	293 016	321 164	368 925	384 504	381 629	382 019	383 482	383 894	377 196	371 576
Nº of young unemployed (under 35 years old)	82 395	87 773	85 714	94 596	116 721	125 622	124 904	123 673	123 827	125 788	125 140	124 145
Nº of unemployed graduated	40 484	41 673	40 021	42 241	46 524	47 836	48 387	51 114	54 378	57 526	55 535	53 745

Source: own elaboration, data from monthly reports of IEFP

Figure 2. Number of unemployed in Portugal (December 2019 - November 2020)

Source: own elaboration, data from monthly reports of IEFP



According to table 1 and figure 2 above, it can be seen that from February 2020, when the pandemic - covid-19 began to appear in Portugal, the level of unemployment rose sharply until May 2020, main-

taining above 370.000 unemployed in the remaining months of the year (which meant an increase of around 100.000 unemployed compared to December 2019).

The same evolution can be seen in the number of youth unemployed and graduates that went from 82.395 and 40.484 in December 2019 to 124.145 and 53.745, respectively, in November 2020. These figures represent an increase of 51% in the young unemployed and 33% in graduates.

Thus, these figures further highlight the importance of the entrepreneurial ecosystem and government support for creating successful businesses that positively impact economic growth and employment.

Programs to support the creation of own business by unemployed

Unemployment remains a primary concern in Europe, particularly youth unemployment. The covid-19 pandemic is having several adverse effects on Portugal's economy. The forecast of the most significant economic recession during democratic times and the near shutdown of some activity sectors are some of this reality's economic indicators. According to the estimates from the Bank of Portugal, due to the contraction of activity resulting from the covid-19 pandemic, "employment is expected to fall significantly in 2020 and the unemployment rate to increase to around 10%".

The importance of improving competitiveness and economic growth, the development of human capital in companies, the fight against unemployment, and the process of job creation and its quality are vectors of strategic concern in Portugal. The Portuguese Government signed the document "Commitment to Growth, Competitiveness, and Employment" providing a set of active measures to support the unemployed in their integration into the labor market and encouragement to the creation and maintenance of jobs and the strengthening of qualifications.

In this strategic document, the objectives of the employment policy are established, which include the promotion of professional qualification, the support to entrepreneurship, the promotion of the insertion in the active life of young people, and the permanence of older workers in the labor market and the reduction of regional employment asymmetries.

In this sense, there has been the development of a national strategy to combat unemployment based on a new generation of active job creation measures that provide specific support for unemployed people registered with the Employment and Vocational Training Institute (IEFP), the entity responsible for supporting unemployed people in Portugal.

In this group of measures, the *Investe Jovem* (Invests Youth) and *Investe Artes e Ofícios* (Invests Arts and Crafts) programs intend to promote the creation of new companies through the support to the creation of self-employment and micro businesses.

However, starting a business from scratch in an increasingly global and competitive world involves many demanding challenges. It is crucial to have a good business idea, but that alone is just not enough. Being an entrepreneur requires market research, planning the business, and above all, obtaining financing for the initial investment necessary to the normal development of the activity.

The Program *Investe Jovem*, created through the act *Portaria* n. 151/2014, aims to promote and foster entrepreneurship through the creation of new companies by young unemployed and economic growth.

The *Investe Jovem* Program recipients are young unemployed people registered with the IEFP between the ages of 18 and 30 and with a business idea. The program aims to achieve the objectives through financial support for investment, the creation of the promoters' own job and technical support in the area of entrepreneurship to strengthen skills and to structure and consolidate the project.

The Program *Investe Artes e Ofícios*, created through the Decree-Law 122/2015 of June 30th, has the objective of promoting entrepreneurship through the creation of artisanal activities companies and concern the creation of self-employment, without any age limitations concerning the promoters. The development of artisanal activities is recognized as a process that can contribute to affirming Portugal's identity, the creation of competitive factors based on differentiation, the promotion of tourism, and the valorization of creative professions.

The artisanal activities sector faces very particular challenges such as the need to improve the articulation between artisanal production and the quality and potentiality of use (uniqueness, functional adequacy, and identity), adaptation to the new commercial logics (global scale, promotion of products and the way they are presented to the client) and the need to improve professionals' skills in other areas such as innovation and marketing. The beneficiaries of this program are the unemployed registered at IEFP and the Arts and Crafts Training Program trainees, without age restrictions.

Portaria n. 151/2014 defines the rules of support to be granted under the *Investe Jovem* and *Investe Artes e Ofícios* programs. The program presupposes two measures of financial support and one of technical support. In the financial scope, the measures are divided into support for creating the promoter's own job, in the form of a non-refundable subsidy, and investment support, with the granting of an interest-free loan. The technical support is based on vocational training in entrepreneurship and project monitoring.

The projects for the creation of companies presented by the promoters must show as main requirements: a total investment between 2,5 and 100 times the Social Support Index (IAS, which in the year 2020 is worth 438,81 euros), and have economic-financial viability.

The projects' eligible investment refers to expenses with tangible and intangible fixed assets and working capital (value to meet inventories or current liabilities). However, expenses with real estate acquisition or construction are not considered eligible. The project's operating working capital may be financed up to 50% of the eligible investment, but with a maximum limit of 5 times the IAS value.

As for financial supports, investment support has a maximum limit of 75% of the total value eligible as project investment. This investment support is granted as an interest-free loan, which may present a maximum loan repayment term of 48 months after a 12-month deferment period, depending on the investment's total amount. The support for creating self-employment is granted in the form of a non-refundable subsidy, up to a maximum amount of 6 times the IAS. This support has a maximum of four full-time job positions. The financial support as a whole may not exceed the total eligible investment amount of the project.

Applications to the Support Programs for creating own job

This paper is developed on the basis of applications to the self-employment support programs (*Investe Jovem* and *Investe Artes e Ofícios*) submitted in the Greater Lisbon region and subject to technical evaluation by the Polytechnic Institute of Setúbal (IPS), from 2015 to 2019.

For the development of this work, we used the multiple case study methodology, based on the analysis of candidatures to the *Investe Jovem* and *Investe Artes e Ofícios* programs. In this way, different information sources were used, namely document analysis, promoters' interviews, and visits to the business facilities.

IPS' evaluation focuses on applications submitted to IEFP in the regions of Setúbal, Lisbon, Santarém, Castelo Branco, and Leiria. This technical evaluation consists of an analysis of the projects, which includes assessing the attractiveness of the business location and the rationality of the investment, an interview with the promoters, and a study of the economic and financial viability.

Entrepreneurship and Unemployment

Table 2. Applications assessed by IPS

Applications	<i>Investe Jovem</i>	<i>Artes e Ofícios</i>	Total
Submitted	76	4	80
Approved	72	4	76
Withdrawal	1	0	1
Rejected	3	0	3

Source: own elaboration

The following section describes the applications evaluated, presenting a quantitative characterization of the applications, the promoters' characterization, and a list of financial supports in view of the projects' investment.

APPLICATIONS' CHARACTERIZATION

A total of 80 applications were submitted during the period under review, 76 of which to the *Investe Jovem* Program and 4 to the *Investe Artes e Ofícios* Program (table 2). Of the applications submitted to the *Investe Jovem* Program there was one withdrawal, and three projects were rejected, the rest were approved after analysis by IPS. Applications to the *Investe Artes e Ofícios* Program were all approved.

Table 3. Applications by industry

Industry	<i>Investe Jovem</i>	<i>Artes e Ofícios</i>	Total	%
Agriculture, Animal Production, Hunting, Forest and Fishing	2		2	2.6%
Manufacturing	5	4	9	11.8%
Construction	1		1	1.3%
Wholesale and Retail Trade	21		21	27.6%
Transport and Storage	1		1	1.3%
Accommodation, Catering, and Similar	15		15	19.7%
Information and Communication Activities	2		2	2.6%
Consulting, Scientific, Technical and Similar Activities	9		9	11.8%
Administrative activities and Support Services	3		3	3.9%
Education	5		5	6.6%
Human Health and Social Support Activities	1		1	1.3%
Artistic, Show, Sports and Recreational Activities	3		3	3.9%
Other Service Activities	4		4	5.3%
TOTAL	72	4	76	100%

Source: own elaboration

Table 4. Applications by the business structure of created businesses

Business Structure	Investe Jovem	Artes e Ofícios
Sole Proprietorship	35	3
Single Partner Company	25	1
Limited Liability Company	12	0

Source: own elaboration

The applications evaluated are distributed among 13 industries (table 3). Although there is a diversification of applications by industry, the wholesale and retail trade industry (21 applications) and the accommodation and catering industry (15 applications) have the highest number of projects.

The industries construction, transport and storage, and human health and social support activities only present one application.

As for the business's structure (table 4), as expected, they are mostly composed of a single partner given the support programs' objectives. Of the applications analyzed, 60 are formed of a single partner, of which 38 are "Sole Proprietorship" and 26 "Single Partner Company". However, 12 applications are aimed at setting up companies with two partners (Limited Liability Company). In these cases, the applications' promoters will need to have 51% of the new companies' share capital.

Table 5. Promoters' age

Age	Investe Jovem	Artes e Ofícios	Total	%
19 Years Old	1		1	1.3%
20 Years Old	1		1	1.3%
21 Years Old	5		5	6.6%
22 Years Old	5		5	6.6%
23 Years Old	6		6	7.9%
24 Years Old	3		3	3.9%
25 Years Old	3		3	3.9%
26 Years Old	8		8	10.5%
27 Years Old	13		13	17.1%
28 Years Old	7		7	9.2%
29 Years Old	8		8	10.5%
30 Years Old	12		12	15.8%
33 to 53 Years Old		4	4	5.3%
TOTAL	72	4	76	100%

Source: own elaboration

Table 6. Academic qualifications of promoters

Academic Qualifications	<i>Investe Jovem</i>	<i>Artes e Ofícios</i>	Total	%
6th Grade	2		2	2.6%
7th to 9th Grade	9	1	10	13.2%
10th to 12th Grade	33	1	34	44.7%
Graduate	21	2	23	30.3%
Masters	7		7	9.2%
TOTAL	72	4	76	100%

Source: own elaboration

CHARACTERIZATION OF THE PROMOTERS

The *Investe Jovem* program promoters are individuals between the ages of 18 and 30, while the *Investe Artes e Ofícios* program has no age limit. Of the total 76 applications analyzed (table 5), 52 applications are from promoters over 25 years old (representing more than 68% of the applications). These data indicate that the applications, in general, are from older promoters, reflecting more professional experience in the areas of business they propose to create. Usually, these promoters, due to their past experience, have a more consistent idea of the business they propose to create and, in this way, are willing to take the risk of working in their own business.

Regarding base formal education (table 6), about 84% (64) of the promoters have a secondary or higher education¹, approximately 40% (30) have a graduate education, and 9.2% (7) hold a master's degree. These results suggest that most promoters, beyond their eventual professional experience in the business area, have more qualified academic qualifications that may be useful in the development of the activity. This may show that the level of training is a determining factor for the existence of a higher entrepreneurial spirit on the part of promoters.

CHARACTERIZATION OF APPROVED SUPPORTS

At this point, it is intended to characterize the applications evaluated regarding the investment value of the projects and the amounts of support granted.

Table 7. Type of support requested by promoters

Type of Support	<i>Investe Jovem</i>	<i>Artes e Ofícios</i>	Total	%
Job creation	72	4	76	100%
Investment	64	3	67	88%
Technical	49	2	51	67%

Source: own elaboration

Most of the applications requested the three types of support provided by the programs (financial support for job creation, investment, and technical support). However, job creation support was the most requested and was asked in all applications (table 7). Technical support was the least requested, representing 67% of the applications analyzed. These data suggest that the fact that the promoters have a medium/high level of education makes them dispense with technical support, not considering essential the reinforcement of their skills and/or specialized monitoring of the project for its success.

These supports are dedicated to the creation of small businesses; thus, the maximum eligible investment in the evaluated applications was 41.900 euros (table 8). However, depending on the project's business area, the amounts of eligible investment are quite diverse. The minimum amount was around 2.830 euros in both programs. Out of the total of applications evaluated, the value of the eligible investment was slightly over 1.462.000 euros.

Table 8. Characterization of the projects (Investment Amount | Financial Support)

Investment Type of Support	<i>Investe Jovem</i>	<i>Artes e Ofícios</i>	Total
Investment			
Total	1 404 095	58 222	1 462 317
Maximum	41 900	29 873	--
Mínimum	2 837	2 828	--
Mean	19 501	14 556	--
Median	14 997	12 761	--
Investment Support			
Total	937 651	37 270	974 921
Maximum	37 474	22 405	--
Mínimum	--	--	--
Mean	13 023	9 318	--
Median	10 103	7 433	--
Job Creation Support			
Total	195 555	10 198	205 753
Total Financial Support			
Total	1 133 206	47 469	1 180 674
Investment Funded	81%	82%	81%
- Through Investment Support	67%	64%	67%
- Through Job Creation Support	14%	18%	14%

Source: own elaboration

Entrepreneurship and Unemployment

Table 9. Characterization of projects by county

	Quantity	Investment	Investment Support	%	Job Creation Support	%	Total Support	%
Alcobaça	1	41 900	31 425	75%	2 515.32	6%	33 940	81%
Almada	5	90 683	62 284.96	69%	12 701.04	14%	74 986	83%
Almeirim	2	48 867	3 996.84	8%	5 030.64	10%	9 027	18%
Amadora	1	12 302	8 450	69%	2 615	21%	11 065	90%
Azambuja	1	33 896	25 422	75%	2 515	7%	27 937	82%
Barreiro	1	4 636	0	0%	4 634	100%	4 634	100%
Benavente	1	20 599	10 811	52%	2 528	12%	13 339	65%
Caldas da Rainha	2	27 636	18 260	66%	5 031	18%	23 290	84%
Cascais	4	25 951	10 390	40%	12 647	49%	23 038	89%
Lisboa	13	221 929	146 498	66%	38 255	17%	184 753	83%
Loures	2	31 829	17 746	56%	5 031	16%	22 776	72%
Lourinhã	1	14 579	10 605	73%	2 515	17%	13 121	90%
Mafra	1	29 873	22 405	75%	2 615	9%	25 020	84%
Moita	1	8 694	3 443	40%	2 515	29%	5 959	69%
Montijo	3	60 726	40 962	67%	7 658	13%	48 620	80%
Óbidos	1	36 103	27 076	75%	2 615	7%	29 691	82%
Odivelas	1	11 751	7 941	68%	2 615	22%	10 555	90%
Oeiras	5	78 217	54 525	70%	12 747	16%	67 271	86%
Palmela	2	21 136	13 928	66%	5 089	24%	19 017	90%
Rio Maior	4	65 664	45 036	69%	10 330	16%	55 367	84%
Salvaterra de Magos	4	54 636	34 044	62%	12 734	23%	46 778	86%
Santarém	2	44 823	31 623	71%	5 130	11%	36 753	82%
Sertão	1	14 279	10 236	72%	2 615	18%	12 850	90%
Sesimbra	2	76 474	47 674	62%	5 031	7%	52 705	69%
Setúbal	3	64 094	45 812	71%	7 744	12%	53 557	84%
Sintra	5	156 183	125 407	80%	12 635	8%	138 041	88%
Tomar	2	35 225	22 993	65%	5 031	14%	28 023	80%
Torres Novas	1	21 485	16 114	75%	2 515	12%	18 629	87%
Torres Vedras	2	50 530	36 665	73%	5 089	10%	41 754	83%
Vila de Rei	1	16 339	12 190	75%	2 515	15%	14 705	90%
Vila Franca de Xira	1	41 279	30 959	75%	2 515	6%	33 475	81%
Total	76	1 462 317	974 921		205 753		1 180 674	

Source: own elaboration

Table 10. Support Programs forecasted accumulated results (euros)

	Sales Revenue	Net Profit	Net Present Value (NPV)	Job Positions
Accumulated Totals	7 187 918	1 517 608	3 670 519	89

Source: own elaboration

Regarding financial support, these projects were financed in 81% of the eligible investment value, for a total amount of 1 180 674 euros. The investment support translates into 67% of the total investment value, for a total amount of 974 921 euros. The maximum amount granted in this type of support was 37 474 euros. Besides, it should be highlighted that some applications did not request this type of support.

Concerning job creation support, it represents 14% of the investment, for a total amount of 205 753 euros.

In the analysis of the support approved by county (table 9), it should be noted that the largest number of applications was concentrated in Lisbon (13), representing the region where there was the largest amount of investment and consequently financial support. The counties with the highest number of applications were Almada, Oeiras, and Sintra, all with five applications. On average, in the county of Sintra, the implementation of projects required the highest amounts of investment and financing.

Table 11. Forecasted accumulated results by industry (euros)

Industry	Sales Revenue	Net Profit	Net Present Value	Job Positions	Number of Applications
Agriculture, Animal Production, Hunting, Forest and Fishing	96 000	32 867	88 329	2	2
Manufacturing	481 716	85 321	213 131	11	9
Construction	66 141	4 452	9 673	1	1
Wholesale and Retail Trade	2 356 761	342 287	735 848	22	21
Transport and Storage	126 939	33 041	70 786	1	1
Accommodation, Catering and Similar	2 223 296	469 283	1 317 825	16	15
Information and Communication Activities	116 912	15 726	16 698	2	2
Consulting, Scientific, Technical and Similar Activities	497 127	90 703	97 171	15	9
Administrative activities and Support Services	433 518	209 455	519 666	4	3
Education	349 300	129 437	280 568	6	5
Human Health and Social Support Activities	70 016	19 378	26 696	1	1
Artistic, Show, Sports and Recreational Activities	135 140	33 327	121 107	3	3
Other Service Activities	235 052	52 330	173 021	5	4

Source: own elaboration

One of the employment policy objectives is to reduce regional asymmetries, namely between coastal regions and regions close to Lisbon, relative to the inland regions, where there are less population and lower wealth indexes. However, the data highlights that most of the applications submitted by the pro-

Entrepreneurship and Unemployment

motors concern the creation of very centralized businesses in Lisbon and in the neighboring counties of Almada, Oeiras, Cascais, and Sintra, which are part of Portugal's wealthiest region. Therefore, as a rule, the inland counties are the ones with the lowest number of applications for this type of support.

Table 12. Mean Forecasted accumulated results by industry (euros)

Industry	Sales Revenue	Net Profit	Net Present Value
Administrative activities and Support Services	144 506	69 818	173 222
Accommodation, Catering and Similar	148 220	31 286	87 855
Transport and Storage	126 939	33 041	70 786
Education	69 860	25 887	56 114
Agriculture, Animal Production, Hunting, Forest and Fishing	48 000	16 434	44 165
Other Service Activities	58 763	13 083	43 255
Artistic, Show, Sports and Recreational Activities	45 047	11 109	40 369
Wholesale and Retail Trade	112 227	16 299	35 040
Human Health and Social Support Activities	70 016	19 378	26 696
Manufacturing	53 524	9 480	23 681
Consulting, Scientific, Technical and Similar Activities	55 236	10 078	10 797
Construction	66 141	4 452	9 673
Information and Communication Activities	58 456	7 863	8 349

Source: own elaboration

EXPECTED ECONOMIC IMPACTS

Taking into consideration the profile of the applications submitted to *Investe Jovem* and *Investe Artes & Ofícios* programs, the main expected economic results are shown in the following tables.

Table 10 presents the forecast accumulated in terms of sales revenue, net profit, net present values, and jobs to be created.

Table 13. Forecasted accumulated results by education level (euros)

Academic Qualifications	Sales Revenue	Net Profit	Net Present Value (NPV)	Job Positions	Number of Applications
6th Grade	142 810	30 376	72 819	2	2
7th to 9th Grade	813 442	147 519	313 913	13	10
10th to 12th Grade	3 769 158	765 450	1 891 892	37	34
Graduate	1 723 610	379 181	999 202	29	23
Masters	738 898	195 081	392 693	8	7

Source: own elaboration

Thus, it can be seen that the micro-companies created should globally reach sales revenue and net profit in the last year of the project, exceeding 7 million euros and 1,5 million euros, respectively. In addition, it is expected that the economic value created (NPV) relative to the investments made and the entrepreneurs' return be more than 3,6 million euros. Finally, at least 89 new jobs are created.

Table 11 presents the forecasted accumulated results by industry, where it can be seen that the activities with the most significant economic contribution are wholesale and retail trade and accommodation, restaurants, and similar, coinciding with the type of industry where there were more applications.

However, analyzing the mean economic values by industry (table 12), considering the number of applications submitted, it becomes evident that the industries with the highest value created are Administrative Activities and Support Services, Accommodation, Catering and Similar and Transport and Storage. Thus, it is verified that the projects in the service activities are the ones that eventually present, greater capacity for value creation. This may suggest that differentiating factors based on the singularity and qualification of the products (as was the case of several projects in the restaurant area) and in technological sophistication, through the use of communication and information technologies with an impact on logistics, in the type of service to be provided, in marketing communication and online businesses development, contribute positively to the potential success of the micro-companies created and to economic growth.

Table 13 shows the estimated accumulated results by the entrepreneurs' education level, noting that the projects with greater economic impact are associated with promoters with education levels between the 10th and 12th grades and graduate.

Finally, table 14 shows that the applications submitted by the highest levels of academic qualifications are the ones with the higher forecasted economic results, which may suggest that knowledge and qualification of human resources are important variables for creating successful micro-companies.

Table 14. Mean forecasted accumulated results by education level (euros)

Academic Qualifications	Sales Revenue	Net Profit	Net Present Value (NPV)
Masters	105 557	27 869	56 099
10th to 12th Grade	110 858	22 513	55 644
Graduate	74 940	16 486	43 444
6th Grade	71 405	15 188	36 410
7th to 9th Grade	81 344	14 752	31 391

Source: own elaboration

CONCLUSION

The covid-19 pandemic is having a very negative economic and social impact on Portugal's economy, having greatly increased unemployment in the country, especially amongst young graduates.

Over the years, several authors and research papers have highlighted the importance of entrepreneurship for economic growth and the creation of qualified employment based on innovation and human resources' unique capabilities. Simultaneously, the relevance of entrepreneurial ecosystems and government support for the creation of successful businesses has also been highlighted.

Thus, this research paper began by presenting and characterizing several important aspects that may condition entrepreneurial initiatives and their economic and social impact, with special attention to the characteristics of entrepreneurial ecosystems and the importance of government support for entrepreneurship and companies' creation. In these, it was concluded that the research paper has shown that soft supports, related to the knowledge transfer about business and financing, have a greater impact on the success of entrepreneurship, relatively to hard supports, more associated with the provision of facilities or equipment.

To highlight the importance and potential impact of government support, it was characterized a support program for investment and own business creation by unemployed people, most of whom are considered young entrepreneurs.

Through the case studied, it was found that qualified young people (graduates) and older people are the majority seeking to create their own business and that, although this type of programs aims to reduce asymmetries between different regions, the wealthiest regions end up providing the largest number of applications. Such evidence suggests that life experience (professional and academic), as well as the size of the potential market, may influence the decision to start your own business. It is also worth mentioning the fact that the activities with greater weight in the developed projects are associated with commerce and accommodation and catering, industries that could be considered traditional. However, in most cases, entrepreneurs tried to develop ideas that sought to be unique in the market through aspects related to innovation or information and communication technologies. Thus, it was some service activities (Administrative and Support Services Activities, Accommodation, Catering and Similar, and Transportation and Storage) that showed the greatest capacity to create economic value per project. Strengthening the role of the so-called intangible assets and the importance of the business's differentiation capacity, it was evident that the projects presented by entrepreneurs with the highest level of academic qualifications were those that also potentially show a greater capacity to generate economic impact.

Finally, it was observed that, although they are small projects associated with micro-companies, they may have a relevant impact in economic and social terms and provide better conditions to face the challenges caused by the pandemic.

The main limitation of this work is the fact that it was carried out only based on the projects submitted to the IEFPP, in the geographic area surrounding Lisbon. An analysis including all projects presented by promoters at the national level will be interesting.

As future research, it is intended to control the success of the approved projects, verifying their scope in terms of sales revenue, net profit, and job creation, as well as the way the pandemic had an impact on the activity.

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ENDNOTE

- ¹ School education is organized into three levels:
- Basic education – comprises schooling from first grade to 9th grade;
 - Secondary education - comprises a cycle of three years (from 10th grade to 12th grade);
 - Higher education - comprises university education and polytechnic education.
- <https://euroguidance.gov.pt/index.php?c=int&id=2> (consulted in November 2020)

Chapter 3

Structures and Functions of Holding Companies in Different Countries

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ABSTRACT

The word “holding” is an English word. Some researchers state that this word derives from the root “hold” and means to hold management as “to hold and control,” while others state that it means to own a stock with the phrase “shareholder” or “to hold and control.” The word “holding” used by the countries of the world for business groups is expressed in different words by different countries. The following words are used: “holding” in Turkey, “chaebol” in South Korea, “keiretsu” in Japan, and “grupos economicos” in Latin America. At the same time, business groups are referred to as Qiye Jituan in China, Guanxi Qiye in Taiwan, Grupos in Spain, and Konzerne in Germany. In addition to these words mentioned, an American term “conglomerate” (holding) is sometimes stated in the alternative with business groups.

INTRODUCTION

Rapid changes in the economy cause the growth and the development of the world trade. In order to cope with these changes, many national and international economic agreements are made between companies in order to gain competitive advantages, to maintain their continuity and to adapt new developments. So, company groups were created. In this process, companies make agreements such as mergers, acquisitions, and establishing capital groups. One of the types of economic agreements made between companies is holding company. Holding companies are one of the types of companies that have an important place in the world economy.

The word *holding* is an English word. Some researchers state that this word derives from the root “hold” and means to hold management as “to hold and control”, while others state that it means to own a stock with the phrase “shareholder” or “to hold and control” (Kara, 1991). The word “holding” used

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by the countries of the world for business groups is expressed in different words by different countries. Following words are used: “holding” in Turkey, “chaebol” in South Korea, “keiretsu” in Japan and “grupos economicos” in Latin America (Şahin, 2007). At the same time, business groups refer to Qiye Jituan in China, Guanxi Qiye in Taiwan, Grupos in Spain and Konzerne in Germany (Lu and Yao, 2006). In addition to these words mentioned, an American term Conglomerate (holding) is sometimes alternative to business groups (Granovetter, 2005).

Holding companies are expressed as conglomerate in America. If the profit, sales and assets of these segments are 10% or more of the total of holding companies, they are reported as a separate segment (Gautier and Hamadi, 2005). Cheabol, which is a holding company in South Korea, consists of many affiliated companies operating in different industrial branches and the ownership and control of these companies are under the rule of a dominant family (Murillo and Sung, 2013). Keiretsu in Japan are holding companies that manage all interconnected companies, receive government support, have a systematized order, and are established for commercial reasons (Ming and Lai, 1999). Holding company in Turkey managing the companies that own the stock and is becoming the center of these firms (Güngör and Orhan, 2009). In addition to these countries, the structure of holding companies differs in countries such as China, Belgium, France, Germany, England and Russia.

Furthermore, according to the study of Chandler Jr (1999), the development process of the “holding company” is examined as follows; First of all, trade associations are occurred to manage cartels that are formed by many small manufacturing companies. In the next step, these trade associations convert into trusts, and in the last step they become a holding company. The holding company creates a legal form, administrative consolidation and centralization in order to provide a strict control over the single-function companies. These companies emerged in the second half of the 19th century and the first holding company movements were seen in the United States of America (USA) and in the United Kingdom (UK) (Akça, 1998).

Therefore, holding companies are defined as companies that diversify by owning the stock of one or more companies (Green, 1933). At the same time, these companies are constantly seeking fields to develop their activities in changing markets and they manage and control the companies that they own its stocks (Quadri, 2010). Companies in which holding companies own the stock of more than 50% and have control power are called as subsidiary (Karapınar and Zaif, 2013). If the holding companies own the shares which are between 20% -50%, these companies are defined as affiliates (Damodaran, 2010). The identity and management styles of subsidiaries and affiliates are protected by holding companies (Şahin, 2007).

Shimotani (2007) mentions that companies are established as a holding company in order to integrate or consolidate existing businesses into one, to find a place among competing businesses, to concentrate on economic power and to reorganize the industry they belong to, or to manage a business group by the parent company effectively. The direction of managerial transfers between holding companies, core operating firms (subsidiaries) and affiliated companies (Nakamura et al., 2018). These companies increase their value to the maximum level when they have subsidiaries and affiliated companies and when these subsidiaries and affiliated companies are traded on the stock exchange. Because the increase in the value of subsidiaries and affiliates also enhance the value of holding companies (Atanasov et al., 2010; Jang, 2017).

Holding company is grouped in various ways in the literature. Firstly, holding companies operate as pure and mixed holding companies regarding to their activities. Secondly, the companies in which the holding companies participate in their capital operate as a single rank and multi rank holding company

structure, depending on whether they have the capital of other companies. Thirdly, firms that gather companies operating in the same or different fields are horizontal or vertical holding companies. Fourthly, holding companies are seen in the economic system as companies with management and auditing purposes or with management, auditing and investment purposes. Finally, holding companies are national and multinational holding companies according to the geographical distribution of the areas in which they operate (Kotika et al., 2014; Akça, 1998; Altuğ, 1986).

Holding companies have many advantages and disadvantages in the economic system. The advantages are defined as capital expansion, risk reduction, creating synergy between its subsidiaries and affiliates, increasing the return resulting from taking advantage of leverage, and increasing the shareholders' wealth to the maximum level (Banerjee et al., 1997; Saraç and Kahyaoğlu, 2010). Contrary to these advantages, the increase in the number of companies that holding company own increases the risk and this causes difficulties in managing those companies. In addition, holding companies making decisions in line with their own interests create a disadvantage (Bonbright and Means, 1932; Akgüç, 2013).

As a result, the purpose of this study is to examine the structures and functions of the holding companies operating as business groups in the countries such as Turkey, the USA, South Korea, Japan, China, Belgium, France, Germany, the UK and Russia. It compares the structures of holding companies in the different countries. Because holding companies structured in different ways in many countries are developing rapidly in the economic system and the number of these companies is increasing.

The rest of this chapter is organized as follows: the next section summarizes the structures and functions of holding companies in different countries. Then, the results and conclusions of the study are presented.

STRUCTURES AND FUNCTIONS OF HOLDING COMPANIES IN DIFFERENT COUNTRIES

Although the holding word is expressed with different words in different countries, this term refers to the companies which dominate other companies with a commercial agreement. This section of the study explains the structures and functions of a holding company in countries such as Turkey, the USA, South Korea, Japan, China, Belgium, France, Germany, the UK and Russia. In addition, this section mentions the different features of holding companies in different countries.

Holding Companies in Turkey

Both the terms “group” and “community” are used for “holding” term and it is used for the form of organization in Turkey and the term “holding company” is also expressed as “company community” and “business group” (Üsdiken and Yıldırım Öktem, 2008; Özen and Yeloğlu, 2006). In the Turkish law system, holding companies are perceived as the roof of many companies from past to present. In law terms, a holding firm refers to an economic community rather than a community and its purpose is to merge under a single management (Durmuş, 2015).

The first holding movements in Turkey began with the formation of capital market as a result of supporting the state's capital market in 1960s (Akça, 1998). Particularly, the establishment of holding companies is gained speed by making the necessary regulations about the Commercial Law and the Corporate Tax Law in these years (Altuğ, 1986) and the first attempts to establish a holding company were made with Sümerbank (Akça, 1998).

According to the research of Güngör and Orhan (2009), holding companies manage the capital and decisions of the companies in which it participates in its capital, and become the center of investments and management. In addition, the holding companies' control, plan, organize and form their budgets of the top management of the companies in which it participates in capital (Veske, 2002). These companies also distribute risk (Ayboğa, 2000).

The method of establishing holding companies in this country is as follows. A holding company is established by providing the minimum amount of capital proposed for joint stock companies and by obtaining the permission of the Economics Ministry is established. Holding companies can also be established by converting from existing joint stock companies (Durmuş, 2015; Çakır, 2014). On the other hand, holding companies are aimed to be in the form of pure holding and to operate in this way. However, there are purpose-subject clauses in the founding agreements of holding companies that show they are different from the structures of other joint stock companies (Özdemir, 2016). Thereby, it shows that the organization form of holding companies is not similar to that of other companies. Since such companies do not operate in industrial and commercial fields, some departments within the organization differ. Holding companies provide many services to their affiliated companies through these departments (Çakır, 2014).

According to study of Yurtoğlu (2000), there are some features that Turkish holding companies have. Firstly, a small amount of the companies in which holding companies participate in their capital are publicly traded on the stock exchange. Secondly, these firms have a very highly concentrated and centralized ownership structure. Families directly or indirectly own more than 75% of these companies traded on the stock exchange and hold the majority of shares. The separation of control and ownership is achieved by a complex or hierarchical structure and by a coalition established through other families or foreign firms.

Conglomerate in the United States of America (USA)

The English equivalent of the American-style holding is "conglomerate" and is described in many studies. While this word is used instead of collective formed by various units, it is also used as business groups (Granovetter, 2005).

In addition, the first phase of holding company development in the USA, individual companies, unions and business partnerships are established. Then, cartels emerge through the "Gentlemen's Agreement". These cartels turn into trust agreements due to frequent trials and avoidance of illegal cartel deals. However, after trusts are deemed as illegal, holding companies with a new form are established and this organization is spreading rapidly (Kishida, 1999).

Holding company establishment movements occurred in the second half of the 19th century and these movements were first seen in the USA and England (Akça, 1998). The first holding partnership system in the USA state of New Jersey was implemented by the Shared Corporations Act, which entered into force in 1888, "a partner is allowed to own the shares of other partners". In other states of the USA, the actions of establishing a holding company started without a special permission in 1929. Holding companies established during these periods are companies such as American Telephone and Telegraph Company, United States Steel Corporation, Pennsylvania Railroad System (Altuğ, 1986: 11-13). Holding companies organized in the form of a pyramid controlled many public service organizations over the term of 1920-1930 in the USA (Mahoney, 2012). The corporate organization forms that emerged as a result of the merger of various unrelated companies in the country in the 1980s were referred as

Structures and Functions of Holding Companies in Different Countries

holding companies. In this period, holding companies were less diversified by selling unwanted shares and preventing growth strategy (Davis et al., 1994).

While conglomerates (holding company) consisted of internal diversification in the past, they comprise of subsidiaries and affiliates which are independent businesses nowadays. The companies such as General Electric and Westinghouse are examples of holding company structure in the past, and Tetron and Gulf Western companies are examples of holding company structure in these days (Colpan and Hikino, 2010; Berg, 1977).

Furthermore, holding companies established to separate the management of funds from production management are similar to the organizational chart of a decentralized firm. Each firm or each division in holding company operates with little or no coordination between their activities. At the same time, each company or each segment manager reports to the central management unit and is administratively and financially responsible to the center (Leontiades, 1969). According to the study of Granovetter (1995), banks under the control of holding companies provide financing to both holdings and other subsidiaries and affiliates.

According to the research of Gautier and Hamadi (2005), there are structural differences between holding companies in the USA and holding companies in other countries. Firstly, subsidiaries and affiliated companies in the USA are like a segment of the holding firm. However, affiliated companies in other countries are organized as an independent firm, fulfill their accounting obligations separately and prepare financial reports. Secondly, if each segment gains 10% or more of the consolidated profit, assets or sales, these segments report their data separately from holding company. Thirdly, holding companies in the USA hold the whole control of the affiliated companies. In other countries, holding companies have control over the affiliated companies as much as the proportion of their capital (Gautier and Hamadi, 2005).

As a result, American-type holding companies are companies formed as a result of diversification by purchasing the shares of companies operating in many industries. The main reason for buying or selling these companies is financial reasons (Granovetter, 2005).

Chaebol in South Korea

There are generally two types of companies in South Korea. The first is individual firms, and the second is even larger businesses that combine these individual firms. These large enterprises, which are holding companies or business groups, are known as “chaebol”. In fact, “chaebol” which is the entire large business sector in the country and it also includes part of holding companies. When researchers examine the word that corresponds to the holding firm structure, “chae” means wealth or property, “bol” is defined as a group or part, and in general, this word expresses a group or a part of wealth (Morden and Bowles, 1998).

When we examine the historical process of the chaebols, they were first revealed after the Korean War, with the restructuring project by the government over the term of 1950-1953. Some large companies turned into “chaebols” which were family companies. Later, family companies, which turned into chaebol, accumulate large amounts of capital in order to ensure economic development, when they begin to implement their first five-year development plan. With the start of financial liberalization in 1980, banks have been privatized and the shares of family companies in the financial sector and commercial banks have increased (Jun, 2009). In these years, family firms that do not need state financing and assistance and they become multinational firms beyond the state control (Murillo and Sung, 2013).

In 1986s, as a holding company which had complex shareholding structure in Korea, chaebol emerged as a part of the government attempt to reduce the economic concentration. Particularly, after the Asian Financial Crisis over the term of 1997-1998, restrictions were eased to encourage the transformation of “chaebol” groups into holding companies. Therefore, the transformation to holding companies increased rapidly (Jang, 2017). Nowadays, holding company system is emerging as a new management structure. This system simplifies the complex equity relationships between affiliated companies and reduces the interdependence of affiliated firms (Kim et al, 2016).

As a result, chaebols are made up of many affiliated companies operated in different industrial fields and the ownership and control of these chaebols are dominated by a dominant family. Such firms have a hierarchical structure, are centralized, rely on government relations and hold a large percentage of the national economy (Murillo and Sung, 2013). In addition, the decision-making mechanisms of such firms concentrates in a single hand and they have overly diversified structures (Oh and Park, 2001). Chaebol includes firms that are diversified horizontally rather than vertically diversified firms (Huh and Kim, 1993).

At the same time, since the majority of the chaebols is held by a single family, this family is the majority shareholder of the affiliated companies. In this regard, family members also have responsibilities such as managing affiliated companies and earning money (Premack, 2017). When chaebols are traded on stock exchange, their market value constitutes the value of equity shares of companies that are traded on the stock exchange and not traded on the stock exchange (Almeida et al., 2008).

According to the studies of Kim et al. (2016) and Almeida et al. (2008), there are some characteristics of chaebols. Firstly, these companies are allowed to borrow more than 100% of their assets and are prevented from investing. Secondly, it becomes difficult for companies under the control of these companies and affiliated companies to hold at least 30% of their equity. Thirdly, non-financial chaebols are prohibited from participating in the capital of a firm in the financial sector and private equity investments unrelated to their business are prevented. Fourthly, it is in the form of a pyramid and has cross shareholding. Finally, horizontal equity investments of such firms are prohibited, and the possibility of circular equity investment is reduced.

Thus, chaebols, which are officially composed of independent companies and defined as a collective under the joint management and financial control of a single family, directly or indirectly hold the shares of the equity of independent companies (Murillo and Sung, 2013; Almeida et al., 2008).

Keiretsu in Japan

After World War II, Japan became a great power with its renewal activities in a short time and arose the second place among the economic powers in the world. The most important reason for the country's rapid rise is business networks or groups (Zerenler and Iraz, 2006). The historical process of business networks in Japan is as follows.

Previously, zaibatsu established as the first business group in Japan was a large-scale company controlled by family. These firms were established to increase versatile business diversification in the late 19th and early 20th centuries and turned into management structures that managed various businesses (Shimotani, 2012). Zaibatsu enterprises were reorganized into joint stock companies from the 1900s to the 1920s and holding companies were established by holding the shares of these companies (Okazaki, 2001). According to the study of Zerenler and Iraz (2006), Zaibatsu is defined as clusters formed by companies operating in various sectors such as banking, insurance, manufacturing and foreign trade,

provided that the holding company is the center. Holding companies have shares varying between 40% and 100% in the capital of the subsidiaries and these companies are dominated by a family. Okazaki (2001) notes that Zaibatsu holding companies control the budgets, financial data and important decisions of affiliated companies. At the same time, according to the researcher, powers are dispersed between the holding firm and affiliated companies. According to the study of Shimotani (2012), in order to prevent the spread of risk, a limited liability system is applied to families that keep companies under control.

The activities of zaibatsu holding firms controlled the components of the industrial sector at the beginning of the 1930s and turned into the large capital organizations that had a crushing impact on the economic environment. At the same time, as a result of the economic crisis experienced in these years, large companies started to take control of subsidiaries and these subsidiaries turned into business groups (Shimotani, 2012). Then, zaibatsu business groups established before World War I in Japan were distributed by the military administration of the USA after the World War II. These groups have been turned into “keiretsu” business group (Murillo and Sung, 2013; Kang: 1996). Thus, keiretsu holding firm structures emerged from zaibatsu holding companies with the independence of Japan in the 1950s and these new structures were formed with the effective support of banks in the next decade (Grabowiecki, 2006). In other words, while zaibatsu holding companies are tightly controlled by the founding family members in the pre-war, keiretsu holding companies are more dispersedly owned in the post-war and are structured around a commercial bank (Huh and Kim, 1993).

According to the research of Ming and Lai (1999), there are some characteristics of keiretsu holding companies. Firstly, they have a systematized regulation to ensure the internal control of member companies. Secondly, these structures are control tools supported by a combination of business rationales (legal ties, financial ties and activity ties) and emotional ties (individual ties and cultural interests). Thirdly, they have a mechanism to ease strategy implementation. Finally, relationship between group members is endorsed by business groups and government officials.

In addition, keiretsu business groups are divided into two. The first is the vertical keiretsu group gathered suppliers and sellers, and these groups are common in the automobile and electronics industry. The other is called as the horizontal keiretsu group or the financial keiretsu group. These groups comprise a wide network of manufacturing enterprises, whose headquarters are either commercial banks or commercial enterprises (Douthett JR et al., 2004).

There are some differences between keiretsu holding company structures in Japan and holding company in Turkey. These differences are shown in the following (Atalan, 1998).

- Parent firm manages all group companies in Japan. But each company is responsible for its own management in Turkey.
- The decision-making mechanism for all companies in the group is the board of directors of the parent company in Japan. But each firm has its own board of directors in Turkey.
- Each company in the group is interdependent in Japan. But each firm is independent in Turkey.
- One of the companies in the group is prohibited from doing business with a foreign company or is subject to the permission of the head office of parent company in Japan. But firms can operate with both companies in the group and foreign companies in Turkey.
- They get the support of the government in Japan. But they only receive incentives for their activities from the government in Turkey.
- Group members can share a project among themselves in Japan. But each firm is responsible for its own project in Turkey.

Structures and Functions of Holding Companies in Different Countries

- Solidarity is provided between group companies with the establishment of a family club in Japan. But a family club is not established for solidarity purposes in Turkey.
- Labor transfer is prohibited in Japan. But labor transfer is made in Turkey.

Furthermore, the keiretsu in Japan differs from the chaebol in Korea in terms of ownership, control, structure, government influence, and culture. These differences report in the following (Tu et al., 2002).

- ü Ownership and control aspect: Cross shareholding, stakeholder focus and collective leadership are provided in Japan. But family ownership, family-oriented, solid autocratic leadership are provided in Korea.
- ü Structure aspect: It diversifies horizontally or vertically and group members are banks in Japan. But the government does not allow banks to be included in unrelated and vertically integrated groups in Korea.
- ü Government influence aspect: The government supports industry policy through research backings in Japan. But it complicates industrial policy through direct grants and assistance in Korea.
- ü Culture aspect: It takes time to come to an agreement with each loser in Japan. Sharing pain allows quick decision making in Korea.

As a result, according to the Anti-Trust Law in 1997, keiretsu in Japan may exceed fifty percent of the total value of the shares of the firms in which they participate in their capital and it can control other firms through the shares they own (Tu et al., 2002).

Jituan Gongsi (Holding Company) in China

“Jituan gongsi” which is China’s holding company is directly translated as “business group” (Lee and Kang, 2010). Holding companies are defined as companies that include top management and subsidiaries. In the country, these companies are also defined as legal investment tools to organize investments and equity costs by foreign investors. This investment tool actively manages investments in China and helps services such as finance, central treasury functions, product distribution, sales and import of products, and project deals (Bimler, 2007).

In addition, the companies listed on the stock exchange in the country are generally managed through holding companies. The state not only has the majority shares of these companies but also controls them. Therefore, holding companies in China are directly majority shareholders of companies listed on the stock exchange, and the government controls these companies indirectly. On the other hand, holding firms typically have a pyramided corporate hierarchy. Example of this situation in the country, a holding company holds the majority shares of a company listed in the stock exchange and all shares of this holding company are owned by the municipality and the city management (Watanabe, 2002). This means that holding companies have a vertical structure and the government controls the companies listed on the stock exchange through the holding company. (Lee and Kang, 2010; Watanabe, 2002).

At the same time, holding companies in China (operating group or group companies) have two different characteristics. These companies have less diversification and the shares of holding companies in the country are owned by the state rather than certain families (Lee and Kang, 2010). As a result, such firms in China emerge as a simple structure that is owned by the state and consists of the parent firm and affiliated firms.

Holding Company in Belgium

Holding companies in Belgium emerged as one of the oldest financial institutions in their economy and the beginning of these institutions dates back in 1882. Since then, the main function of holding companies is to control and organize the flow of capital in the Belgian economy. Other activities are observing the economy in the form of a financial institution, retaining receivables and exporting financial receivables on the stock exchange. Most of the holding companies in the country are established as joint stock companies and are traded on the stock exchange. Affiliated companies of these companies are also established as joint stock companies and they are among the large industrial and financial institutions. At the same time, some of these holding firms hold a diversified portfolio and some specialize in certain sectors such as glass, oil, electricity and tobacco (Daems, 1978).

According to the study of Rommens et al. (2004), holding companies in Belgium and other Continental European countries play an important role in corporate finance. These firms are a part of a complex hierarchical structures and corporate groups and they are intertwined with ownership and voting agreements.

In addition, there are differences between holding companies in Belgium and other countries. For example, while holding companies in the USA have a tight structure, holding companies in Belgium have a loose structure mostly with bad corporate policies. In Japan, members of keiretsu groups are equal, and members are both associated with banks and play an important role in financing holding companies. Holding companies in Belgium are controlled by a pyramid structure and the banks in the group both play a small role in management with finance and perform their traditional activities (Buysschaert, 2005).

As a conclusion, holding companies in Belgium are organizations established to structure and organize the corporate control market. These firms are defined as financial institutions and their main activity is capital management. Their effect on capital management is control (Daems, 1978).

Holding Company in France

Holding firms in France are defined as financial intermediary that unites individual shareholders and is a customized form of major shareholders. These companies are among the companies with the highest trade in Paris and the market value of these companies represents a significant share of the most popular equity index. The complex and gradual ownership structure of holding companies increase control (Banerjee et al., 1997).

Furthermore, they are French holding companies that manage all activities in Europe and these companies are owned by a parent company in the USA (Anghileri, 2017). While the USA owns holding companies, which are a multi-divisional corporate structure, France has a holding company structure that controls large industrial groups (Murphy, 2005).

Konzern (Holding Company) in Germany

Konzern, which are expressed as holding types in Germany, appeared by the law dated 1965. According to the law, holding companies do not show as real profit the profit obtained by the affiliated companies to which they participate in their capital and do not include this profit in the balance sheet. Moreover, these affiliated companies cannot buy the shares of holding companies (Altuğ, 1986).

Adams (1999) states that holding companies are banned in other countries although they are not banned in Germany. According to the researcher, holding companies are defined as companies holding

shares in another company. These companies are formed between more than two companies and the voting rights and earnings of these companies are determined according to the ratio of shares.

Finally, holding companies in Germany reduce the withholding tax. According to the researchers, in this country, low withholding tax rates are offered, and the tax is minimized by establishing a holding company. This application is also implemented in countries such as Hong Kong, Singapore, Malaysia and Russia (Endres et al., 2010)

Holding Company in the United Kingdom (UK)

In the second half of the 19th century, one of the countries where holding company movements were first seen was the UK (Akça, 1998). Due to the war and some factors in the country, holding companies were established to combine several company relations and to continue business activities through affiliated companies in 1920s (Edwards and Webb, 1984).

According to Companies Act in 1948, if a firm controls the formation of another firm's board of directors, or if a firm holds more than half of the equity value of another firm, these firms are referred to as holding firms. Moreover, affiliated companies are both partners of the holding company and dependent on holding companies in terms of management and control (Altuğ, 1986).

There are provisions about holding companies and affiliated companies in the Companies Act, 2006. They are expressed as follows;

- A firm holds the majority of another firm's voting rights,
- A firm has a majority of the board of directors,
- A firm alone controls the compliance of the agreement and has a majority of the voting rights.

In addition, Bleach and Stern (2002) state that the UK creates a tax advantage in providing dividends from holding companies and these companies is highly preferred by shareholders.

Holding (Kholding) Company in Russia

There are holding companies such as business groups in Russia (Evnevich and Yaburova, 2013: 64). Holding companies derived from the financial and commercial sectors are an important element in stimulating the Russian economy (Schwartz and McCann, 2007).

These companies, whose official names are registered as either commercial firm (torgovaya kompaniya / torgovyidom) or holding company (kholding) in Russia, are defined as companies controlling three or more companies in the same sector through shareholding. These companies are diversified by operating in textile and food production as well as financial activities. In addition, holding companies have complete control over appointed managers and direct and plan the activities of affiliated companies (Morrison, 2007). Affiliates differ significantly from other independent firms (Avdasheva, 2007).

Avdasheva (2007) states that holding companies in Russia develop in three stages. The first stage is the start of intensive privatization in 1992. The second stage is the transformational recession in 1993-1998. The last stage is the start of economic development in 1999 and after. In addition to these stages, Parakhina (2013) indicates that holding companies are affected by the global economic factors such as mergers and acquisitions from 2009 to nowadays.

Structures and Functions of Holding Companies in Different Countries

According to the study of Clarke (2004), holding companies in Russia are divided into different types. The first are vertical holding companies that form a part of their production chains and are integrated by purchasing businesses. These companies are developing especially in the oil, gas and metal science sectors. In addition, these firms ensure the control of the markets and strengthen the position of affiliated firms in the economic and political environment. The second is horizontal holding firms alone seeking to establish positions in regional or federal markets. The main problem of these companies is to dominate the regional or national markets and reduce the costs of affiliated companies. But holding companies solve these problems. The last are diversified holding companies that have diversified their business portfolio to generate shareholder value and profit. These companies are independently integrated horizontally and vertically. In addition, these companies develop long-term plans to maximize the profits of the affiliated companies and increase the value of their shareholders.

As a result, Russian holding firms play a defining role in economic development and these firms have the necessary resources and the ability to manage (Parakhina, 2013).

COMPARISON THE STRUCTURES AND FUNCTIONS OF HOLDING COMPANIES IN DIFFERENT COUNTRIES

Many studies in the literature and Franks and Mayer (1997), Özen and Yeloğlu (2006) and Dirlik (2016) studies are reviewed. As a result of this examination, it is seen that holding companies operating in different countries differ in terms of many features such as ownership and control aspect, companies in the group, diversification and organizational structure. Hence, different characteristics of holding companies in different countries are summarized comparatively in Table 1.

Table 1. Comparison of holding companies in different countries

Country	Features of holding company				
	Ownership and control aspect	Companies in the group	Diversification	Organizational structure	Economic significance
Turkey	Family, shareholders	Independent	Unrelated	Pyramid	Increasing
The USA	Parent firms	Independent	Unrelated	Diversified	Important
South Korea	Family	Independent	Unrelated	Network	Increasing
Japan	Shareholders, family	Dependent	Unrelated	Network	Decreasing
China	Government	Dependent	Associated and unrelated	Hierarchical	Increasing
Belgium	Shareholders	Dependent	Associated and unrelated	Pyramid	Important
France	Shareholders	Independent	Unrelated	Pyramid	Increasing
Germany	Shareholders	Independent	Associated and unrelated	Pyramid	Important
The UK	Shareholders	Independent	Associated and unrelated	*	Important
Russia	Entrepreneurs	Dependent	Associated and unrelated	Hierarchical	Increasing

Notes: Table is summarized by the author.

(*) shows that it is not found enough information in the literature.

CONCLUSION

This study examines the structures and functions of holding companies in different countries such as Turkey, the USA, South Korea, Japan, China, Belgium, France, Germany, the UK and Russia. Many studies in the literature have been investigated. The results of the study reveal that the structures and functions of holding companies in different countries vary in term of several features. Particularly, this study shows that holding company owned by family and shareholders in Turkey, by parent firm in the USA, by family in Japan and South Korea, by the government in China, by shareholders in Belgium, France, Germany and the UK, and by entrepreneurs in Russia. The firms in the group company in Turkey, the USA, South Korea, France, Germany and the UK are independent while the firms in Japan, China, Belgium and Russia are dependent. In addition, holding company in Turkey, the USA, South Korea, Japan and France diversify unrelated. But they diversify associated and unrelated in China, Belgium, France, Germany, the UK and Russia. In other countries, with the exception of Japan, holding companies are economically important and their importance is increasing. Hence, this study states that apart from these features, holding companies differ from one country to another in many aspects.

As a result, the globalizing world leads to the removal of economic borders between countries and many developments in the economy. With these developments, companies create more value, provide competitive advantages, maintain their continuity, adapt the innovations and developments, participate in national and international agreements and bring together the capital. This situation pushes all companies to make agreements such as mergers, acquisitions and establishing capital groups in the world. One of these agreements is holding company structure. Holding companies combine companies operating in different areas such as production, industry, trade, finance under a certain capital and manage them. These kinds of firms have a significant role on the economy of countries.

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Section 2

Organizations

Chapter 4

Financial Capacity During a Pandemic Crisis: Insights From the Non-Profit Sector

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ABSTRACT

This chapter seeks to provide empirical evidence of the financial shocks that non-profits experienced during the coronavirus disease-19 (COVID-19) pandemic lockdown period. The research included a literature review of the main up-to-date publications to understand non-profits' financial vulnerabilities. The statistical analyses' results facilitate a fuller understanding of the impacts that the abrupt loss of clients, volunteers, and employees due to the pandemic has had on non-profits' finances. These results are discussed in light of the previous studies. Through computer-assisted text analysis, this study examined non-profit managers' perceptions of the most significant challenges faced by these organisations in the pandemic's initial phase. The findings reveal a dramatic situation characterised by a decrease in revenues and increase in expenses, in which non-profits regulated by Portugal's social welfare private institutions statutes were the most strongly affected. The most salient challenges identified include technological preparedness, safety assurance, and physical distancing.

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INTRODUCTION

The non-profit sector covers a large number of organisations that pursue community welfare and development objectives, comprising more than 70,000 entities in Portugal alone. During the coronavirus disease-19 (COVID-19) pandemic, these organisations have played a key role by ensuring support for the most vulnerable individuals in terms of health, social and economic conditions. Non-profits work hand-in-hand with the public sector to deliver essential services to the relevant populations.

The degree to which governments rely on the non-profit sector depends on the perceived social urgency of the problems to which these organisations seek to respond (Frumkin & Kim, 2002). Evidence-based decision making can guide politicians who develop public policies for this sector and managers who readjust strategies and operational resources to keep their organisation active during the current crisis. In this sense, evidence related to non-profit sector challenges is urgently needed so that appropriate policies and strategies can be put into place.

Non-profits have responded to the COVID-19 pandemic crisis from the first day, but they have struggled to sustain preparedness and intervention capacities primarily because of the lack of resources that characterises these organisations and workers and volunteers' absence due to health issues related to the virus. Some academic studies have contributed to providing a picture of how non-profits have responded to the COVID-19 pandemic and how this has impacted their activities. Recent contributions have come, for example, from the United States (Deitrick, Tinkler, Young, Strawser & Meschen, 2020; Mumford & Greene, 2020) and Canada (Barr, 2020). These authors reveal a non-profit sector experiencing a decline in the average revenue and applying human resources policies that reduced the number of employees or staff hours. The cited authors also highlight the need to keep supporting non-profits considering that, in this pandemic, the demand for non-profit services continues to grow.

Cultural and historical factors intensify differences between non-profits from varied regions (Mirabella, Gemelli, Malcolm & Berger, 2007), which implies that academics must take into consideration differences and similarities between non-profits when generalising results (Santos, Laureano & Moro, 2020). To generate more valuable insights for Portuguese non-profit sector managers and public policies, the present study addressed the specific challenges that Portugal's non-profits are facing as a consequence of COVID-19. In particular, this research focused on non-profits' financial capacity as it is a key aspect in terms of anticipating resource constraints, managing risks and implementing proactive risk response activities through both management decisions and public funding programmes. On the one hand, this study sought to characterise the impacts that the abrupt loss of clients, volunteers and employees due to the pandemic have had on non-profits' financing policies. On the other hand, these organisations face a vast array of challenges, including financial issues, so the research focused on examining non-profit managers' perceptions of the most significant challenges faced by non-profits in the COVID-19 pandemic's initial phase.

Background

Non-profits are oriented towards social impacts, which is a distinct feature of these organisations compared with companies that are not so clearly mission-driven (Sagawa & Segal, 2000). Thus, when decision-making processes are based on non-profits' social mission rather than financial returns (Drucker, 1989), these organisations will most likely struggle to keep their financial situation balanced. Non-profits' financial vulnerability has been widely confirmed in the literature. Scholars posit that this vulnerability

is influenced by an inadequate equity balance, revenue concentration, low administrative costs and a low or negative operating margin and level of international funding (Despard, Nafziger-Mayegun, Adjabeng & Ansong, 2017; Greenlee & Trussel, 2000; Tuckman & Chang, 1991).

Non-profit organisations typically have multiple goals that also influence their vulnerabilities. Healthcare and welfare support non-profits, for instance, are perceived as the most likely to be impacted by financial shocks (Salamon & Abramson, 1993; Tuckman & Chang, 1991). Organisations' size and funding sources were also examined by Silva and Burger (2015), who concluded that larger non-profits and those more dependent on donor grants are negatively associated with financial problems. A relationship between diversified revenue sources and financial vulnerability has also been found (Despard et al., 2017) as non-profits with multiple types of revenue are associated with less financial vulnerability compared to organisations with one type of revenue. Empirical research has also found that financially vulnerable non-profits are those that have experienced a decline in their ratio of expenses to total revenues over time (Greenlee & Trussel, 2000) or a specific percentage decrease in recurrent revenues (Silva & Burger, 2015).

Non-profits have responded to the COVID-19 pandemic crisis from the first day, but they have struggled to sustain preparedness and intervention capacities primarily because of the lack of resources and high uncertainty of financial support that characterises these organisations (Rusteberg, Appel, & Dqbrowska, 2002). It is proved that more stable revenues could promote greater organizational longevity in this sector (Carroll & Stater, 2009), thus investigating the impact of this pandemic in the level of revenues of non-profits contributes for assessing how the sustainability of these organizations may have been compromised, as it occurred in previous crisis. The financial crisis of 2008 resulted in a decline in revenues of the non-profits (Tzifakis, Petropoulos, & Huliaras, 2017), which made non-profits to have a lower level of strategic response (Arik, Clark, & Raffo, 2016). On the other hand, financial health of organizations is also affected by the expenses level. Non-profits that experience a decrease in the level of revenues may reduce their expenses, in an attempt to balance the accounts. But low level of costs could mean inadequate staffing and insufficient equipment to run and improve program services in non-profits (Kim, 2017), which could prevent non-profits to contribute for minimizing suffering of the most social and economic vulnerable population. Information is currently scarce on how many Portuguese non-profits maintained their activities during the first lockdown period or how this health crisis affected their financial ability to keep operating programmes. The present study, thus, addresses the following research question: What impacts did the COVID-19 pandemic have on Portuguese non-profits' financial indicators during the lockdown period – e.g., level of activity, revenues, and expenses?

Non-profits managers must also focus their attention on aspects other than financial risks. For instance, their human resources' professionalism (Marshall & Suarez, 2013; Sanzo-Pérez, Rey-Garcia & Álvarez-González, 2017) or technology innovation (Luo & Hu, 2015) are specific factors influencing non-profits' strategies. In human resources area, volunteers have significant presence in non-profits, in such a way that organizations invest in its retention, engagement and satisfaction (Curran, Taheri, MacIntosh, & O'Gorman, 2016). In contrast to the financial crisis of 2008 in which the number of volunteers reached record levels (Tzifakis et al., 2017), the COVID-19 pandemic created a situation of volunteers' absence due to health issues. The role of volunteers is, then, magnified and it is largely recognised, as well as the need of disclosure of the information on volunteer contributions (O'Brien & Tooley, 2013). Moreover, the level of volunteer dependency proved to influence organizational strategy (Zchout & Tal, 2016). Thus, volunteering level should be considered when addressing the impact of the COVID-19 pandemic

in non-profits. In this sense, the second research question formulated is: Did the financial impacts differ depending on the financing sources or workforce size involved?

The present study sought also to contribute to a fuller understanding of the COVID-19 pandemic's impacts on non-profits' financial capability and the way this sector's organisations characteristics are associated with financial problems. An exploratory research is, therefore, conducted to unveil the challenges this sector's organisations are facing to keep their activities and how such challenges are connected to financial factors. Considering that COVID-19 pandemic affected countries in similar ways, it is expected that challenges faced by nonprofits are a consequence of the negative social and economic effects from the pandemic, e.g., stay at home orders, increasing unemployment rates and, thus, the demand for food, shelter and other basic needs. Such challenges may include cash flow problems or unavailability of staff to provide services due to health conditions (Mumford & Greene, 2020), but it is also expected challenges resulting from lack of IT equipment and missing competencies among professionals as a consequence of work from home rules imposed by governments (Selamet, 2020). In order to unveil challenges faced by nonprofits during COVID-19 pandemic, the following research question was addressed: What are the most salient issues among the non-profits' challenges during the lockdown related to the socioeconomic crisis triggered by the pandemic? How are they connected to these organisations' financial situation?

MATERIAL AND METHODS

Given the work from home restrictions imposed by the pandemic, Web-based questionnaires were distributed via e-mail to survey Portugal's non-profit organisations. The questionnaire was designed in consultation with accounting and financial experts and academics knowledgeable about the non-profit sector. Next, a pilot test was run by sending the questionnaire via e-mail to representatives of seven non-profits. A convenience sample was then chosen comprising about 7,000 Portuguese non-profits located in different Portuguese cities. This decision facilitated the inclusion of different contexts and thus increased the study's generalisability.

The Web-based survey instrument asked participants to provide their organisation's perception of the management challenges faced during the COVID-19 pandemic, as well as financial indicators related to revenues and expenses. The data were collected from 27 May to 8 July 2020. A total of 564 completed surveys were received. This instrument used closed questions that required only a 'yes' or 'no' answer and open questions that asked the respondents to elaborate in greater detail.

To address the research questions and process the data collected with open and closed questions, the study relied on computer-assisted text analysis using Orange3 software and quantitative analysis using IBM's SPSS software. Regarding the first two research questions, the data were structured as yes or no or Likert-scale responses, so descriptive statistics could provide graphical visualisations of the data on the non-profits' characteristics and changes in their financial indicators. Since most scales used to assess organisations' workforce size provide ordinal data, the analysis conducted to address the second question used nonparametric methods. The Kruskal-Wallis test was run to detect differences in impacts on financial indicators between non-profits with a smaller or larger workforce. In addition, the Mann-Whitney nonparametric test was used to determine differences in financial indicators between the two independent samples of non-profits with multiple significant sources of funding and the organisations with a single primary funding source. An ordinal variable was generated from the original data in order to apply the Kruskal-Wallis test and examine differences in impacts on financial indicators between

non-profits with no, little or high diversity in funding sources. A significance level of 0.05 was adopted to conclude on rejecting null hypothesis.

To elicit non-profit managers' perceptions of their challenges, the open questions allowed the respondents to write sentences instead of choosing from a list of options. From a data analysis perspective, this required an analysis of unstructured text, and the enormous amount of data (i.e. more than 500 answers) meant that computer-assisted text analysis was the most viable method. By using text mining tools, this research not only provided insights regarding the most cited terms but also leveraged the respondents' inputs by using topic modelling (Uys, Du Preez & Uys, 2008).

First, a lexicon of the terms used in the present study's questionnaire to explain challenges was constructed based on the frequency of the terms in the answers and a group of non-profit experts' opinions on the most relevant terms for explaining challenges. When these experts were asked to validate the lexicon, they concluded that specific cited terms should not be included in the analysis (e.g. activity, services, institution and social). This methodology was applied in previous studies for creating lexicon for purposes of using text mining techniques (e.g., Santos et al., 2020). The lexicon of significant terms that resulted from this validation process is presented in Table 1.

Table 1. Lexicon – basic terms and similar terms or terms from the same domain

Basic term	Similar terms or terms from the same domain
Computer	Computer system, hardware, software, computer equipment, technological equipment, computer, Internet, digital, computer expertise
Telework	Telework, remote work, online, videoconference
Assistance	Face-to-face service, remote service, assistance
Personnel	Human resources, employees, personnel, professionals
Board	Board, directors
Protection	Personal protective equipment, protection, safety, masks
Funding	Financial, funds, funding, finances, budget, fundraising, revenues, financial resources, donations, grants, fees
Expense	Expenses, expenditure
Stakeholder	Clients, beneficiaries, members, parents, young people, elderly people, athletes, children, volunteers
Training	Training
Acquisition	Acquisition, acquire, buy, purchase
Adaptation	Adaptation, reorganisation, restructuring, adaptability, readaptation
Continuity	Maintain, maintenance, keep going, continuing, restart, suspend, discontinuation, suspended, close, closure, sustainability, return, interrupt
Emotion	Confidence, fear, emotional, emoticons, uncertainty, demotivation, distress
Lack	Lack, deficit, needs
Communication	Communication, communicate
Distancing	Distancing, physical contact, face-to-face, on-site, isolation, proximity
Support	Help, support
Space	Space, facilities

The lexicon facilitated the identification of the most significant terms used to characterise the challenges faced by non-profits during the lockdown period and a minimisation of the number of terms in the results by grouping similar terms into a single, reduced term. The terms in each group were considered to have the same meaning or to address the same lexical domain describing the non-profits' challenges. For example, when non-profit managers referred to a lack, deficit or needs, those terms all became equivalents of the term 'lack', which was used in topic modelling and word frequency analysis.

Second, the selected text mining software (i.e. Orange3) searched for the lexicon's terms in each non-profit manager's responses, and patterns were uncovered based on the terms' frequency within each response. The output was a matrix containing the number of times that each term in the lexicon appeared in each response. Last, these patterns were used to apply topic modelling through the latent Dirichlet allocation (LDA), which is one of most frequently used method validated by academics (Santos et al., 2020). The LDA calculated the similarity between non-profit managers' responses and provided the answers' distribution across topics (Jelodar et al., 2019), thereby highlighting trends in the challenges represented by the three most significant topics that emerged.

RESULTS AND DISCUSSION

Characterisation of sample

The present study's sample was stratified by the 18 districts on the mainland plus the 2 autonomous regions (i.e. Madeira and the Azores). All districts and autonomous regions were represented in the sample. About 40% of the non-profits have a small workforce in terms of paid (i.e. up to 5 employees) or voluntary (i.e. up to 5 volunteers) staff. The larger organisations have more than 50 employees and represent about one fourth of the total organisations surveyed. Less than 8% of the non-profits have more than 50 volunteers in their workforce (see Figure 1).

Figure 1. The number of employees and volunteers in non-profits surveyed



Only 5% of the non-profits are young organisations (i.e. up to 5 years of activity), and 65% have conducted their activities for over 30 years. Programmes providing support for the elderly, education and arts and culture are the most important activities.

Impacts did the COVID-19 Pandemic on Portuguese non-Profits' Financial Indicators

Level of Activity

The results show that a significant number of non-profits stopped their entire activity (11%), and in nearly 50% of the non-profits the activity performed severely or moderately reduced. The organizations that stopped the provision of services depend almost totally on volunteer labour. Only one of these organizations identifies public funds as the most important source of funding. About 20% of the non-profits keep performing in the same level of activity as they were before the pandemic. For these group of organizations, the staff is composed by more than 30 employees and the number of volunteers is under 10.

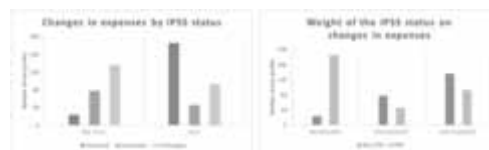
Nonetheless, part of the organizations (17%) increased the level of activity to respond to community's needs. Indeed, in the areas of social services and the support for the elderly the non-profit sector received more requests for support and, as a consequence, a larger number of people was assisted by Portuguese non-profits. This assistance was provided through different ways. The vast majority of the organizations maintained the face-to-face service (about 71%), although part used both remote and face-to-face provision of services. The remaining non-profits were capable of providing services remotely, in exclusive.

Level of Revenues and Expenses

The results show that the lockdown period severely impacted non-profits' finances. The overwhelming majority (82%) experienced a drop in funding, which was expected considering that the same impact occurred in financial crisis of 2008. A significant number of non-profits reporting this financial impact (50%) have no more than 15 employees in their workforce. If the organizational size is measured based on the number of volunteers (up to 15), this percentage of non-profits experiencing financial problems increases to 68%.

Concurrently, about 40% of these organisations experienced a rise in expenses. A clear tendency existed towards increased expenses when activities were run by non-profits falling into Portugal's Private Institutions for Social Welfare (IPSS) category – the non-profits that deliver state-financed social welfare services. Overall, 57% of the non-profits functioning as an IPSS confirmed that their expenses significantly increased during the lockdown period compared with the 10% of non-IPSS organisations that confirmed increased expenses during that time (see Figure 2).

Figure 2. Changes in expenses by IPSS status



In general, a significant part of the organizations (37%) refer that expenses increased. About 89% of the total of those non-profits are functioning as an IPSS. About 41% of the organizations were not

impacted by the pandemic in the expenses side, while 22% decreased the level of expenses, which is critical considering that this may negatively affect the level of strategic response of non-profits, as occurred in the financial crisis of 2008 (Arik, Clark, & Raffo, 2016).

Financial Impact Based on Financing Sources and Workforce Size

Workforce Size Perspective

More than 75% of the non-profits that confirmed their expenses increased had more than 15 employees (large organizations). The opposite occurred with respect to non-profits depending on a voluntary workforce. Non-profits with up to 15 volunteers (small organizations) are the ones which mostly experienced increases in expenses, representing 83% of the total of those whose costs rose.

Regarding a short-term financial perspective, non-profits were asked to classify the probability of six scenarios occurring: loss of fees, loss of funding from private or public entities connected to contractual obligations in force, employee lay-off measures, delays in receiving expected funds, failure to pay rents or decrease in donations. For these 6 financial indicators, the Kruskal-Wallis test in 2 cases rejected the possibility of a similarity in distributions according to the number of employees ($p = 0.003$ for loss of funding from private or public entities connected to contractual obligations in force and $p = 0.045$ for the need for lay-off measures). The results have a significance level of 0.05 (see Table 2). The Spearman's coefficient showed relatively low values, and a negative relationship was observed only between the variables' loss of funding from private or public entities connected to contractual obligations in force and organisational size.

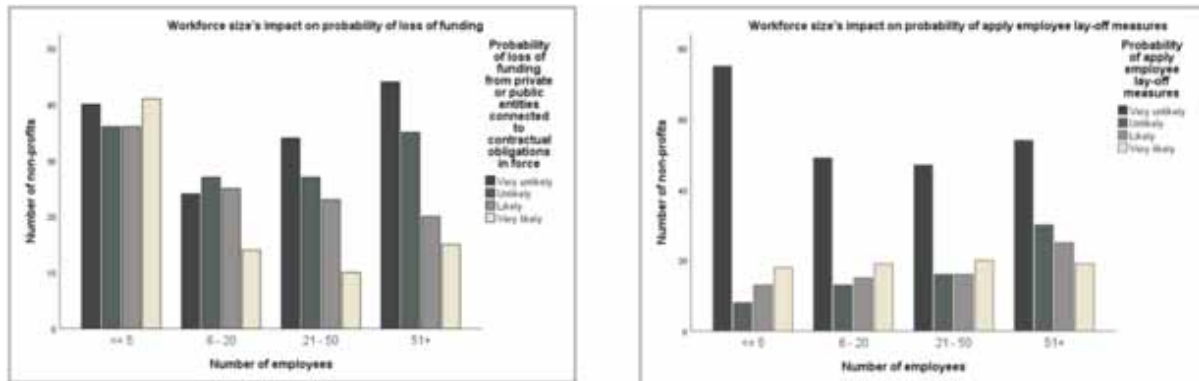
Table 2. Kruskal-Wallis test of similarity of distributions according to number of employees

	Loss of fees	Loss of funding from private or public entities connected to contractual obligations in force	Employee lay-off measures	Delays in receiving expected funds	Failure to pay rents	Decrease in donations
Asymp. Sig. (Kruskal-Wallis H)	0.204	0.003	0.045	0.988	0.857	0.222

Figure 3 provides graphical visualisations of these results, showing the highly significant difference in the first financial indicator mentioned (i.e. probability of loss of funding from private or public entities connected to contractual obligations in force). The findings include that a lower number of employees was associated with a higher value for this indicator (i.e. smaller organizations are negatively associated with financial problems). These results contradict prior research in which larger non-profits were found to be negatively associated with financial problems (Silva & Burger, 2015).

Financial Capacity During a Pandemic Crisis

Figure 3. Workforce size's impact on probability of loss of funding from private or public entities connected to contractual obligations in force or lay-off measures



In contrast, lay-off measures tend to be considered highly unlikely by the non-profits surveyed, regardless of how many employees they had. Notably, when the number of volunteers was used to represent non-profits' size, no significant differences were identified for the six financial indicators examined.

Financing Sources Perspective

On the revenue side, 43% of the non-profits depended on the services provided as these were given as the main source of funding. A similar percentage of organisations (39%) identified the central government as their most important funding source. These were mostly the non-profits falling into the IPSS category. Another 15% reported private donations as their primary source of funding, and the remaining organisations stated that all funding sources were equally important. The organisations that depend on private donations had a mostly voluntary workforce.

The Mann-Whitney non-parametric test was used to find differences in financial indicators between the two independent subsamples of non-profits: those that had multiple main funding sources and those that had a single primary funding source. The results reveal no significant difference between the two groups, at a significance level of 0.05, except in case of decrease in donations ($p = 0.048$). Table 3 presents these findings.

Table 3. Mann-Whitney test of similarity of distributions according to diversity of funding sources (non-ordinal variable)

	Loss of fees	Loss of funding from private or public entities connected to contractual obligations in force	Employee lay-off measures	Delays in receiving expected funds	Failure to pay rents	Decrease in donations
Asymp. Sig. (Mann-Whitney U)	0.145	0.067	0.361	0.466	0.346	0.048

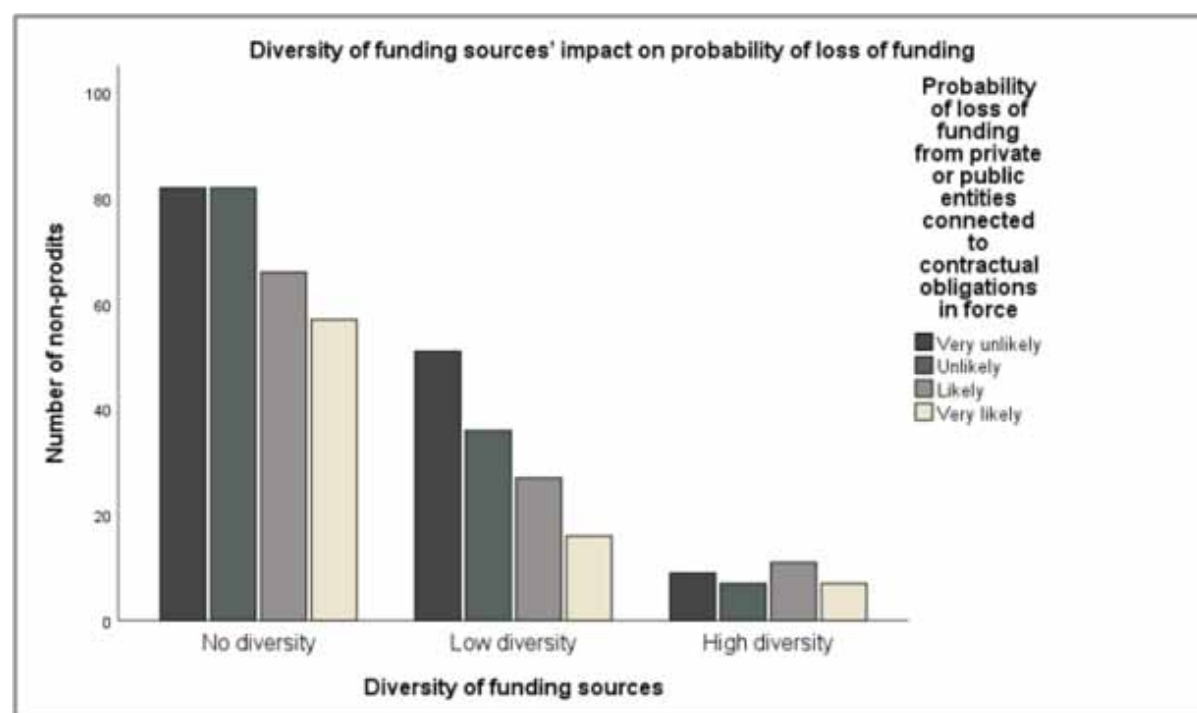
Additional analysis was conducted using the ordinal variable generated from the original data in order to examine differences in impacts on financial indicators between non-profits with no, low or high diversity of funding sources. For the six aforementioned financial indicators, the Kruskal-Wallis test in one case rejected the hypothesis of a similarity in distributions according to the level of diversity in funding sources ($p = 0.027$ for loss of funding from private or public entities connected to the contractual obligations in force) (see Table 4).

Table 4. Kruskal-Wallis test of similarity in distributions according to diversity of funding sources (ordinal variable)

	Loss of fees	Loss of funding from private or public entities connected to contractual obligations in force	Employee lay-off measures	Delays in receiving expected funds	Failure to pay rents	Decrease in donations
Asymp. Sig. (Kruskal-Wallis)	0.340	0.027	0.067	0.443	0.632	0.138

Spearman's correlation coefficient analysis revealed, however, that no association exists between loss of funding from private or public entities and diversity of funding sources. Figure 4 presents the non-profits' distribution by diversity of funding sources.

Figure 4. Diversity of funding sources' impact on probability of loss of funding from private or public entities connected to contractual obligations in force



The results are in line with the chi-squared test conducted, but they are not consistent with the findings reported in the literature, which highlighted a relationship between diversification of revenue sources and financial vulnerability (Despard et al., 2017).

THE MAIN CHALLENGES FACED DURING THE LOCKDOWN

The analyses' results show that only 43 of the 564 entities surveyed failed to mention any challenges arising from the lockdown period. The remaining managers reported different challenges using lexicon terms, of which the most frequently mentioned are presented in Table 5.

Table 5. Terms' absolute frequency in descriptions of non-profits' challenges during pandemic lockdown

Position	Terms	Number of times term is mentioned [a]	Number of responses in which term appears[b]	Ratio = [a]/[b]
1 st	Adaptation	137	129	1.06
2 nd	Computer	125	97	1.29
3 rd	Stakeholder	101	90	1.12
4 th	Telework	100	96	1.04
5 th	Personnel	87	79	1.10
6 th	Acquisition	79	76	1.04
7 th	Funding	71	63	1.13
8 th	Training	61	61	1.00
9 th	Protection	59	57	1.04
10 th	Lack	50	48	1.04
11 th	Distancing	47	45	1.04
12 th	Communication	44	41	1.07
13 th	Continuity	42	40	1.05
14 th	Support	28	27	1.04
15 th	Expense	24	23	1.04
16 th	Emotion	23	19	1.21
17 th	Space	21	21	1.00
18 th	Board	8	8	1.00
19 th	Assistance	6	5	1.20

Adaptation and computer stand out as the most frequently used terms, revealing a strong challenge regarding these non-profits' preparedness for using technologies and providing their human resources with the necessary computer hardware and software. These terms' importance in descriptions of challenges can best be visualised as a word cloud (see Figure 5).

Figure 5. Word cloud showing terms' absolute frequency in descriptions of non-profits' challenges during pandemic lockdown



Table 6. Salient topics, important terms used in each topic, correlation coefficient between topic and terms and number of responses associated with each topic

Topic number	Significant terms used in each topic (correlation coefficient)	Number of responses in which topic is the most significant
Topic #1	Personnel (0.35), stakeholder (0.34), training (0.29)	122
Topic #2	Computer (0.38), protection (0.22), acquisition (0.19)	36
Topic #3	Distancing (0.50), space (0.22), assistance (0.18)	48
Topic #4	Adaptation (0.98)	103
Topic #5	Telework (0.36), lack (0.32), funding (0.25)	91
Topic #6	Continuity (0.95)	121

Computers were mentioned by 97 non-profits' managers, so this term has the highest citation ratio (i.e. 1.29 times/response). Telework is also quite frequently used, and its distribution across responses is extremely similar to that of computers. Workforce, training and protection were terms mentioned repeatedly by non-profit managers when describing the human resources challenges faced during the lockdown period. In the area of financing, concerns about funding appeared only in seventh position as just 63 respondents (i.e. about 10% of the total) used this term. Regarding management operations and

strategy, the terms adaptation, acquisition, lack and support were largely applied by non-profit managers to indicate challenges within their activities. The terms related to organisational operations' continuity were not significantly common since only 40 managers used the related terms when mentioning challenges.

The topic modelling analysis facilitated experimentation with different combinations of terms regarding the number of topics defined. Six topics was determined to be the optimal number based on the intensity of topics' incidence per response and the degree to which they were present in all responses (Santos, Laureano & Moro, 2020). Table 6 shows the data for the six topics.

An analysis of terms' combinations in non-profit managers' responses regarding challenges faced during the pandemic first lockdown revealed that the most salient topic (#1) focuses on the workforce and training. This topic is strongly associated with 122 responses, which confirms that managers were concerned about developing or enhancing their employees' skills. Topic #2 is also related to improving organisational capacities as it addresses the need to acquire technology and safety equipment. Updating the quality of these organisations' technological infrastructure was a key point in being prepared to deal with this pandemic, namely, ensuring computer equipment was available for employees to work from home. In addition, hygiene and safety conditions at work had to be reinforced, so the second topic also focuses on being prepared to protect the workforce and beneficiaries.

Topic #3 comprises the challenge presented by physical distancing and its impact on the space needed to provide customer service and support to beneficiaries, which is mentioned by 48 non-profits' managers. The financial component of challenges was referred to by the organisations in 91 responses associated with topic #5, although funding is only the third most frequently mentioned term. This topic primarily focuses on the work from home challenge, which implied organisations had to implement innovative, flexible and less supervised ways of working and providing assistance and services.

Finally, topics #4 and #6 are also frequently present in responses as 224 managers referred to challenges associated with these topics. Both topics comprise a single term: adaptation and continuity, respectively. The first is related to the management strategies organisations applied in response to the pandemic lockdown in order to preserve their existing resources. This challenge highlights the changes non-profits had to make to deal with alterations in health, economic and social areas caused by the COVID-19 pandemic. Topic #6 covers the strategic decisions non-profit managers had to make during the lockdown regarding maintaining or interrupting activities and restarting them when the necessary conditions were present.

SOLUTIONS AND RECOMMENDATIONS

This study produced important results that can be used to develop more customised solutions for non-profit management – particularly in terms of strategic decisions about financing and enhancing capacities – and for public policy – especially regarding types of support that can be provided to these organisations. Given non-profits' vulnerability during the lockdown period, challenges regarding the development or enhancement of employees' skills and the need to diversify funding sources are urgent issues to which non-profits' management have to give top priority. The financial vulnerability and professionalisation of these organisations' human resources are topics that academics have been highlighting for years.

Regarding financial vulnerability, our findings contradict past research in the non-profit sector, as it showed that the lower number of employees was negatively associated with financial problems. This suggests that financial vulnerability may be affected in a distinct way during a sanitary crisis when com-

pared with an economic or social crisis (context in which previous vulnerabilities were studied). This conclusion has important implications for public policies, considering that it may imply governments and corporate social responsibility to take particular attention for smaller non-profit organizations in a pandemic context, in which they become more financially unprotected when compared to the larger organizations.

This research found empirical evidence that non-profits identify technology as a gap in their resources, which affected their activities during the pandemic lockdown. In all sectors, technological innovation and preparedness differentiated between organisations that were able to keep running their programmes by implementing a telework regime and those that had to stop providing services due to a lack of computer equipment (Belzunegui-Eraso & Erro-Garcés, 2020). Technological innovation thus needs to be a part of the non-profit sector's strategic practices in terms of not only acquiring computer equipment but also training human resources for using it. Technological investment can be supported by public and private funding initiatives and the positive differentiation created for those organisations able to leverage their programmes technologically versus non-profits that do not.

Thus, the present study's findings have three implications. First, non-profits managers have to become prepared to face significant challenges when updating their infrastructure to be able to keep having an impact on social issues. These organisations' role has expanded due to the current deterioration of economic conditions. Second, the results show how crucial a real-time data dashboard is for each non-profit to enhance social services programmes, anticipate measures that help these organisations and implement contingency plans for economic recovery adapted to their specific characteristics. Last, the findings highlight how crucial management and technological capacity are, as well as specific training programmes for employees. These capacity-enhancement programmes can be developed in close cooperation with social security authorities, organisations that represent non-profits and higher education institutions.

FUTURE RESEARCH DIRECTIONS

The post-lockdown period started gradually. At this stage, knowledge is still scarce about how this health crisis has impacted non-profits' financial capacity to continue running activities or which target populations are being supported or neglected by COVID-19 relief programmes. Thus, researchers must make a more concerted effort to understand the pandemic's impact on non-profits' ability to meet their community's needs and the ways that these organisations have adhered to the public policies in force that seek to support non-profits' financial viability.

Moreover, the static outputs obtained contradicting previous studies on vulnerability of non-profits should be confirmed through more quantitative research in other countries and in larger scale.

CONCLUSION

The COVID-19 pandemic has required all economic sectors' citizens and organisations to develop a strong resilience to shocks. Non-profits comprise the social welfare economy and have a special mission to generate social impacts on society, in general, and the most vulnerable people, in particular. Thus, during the pandemic lockdown period, many non-profits experienced an increased demand for aid in the form of food, shelter and other basic necessities due to increased unemployment or salary cuts.

This study's results show that the pandemic crisis drastically affected non-profits' revenue, especially the organisations that depend on a single source of funding. Concurrently, increased expenses were also a reality, although this challenge was not as significant as decreased revenue. The non-profits falling into Portugal's IPSS category were the most affected regarding increased expenses during this period. These findings reveal an alarming financial situation in the Portuguese non-profit sector created by the need to ensure employees and volunteers' safety and establish work from home procedures during the lockdown and for several subsequent months. The results also revealed that smaller non-profits experienced higher financial problems, contradicting previous literature. Although in previous crisis, the number of volunteers increased to support organizational recovery, this unique pandemic crisis may prevent this to occur considering the levels of workforce absence due to health issues.

Six salient topics emerged from the challenges identified by the non-profit managers surveyed. First, the workforce's professionalisation is a priority, namely, training in safety procedures and technological skills. Second, physical distancing to avoid the virus's spread will require additional spaces and facilities to guarantee safe conditions for workers and beneficiaries. Third, computer equipment's availability determined non-profits' preparedness to operate remotely – a challenge that felt especially significant to organisations. Fourth, organisational activities' continuity was a key concern mentioned by non-profit managers who had to decide whether to keep running, interrupt or stop their programmes, weighing all the consequences for the individuals and families receiving support. Fifth, decision makers also had to consider non-profits' adaptation efforts, making this a quite salient topic. Last, strategic decisions about innovative and flexible ways of working were made to allow these organisations to keep providing assistance and services to those who needed them the most.

Although financial challenges were not widely referred to by non-profit managers during the period in which they felt the COVID-19 pandemic's most immediate impact, financial components could become a key concern following the lockdown period, especially for smaller non-profits. Reinforcing these components will be necessary to enhance this sector's resilience as non-profits must be able to acquire new capabilities and equipment that will allow these organisations to emerge stronger from their struggle to cope with the pandemic.

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KEY TERMS AND DEFINITIONS

Computers: This technology equipment and infrastructure allows individuals to work and communicate remotely by using the required hardware and software.

Fundraising: Non-profit organisations use these activities and tasks to collect the money and assets needed to perform their activities.

Non-Profits: These organisations focus on achieving social impacts rather than generating and distributing surplus income. Non-profits are privately managed, and they usually collaborate with the public and for-profit sectors.

Telework: A way workers can perform their tasks that does not involve being physically present in their employer's facilities. Employees can usually perform their duties remotely from places with access to a computer and the internet.

Text-Mining: A technique of data analysis useful for analysis of unstructured text. This is a computer-assisted text analysis technique that provides insights regarding the most cited terms in corpus.

Chapter 5

Does the Capital Structure of New Ventures Differ as a Response to a Financial Crisis?

Capital Structure Responsiveness of Portuguese New Ventures to an Economic Downturn

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ABSTRACT

The Portuguese economy has experienced a recent economic recession that forced firms to look for different ways to finance themselves in order to be able to respond and overcome the crisis. This study investigates whether the capital structure of new ventures differ as a response to the crisis. Drawing on a panel of 75,826 Portuguese new ventures (241,284 venture-year observations) established between 2006 and 2015 and followed until 2017, the results show that new ventures capital structure responds to economic downturns. New ventures founded during the crisis have higher values of debt-ratio, for both total and short-term debt ratio, higher profitability, higher growth, and lower tangibility. Furthermore, ventures that are financed mainly with equity resort to less short-term debt have higher profitability and liquidity but experience lower growth. This study informs managers, practitioners, and policymakers that new ventures' capital structure is responsive to an economic downturn and has implications for the establishment of ventures during recessionary periods.

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INTRODUCTION

Access to finance and the choice of capital structure are pivotal issues for all firms and, thus, have attracted considerable attention from scholars and motivated a large body of theoretical and empirical studies (Kumar, Colombage & Rao, 2017). The theoretical roots of this literature date back to Modigliani and Miller's (1958) capital structure theory, arguing that the value of a firm is not affected by capital structure choices and that the cost of capital is unaltered when changing the proportion of debt and equity held by the company. However, some theorists point out the shortcomings of these assumptions, and new capital structure theories have emerged, expanding the range of capital structure topics and proposing several capital structure determinants (Graham & Leary, 2011).

On the one hand, tradeoff theory (ToT) (e.g., Scott, 1972; Kraus and Litzenberger, 1973; Frank & Goyal, 2009) argues that firms seek to reach an optimal level of debt, balancing the costs (direct and indirect costs of financial distress) and benefits of debt (tax savings and reducing agency conflicts between managers and owners). On the other hand, pecking order theory (PoT) (e.g., Myers & Majluf, 1984) argues that managers are better informed than outsiders about firm capabilities and prospects, or in other words, information asymmetry exists. As such, there is a hierarchy of preference for financing, favoring the use of internal finance.

Despite the various studies carried out on the determinants of financial decisions and capital structure, the vast amount of evidence comes mainly from studies that focus on large listed firms (e.g., Titman & Wessels, 1988; Rajan & Zingales, 1995; Harrison & Widjaja, 2014) or on small and medium-sized enterprises (SMEs) (e.g., Van der Wijst & Thurik, 1993; Chittenden, Hall & Hutchinson, 1996; Michaelas, Chittenden, Poutziouris, 1999; Sogorb-Mira, 2005). However, little attention has been paid to new ventures (e.g., Chandler & Hanks, 1998; Cassar, 2004; Örtqvist, Masli, Rahman & Selvarajah, 2006).

Additionally, to date, only seldomly related studies consider the financial context that may affect and condition access to finance decisions. Past studies have shown that macroeconomic conditions affect capital structure decisions (Korajczyk & Levy, 2003). One type of event that undoubtedly affects access to finance is a financial crisis, such the one that began in late 2007 in the US and spread worldwide at different paces and intensities (Campello, Graham & Harvey, 2010). This crisis caused considerable disruption to markets and financial institutions (D'Amato, 2019), most evidently in terms of access to and conditions of credit (Campello et al., 2010; Daskalakis, Balios, Dalla, 2017). Access to credit was very limited (Ivashina & Scharfstein, 2010; European Central Bank - ECB, 2013; Carbo-Valverde, Rodriguez-Fernandez & Udell, 2016), and the cost of such financing increased sharply (Santos, 2011), particularly for smaller firms (Serrasqueiro, Leitão & Smallbone, 2018). This situation poses constraints to those firms that rely heavily on bank loans as a means of financing (e.g., DeYoung, Gron, Torna, & Winton, 2015; Thakor, 2015). The difficulties were more accentuated for smaller and younger firms (Cowling, Liu, Ledger, 2012), which led to a decrease in the debt levels of SMEs during the crisis (Proença, Laureano & Laureano, 2014). Additionally, firms also experienced constraints and difficulties, such as a decrease in both revenue and growth opportunities. Such uncertainty affected cash flows and, consequently, impacted the capital structure (D'Amato, 2019).

The previous literature shows that on the one hand, during recessions, there is a decrease in the creation of new firms and self-employment (e.g., Klapper & Love, 2011; Parker, 2011; Parker, Congregado, Golpe, 2012). On the other hand, ventures founded during recessions are more likely to experience failure (Kedrosky, 2008; Shane, 2011). In light of such conditions, is it reasonable to expect differences in the capital structure of ventures founded during recessions compared to those founded in better economic

times? Some limited work on this topic has shown that a crisis has an effect on capital structure determinants (e.g., Akbar, ur Rehman & Ormrod, 2013; Zeitun, Temimi & Mimouni, 2017), but the particular case of new ventures has not been explored. The understanding of the changes in new ventures' capital structure as a response to an economic downturn is pivotal and has implications for the establishment of ventures during recessionary periods.

Surprisingly, most studies have failed to simultaneously combine the consequences of events, such as a financial crisis and its impact on finance decisions, and the capital structure of firms. Some notable exceptions are Harrison and Widjaja (2014), Daskalakis et al. (2017) and D'Amato (2019). However, none of the studies look to the finance decisions and determinants of capital structure for new ventures.

The present study aims to fill this gap and will investigate how an event such as the financial crisis affected the capital structure of Portuguese new ventures. Portugal is a very interesting study context, as it has experienced one of the worse effects of the crisis (Lane & Milesi-Ferretti, 2010) with significant job losses, a drop in labor productivity and a large number of firm closures (Carneiro, Portugal & Varejão, 2014; Kapelko, Horta, Camanho & Lansink, 2015; Terjesen, Guedes & Patel, 2016). The aim of this study is to analyze the vulnerability of new ventures' finance to adverse macroeconomic environments. The objective is to study how an event such as a financial crisis affected the capital structure of Portuguese new ventures.

Using a panel of 75,826 Portuguese new ventures established between 2006 and 2015 and followed until 2017 (241,284 venture-year observations), the results show that new ventures founded during the crisis have higher debt ratios for both total and short-term debt, higher profitability, higher growth, and lower tangibility and pay less taxes. Furthermore, ventures that are financed mainly with equity resort to less short-term debt and have higher profitability and liquidity but experience lower growth.

This study makes three important contributions. First, it examines the Portuguese new ventures that were established before and during the crisis and then followed them until 2017. New ventures are firms with fragile structures that face big challenges (market share, access to capital and means of financing and attracting new investments). In addition, it investigates if the capital structure of new ventures created before the crisis is different from the ones created during the crisis. Secondly, studies have rarely examined new ventures separately and our study covers the totality of new ventures created before and during the crisis to assess their capital structure strategy during their first years of business. Finally, this study contributes to the literature, reinforcing the previous works about the capital structure but also informing managers and policy makers of the importance of behavior changes during a crisis.

THEORETICAL BACKGROUND AND PREDICTIONS

Studies on the financing of new ventures have shown that these newly established firms have distinctive features. New ventures are characterized by adverse selection problems and uncertainty, as entrepreneurial ability is uncertain, and the success of the venture is difficult to predict. Furthermore, the information asymmetry that exists between owners and investors makes the search for external funding more difficult (e.g., Mishra & Zachary, 2014; 2015) and costly (Serrasqueiro & Caetano, 2015). To this end, new ventures may rely more on internal cash flows to fund their investment opportunities because doing so costs less when compared to external sources of financing (Berger & Udell, 1998; Berger & Schaeck, 2011; Dietrich, 2012; Canton, Grilo, Monteagudo & van der Zwan, 2012; Balboa, Martí & Tresierra-Tanaka, 2017). This is aggravated by the fact that there are fewer requirements to disclose information

(when compared to large firms), making it difficult to access publicly available information (McMahon, Holmes, Hutchinson & Forsaith, 1993). As such, new ventures may need to adjust their capital structure, taking into consideration the challenges they face due to their newness and adverse selection problems, as well as the economic cycle. It is, therefore, important to consider a dynamic capital structure (Scherr & Hulburt, 2001) and expect adjustments to the target capital structure. Furthermore, the capital structure may be altered in response to economic downturns. In the context of a financial crisis, the determinants of the capital structure may change as a consequence of the economic and financial environment (Scherr & Hulburt, 2001).

To investigate new ventures' capital response to a crisis, we focus on the main determinants of new venture capital structure and what to expect in the context of a crisis. We root our work in two capital structure theories: ToT and PoT. Although these theories have advanced competing predictions on what best explains the choice of capital structure of firms, they seem to agree on the determinants of capital structure: tangibility, profitability, growth, liquidity, effective tax rate, nondebt tax shield, age and size.

Regarding investments in tangible assets, those may be seen as a way to signal investors that new ventures have assets to secure credits, enabling them to use debt and to borrow at lower rates (Rajan & Zingales, 1995). As such, the asset structure may condition the ability of a venture to explore new investment opportunities in the case in which the venture is subject to financing constraints (Siedschlag, O'Toole, Murphy & O'Connell, 2014). According to ToT theorists, ventures that have higher levels of assets are expected to face less chances of bankruptcy (e.g., Kim & Sorensen, 1986; Titman & Wessels, 1988; Rajan & Zingales, 1995), while for PoT theorists, the existence of sufficient fixed assets shows the existence of less information asymmetry, and ventures can resort more easily to debt. In light of these arguments, both theories suggest a positive relationship between the asset structure and debt (Myers, 1977; Berger & Udell, 1998).

According to ToT and PoT, the relationship between capital structure decisions and profitability is mixed. Thus, on the one hand, according to ToT theorists, when ventures are profitable, they can resort to debt (e.g., Rajan & Zingales, 1995), as they have the means to fulfill their responsibilities in the form of the repayment of debt and interest, which translates into less of a chance of bankruptcy, and can take advantage of tax shields (Kraus and Litzenberger, 1973; Scott, 1977; Fama & French, 2002). Furthermore, ventures would not need to use debt if the use of equity would increase their profitability (Marsh, 1982). However, on the other hand, PoT theorists claim that if ventures are profitable, then they have enough internal profits to fund themselves and no need to use debt (Hall, Hutchinson & Michaelas, 2000). For the case of SMEs, most studies find support for the latter argument (e.g., Rajan & Zingales, 1995; Palacín-Sánchez, Ramírez-Herrera & Di Pietro, 2013). In line with these findings, ventures that are mainly financed through equity would increase their profitability, while the opposite is expected for ventures financed mainly through debt.

As far as growth is concerned, ToT and PoT have divergent predictions about the relationship between growth and the capital structure. According to ToT, the ability to grow, especially at high rates, is associated with high risk. In light of this uncertainty, there is a greater chance for bankruptcy, which makes debt less appealing for new ventures. Thus, a negative relationship is expected (Myers 1977; 1984). In contrast, PoT theorists claim that ventures that experience growth need funds and may resort to debt, as opening up to external equity could translate into a loss of control and management (Sogorb-Mira, 2005). To this end, a positive relationship is proposed (Marsh, 1982; Michaelas et al., 1999; Frank & Goyal, 2009; Palacín-Sánchez et al, 2013). In recessionary periods, ventures may face challenges to growth. On the one hand, they will face greater constraints to accessing external financing. According to the

Does the Capital Structure of New Ventures Differ as a Response to a Financial Crisis?

ECB (2013), in the financial crisis of 2008/2009, SMEs had more restrictions to access bank loans than did larger firms. This can create great instability if the venture relies heavily on bank loans and cause difficulties in growing (Jõeveer, 2013). In addition, ventures have limited access to capital markets, which also hinders their capacity to use this source of financing. On the other hand, ventures may have to rely more on internal financing to promote growth, which is dependent on their capacity to maintain the success of the business and in its ability to generate cash flows and find new opportunities to grow.

Being able to fulfill obligations such as debt payments and interest is pivotal for any firms, particularly for new ventures, as it creates reputation, trust and lower cost for debt. In other words, having liquidity is pivotal for ventures. Thus, if ventures are capable of generating enough funds for these obligations, then they have less of a chance to experience financial distress that in the worst-case scenario, leads to bankruptcy (de Jong, Kabir & Nguyen, 2008). PoT theorists agree with the argument and claim that more liquidity means an increased use of internal funds for financing business opportunities.

Tax-related determinants are also important. According to ToT, firms have incentives to use debt when they can explore the benefits of tax shields, an effect that occurs when interest payments are tax deductible. As such, several previous studies have validated this prediction and found a positive relationship between the effective tax rate and debt (e.g., DeAngelo & Masulis, 1980; Haugen & Senbet, 1986; Korajczyk & Levy, 2003). In particular, when the marginal tax rate is high, firms are more likely to resort to debt (e.g., Mackie-Mason, 1990; Graham, 2013).

Nondebt tax shields derive from tax deductions for depreciation and investment tax credits and act as substitutes for the tax benefits of debt to enable firms to expect greater cash flow (DeAngelo & Masulis, 1980). As such, those firms that can benefit from high levels of nondebt tax shields will probably need to resort to less debt (DeAngelo & Masulis, 1980). As such, according to ToT, the expected relationship between nondebt tax shields and debt is negative. In the particular case of new ventures, this can represent an important finding. As D'Amato (2019) claims, this can constitute the main alternative to reduce tax burdens if the ventures have low profitability and may not use debt and, therefore, not exploit the benefits of tax shields.

Age also determines the capital structure. For ToT theorists, as firms age, they gain more visibility, solidify their competitive position, and gain a reputation, which enable creditors to gain information and have less uncertainty about what to expect (Barton, Hill, & Sundaram, 1989); that is, they reduce their information asymmetry (Berger & Udell, 1998). As such, older firms resort to more debt (Diamond, 1989; Chittenden et al., 1996; Hall, Hutchinson & Michaelas, 2004), and ToT suggests a positive relationship between age and the capital structure. In contrast, PoT theorists claim that with time passing, ventures have the ability to accumulate resources and may choose to use internal funds to finance themselves, thus having less of a need to resort to debt (Michaelas et al., 1999; Hall et al., 2000; Romano, Tanewski & Smyrniotis, 2001; López-Gracia & Sogorb-Mira, 2008). To this end, PoT theorists suggest a negative relationship between the capital structure and age.

In recession periods, the choice of capital structure for new ventures may be limited. On the one hand, the liability of newness may impose difficulties in generating enough funds for internal financing. On the other hand, if ventures have the need to resort to debt but access to credit is very limited and/or costly, then they may face serious challenges.

Finally, smaller (and newer) ventures are likely to face higher bankruptcy risks because their revenue and cash flows are still uncertain, volatile and less likely to be diversified by different businesses (Rajan & Zingales, 1995). As ventures grow, they obtain more financing options. Thus, ToT predicts a positive relationship between firm size and debt (e.g., Michaelas et al., 1999; Romano et al., 2001; Sogorb-Mira

2005; López-Gracia & Sogorb-Mira, 2008). However, PoT does not always agree with this prediction and claims that small firms may be less complex and less likely to experience information asymmetry, as the information requested by creditors, in the event of an increase in external capital, can be more transparent and easier to understand. To this end, PoT theorists predict the possibility of a negative relationship between firm size and debt, especially for low-maturity debt (e.g., Scherr, Sugrue & Ward, 1993; Chittenden et al., 1996, Michaelas et al., 1999).

Although some previous studies show that PoT has higher explanatory power for new ventures, for SMEs' capital structure decisions (e.g., Sogorb-Mira, 2005; D'Amato, 2019), we consider that ToT and PoT are not mutually exclusive (Graham & Leary, 2011), as shown by some previous studies on SMEs (López-Gracia & Sogorb-Mira, 2008; González and González, 2011; Serrasqueiro & Caetano, 2015). Furthermore, both theories will also continue to be valid in the context of a crisis, and the determinants of the capital structure remain the same, with each one responding.

Hypothesis 1: The capital structure of new ventures responds to economic downturns.

SAMPLE AND DATA COLLECTION

We use panel data on the capital structure of Portuguese new ventures founded between 2006 and 2015 and followed until 2017. The period 2009-2015 explores the effects of the financial recession on the capital structure of newly established ventures.

The data were obtained from the IES (*Informação Empresarial Simplificada*) form, available on the INFORMA D&B database, which includes financial and performance data certified by a chartered accountant.

We include ventures with a registration date (Davidsson & Reynolds, 2009), exclude ventures with no sales in their first year or that had reported the suspension of activities, and those that had reported one of the following outcomes reported in Informa D&B: dissolution, extinction, insolvency, and legal closure. Next, we excluded the ventures that were acquired in the period. Finally, we dropped the ventures that had reported information with some errors, such as negative values for assets or cash (e.g., D'Amato, 2019; Patel, Guedes, Pagano, & Olson, 2020).

Based on casewise deletion, the final sample consists of 241,284 venture-year observations, representing a total of 75,826 new ventures established between 2006 and 2015 and followed until 2017. From these, 108,549 venture observations, representing a total of 24,750 new ventures, were established before the crisis, and 132,735 venture-year observations, representing a total of 51,076 new ventures, were established during the crisis.

VARIABLES

The debt ratio is defined as the ratio of total liabilities to total assets and the short-term debt ratio is the of current liabilities to total assets. Equity ratio is the total equity to total assets (Örtqvist et al., 2006; Daskalakis et al., 2017; D'Amato, 2019).

The traditional capital structure determinants (e.g., Titman & Wessels, 1988; Daskalakis et al., 2017; D'Amato, 2019) are: Profitability is defined as the ratio of earnings before interest, taxes, depreciation

Does the Capital Structure of New Ventures Differ as a Response to a Financial Crisis?

and amortization (EBITDA) to total assets. Growth is the annual growth rate of assets. Liquidity is measured by the current ratio, defined as the ratio of current assets to current liabilities. Tangibility is measured by the asset structure, defined as the ratio between fixed assets to total assets. The effective tax rate is defined by the ratio of income taxes paid to income before taxes. A nondebt tax shield is defined as the ratio of total depreciation to total assets. Size is the natural logarithm of employee count, and age is the number of years the venture has been in business since foundation. Crisis is a dummy variable equal to one if the venture was founded from 2009 to 2015, when Portugal experienced the effects of the financial recession (WorldBank, 2020), and zero otherwise for 2006 to 2009 as the year of founding.

Finally, we include two-digit *industry* dummies to account for industry-specific heterogeneity and the *region* dummy, representing the 29 administrative regions that include the islands of Azores and Madeira.

SUMMARY STATISTICS

Table 1 presents the new venture distribution by the two-digit industry and splits that distribution for venture founding before and during the crisis. Among the 75,826 ventures created, the largest share is in retail trade, except for motor vehicles at 16.1% of the sample (N=12,188), followed by wholesale trade, except for motor vehicles and motorcycles at 12.2% of the sample (N=9,281) and food and beverage service activities at 6.6% of the sample (N=5,020). The distribution of the represented industries is quite similar for new ventures founded before and during the crisis.

Table 2 presents the sample description and correlations. Portuguese new ventures use debt to finance over 66.5% of their assets, slightly higher than the values obtained by D'Amato's (2019) study on Italian SMEs during the financial crisis. According to D'Amato (2019), Italian firms used debt to finance over 60% of their investments. However, these results are in line with the present author (50%) and slightly higher than those obtained by Örtqvist and colleagues (2006) (between 42 and 47%) for the case of short-term debt. The findings show that Portuguese new ventures use approximately 49.4% of short-term debt to finance assets, compared to 50% obtained by D'Amato (2019). Only approximately 17% are financed by long-term debt.

On average, the new venture size is 7 employees, with sales revenues of 788,602 euros and an annual growth rate of 19.5%. The average profitability is 14.5%. While the obtained average profitability value aligns with the results for SMEs obtained by D'Amato (2019) (i.e., 12%), the growth rate is more than 5 times higher than those experienced by SMEs (e.g., 4% for D'Amato, 2019). New ventures have a good level of liquidity, with an average ratio of current assets to current liabilities of 1.87. As D'Amato (2019) shows, this finding is in line with results that are typical for SMEs, which have more current assets (in this study, the value of fixed assets is only 21%) and high levels of short-term liabilities (in this case, as mentioned before, it is approximately 49%), representing "a condition of flexibility for these firms to change assets if the business needs change" (D'Amato, 2019, p. 8). The average tax rate is 20.2%, and the nondebt tax shield is 5.3%, values that are also in line with previous findings (e.g., D'Amato, 2019).

According to Table 2, the debt ratio is negatively and significantly correlated with profitability, liquidity, nondebt tax shields and age. In contrast, it is positively correlated with growth, tangibility, size and effective tax rate.

Does the Capital Structure of New Ventures Differ as a Response to a Financial Crisis?

Table 1. New ventures distribution by Industry, before and during the Crisis

Industry code		Number of ventures	Proportion (%)	Founded before the Crisis		Founded during the Crisis	
				Number of ventures	Proportion (%)	Number of ventures	Proportion (%)
10	Manufacture of food products	1,049	1.4%	396	1.6%	653	1.3%
11	Manufacture of beverages	257	0.3%	118	0.5%	139	0.3%
13	Manufacture of textiles	483	0.6%	150	0.6%	333	0.7%
14	Manufacture of wearing apparel	1,266	1.7%	353	1.4%	913	1.8%
15	Manufacture of leather and related products	745	1.0%	205	0.8%	540	1.1%
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	589	0.8%	169	0.7%	420	0.8%
17	Manufacture of paper and paper products	96	0.1%	41	0.2%	55	0.1%
18	Printing and reproduction of recorded media	421	0.6%	165	0.7%	256	0.5%
19	Manufacture of coke and refined petroleum products	5	0.0%	2	0.0%	3	0.0%
20	Manufacture of chemicals and chemical products	122	0.2%	41	0.2%	81	0.2%
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	19	0.0%	11	0.0%	8	0.0%
22	Manufacture of rubber and plastic products	208	0.3%	80	0.3%	128	0.3%
23	Manufacture of other non-metallic mineral products	334	0.4%	119	0.5%	215	0.4%
24	Manufacture of basic metals	63	0.1%	23	0.1%	40	0.1%
25	Manufacture of fabricated metal products, except machinery and equipment	1,686	2.2%	576	2.3%	1,110	2.2%
26	Manufacture of computer, electronic and optical products	65	0.1%	21	0.1%	44	0.1%
27	Manufacture of electrical equipment	110	0.1%	41	0.2%	69	0.1%
28	Manufacture of machinery and equipment n.e.c.	282	0.4%	102	0.4%	180	0.4%
29	Manufacture of motor vehicles, trailers and semi-trailers	89	0.1%	33	0.1%	56	0.1%
30	Manufacture of other transport equipment	46	0.1%	19	0.1%	27	0.1%
31	Manufacture of furniture	591	0.8%	193	0.8%	398	0.8%
32	Other manufacturing	354	0.5%	110	0.4%	244	0.5%
33	Repair and installation of machinery and equipment	791	1.0%	177	0.7%	614	1.2%
41	Construction of buildings	4,713	6.2%	1,652	6.7%	3,061	6.0%
42	Civil engineering	530	0.7%	179	0.7%	351	0.7%
43	Specialized construction activities	4,454	5.9%	1,479	6.0%	2,975	5.8%
45	Wholesale and retail trade and repair of motor vehicles and motorcycles	3,392	4.5%	1,067	4.3%	2,325	4.6%
46	Wholesale trade, except of motor vehicles and motorcycles	9,281	12.2%	3,115	12.6%	6,166	12.1%
47	Retail trade, except of motor vehicles and motorcycles	12,188	16.1%	3,935	15.9%	8,253	16.2%
49	Land transport and transport via pipelines	2,335	3.1%	898	3.6%	1,437	2.8%
50	Water transport	39	0.1%	13	0.1%	26	0.1%
51	Air transport	16	0.0%	6	0.0%	10	0.0%
52	Warehousing and support activities for transportation	402	0.5%	158	0.6%	244	0.5%
53	Postal and courier activities	144	0.2%	36	0.1%	108	0.2%
55	Accommodation	1,529	2.0%	465	1.9%	1,064	2.1%
56	Food and beverage service activities	5,020	6.6%	1,605	6.5%	3,415	6.7%
58	Publishing activities	380	0.5%	145	0.6%	235	0.5%
59	Motion picture, video and television programme production, sound recording and music publishing activities	469	0.6%	138	0.6%	331	0.6%
60	Programming and broadcasting activities	34	0.0%	9	0.0%	25	0.0%
61	Telecommunications	206	0.3%	44	0.2%	162	0.3%
62	Computer programming, consultancy and related activities	2,279	3.0%	624	2.5%	1,655	3.2%
63	Information service activities	208	0.3%	57	0.2%	151	0.3%
64	Financial service activities, except insurance and pension funding	391	0.5%	214	0.9%	177	0.3%
66	Activities auxiliary to financial services and insurance activities	1,915	2.5%	462	1.9%	1,453	2.8%
69	Legal and accounting activities	2,583	3.4%	925	3.7%	1,658	3.2%
70	Activities of head offices; management consultancy activities	3,581	4.7%	1,107	4.5%	2,474	4.8%
71	Architectural and engineering activities; technical testing and analysis	2,505	3.3%	942	3.8%	1,563	3.1%
72	Scientific research and development	176	0.2%	66	0.3%	110	0.2%
73	Advertising and market research	985	1.3%	297	1.2%	688	1.3%
74	Other professional, scientific and technical activities	1,808	2.4%	494	2.0%	1,314	2.6%
75	Veterinary activities	351	0.5%	142	0.6%	209	0.4%
77	Rental and leasing activities	535	0.7%	155	0.6%	380	0.7%
78	Employment activities	164	0.2%	42	0.2%	122	0.2%
79	Travel agency, tour operator reservation service and related activities	545	0.7%	169	0.7%	376	0.7%
80	Security and investigation activities	146	0.2%	42	0.2%	104	0.2%
81	Services to buildings and landscape activities	861	1.1%	244	1.0%	617	1.2%
82	Office administrative, office support and other business support activities	1,990	2.6%	679	2.7%	1,311	2.6%
	Total	75,826	100.0%	24,750	100.0%	51,076	100.0%

Notes:

N = 241,284 venture-year observations, representing a total of 75,826 new ventures established between 2006 and 2015 and followed until 2017.

Does the Capital Structure of New Ventures Differ as a Response to a Financial Crisis?

Table 2. Mean, SD and correlations

		Mean	SD	1	2	3	4	5	6	7	8	9	10
1	Debt ratio	0.665	0.222	1									
2	Short-term debt ratio	0.494	0.242	0.591***	1								
3	Profitability	0.145	0.19	-0.319***	-0.202***	1							
4	Growth	0.195	0.416	0.057***	0.065***	0.204***	1						
5	Liquidity	1.867	1.084	-0.510***	-0.686***	0.178***	-0.002	1					
6	Tangibility	0.207	0.234	0.069***	-0.218***	0.027***	-0.083***	-0.253***	1				
7	Effective Tax Rate	0.202	0.213	0.009***	0.015***	0.149***	0.045***	0.021***	-0.044***	1			
8	Non-debt Tax Shield	0.053	0.065	-0.047***	-0.113***	0.322***	-0.128***	-0.052***	0.377***	0.025***	1		
9	Age	4.608	2.511	-0.091***	-0.109***	-0.112***	-0.163***	0.052***	0.021***	0.007***	-0.083***	1	
10	Size	1.506	0.877	0.102***	0.047***	-0.024***	0.007***	-0.111***	0.081***	0.099***	0.021***	0.168***	1

Notes:

N = 241,284 venture-year observations, representing a total of 75,826 new ventures established between 2006 and 2015 and followed until 2017.

* p<0.10, ** p<0.05, ***p<0.01

Table 3. Mean of variables, for new ventures created before and during crisis

Variable	Full Sample	Founded before the crisis	Founded during the crisis	t-test
Debt ratio	0.665	0.658	0.670	-13.245***
Short term debt ratio	0.494	0.481	0.504	-23.362***
Equity ratio	0.335	0.342	0.330	13.245***
Profitability	0.145	0.119	0.166	-60.252***
Growth	0.176	0.092	0.246	-78.928***
Liquidity	1.867	1.863	1.871	-1.688*
Tangibility	0.207	0.218	0.198	21.003***
Effective Tax Rate	0.202	0.205	0.199	6.490***
Non-debt Tax Shield	0.053	0.051	0.054	-12.809***
Size	1.506	1.625	1.409	60.402***
Age	4.608	6.384	3.156	408.690***

Notes:

N = 241,284 venture-year observations, representing a total of 75,826 new ventures established between 2006 and 2015 and followed until 2017.

N=108,549 venture- observations, representing a total of 24,750 new ventures established before the crisis and 132,735 venture-year observations, representing a total of 51,076 new ventures established during the crisis.

* p<0.10, ** p<0.05, ***p<0.01

RESULTS

To investigate the above predictions, we compare the means of the capital structure determinants for ventures created before and during the crisis. The results are presented in Table 3. According to the table, there are statistically significant differences in the means of all determinants. On the one hand,

Does the Capital Structure of New Ventures Differ as a Response to a Financial Crisis?

ventures founded during the crisis have higher values of debt ratio for both total and short-term debt. Although the differences are significant, the difference in the mean values for those ventures that were created before the crisis is just 1.2% and 2.3% for total and short-term debt, respectively. Then, and very interestingly, those created during the crisis have 4.7% more profitability and 15.4% more growth than ventures created before the crisis. On the other hand, ventures created before the crisis have 2% more fixed assets in their asset structure and pay slightly more taxes.

In addition, we investigate whether ventures that are mainly financed through equity differ from those that are mainly financed by debt, accounting for the crisis period. The results are presented in Table 4. According to this table, there are statistically significant differences in the capital structure determinants for ventures that are mainly financed by equity or by debt. On the one hand, the table shows that ventures that are financed mainly with equity resort to much less short-term debt than do those that are financed mainly by debt. In fact, the former type of ventures only finance their assets with approximately 29% of short-term debt, while the latter type of ventures resort to less than 56% of short-term debt.

In line with Marsh (1982), ventures that do not use debt increase their profitability. To this end, ventures that are mainly financed by equity, on average, have a higher profitability than do those that are mainly financed by debt. This finding is more evident in ventures created during the crisis, namely, ventures that are mainly financed by equity have 27.2% profitability, while ventures that are mainly financed by debt have 13.2% profitability. Nevertheless, ventures created before the crisis experience lower growth rates, at approximately 8.6%, when compared to the mean value of 23% for ventures created during the crisis. This finding seems to be aligned with the work of Serrasqueiro et al. (2018), which evidenced that a crisis has a negative effect on venture growth. In terms of liquidity, ventures that are mainly financed by equity have higher mean values, which may be explained by the fact that ventures financed mainly by debt need to use their funds to repay short-term debt obligations, which also aligns with the higher short-term debt ratio they have. Ventures financed mainly by equity seem to benefit slightly but significantly more from nondebt tax shields and pay slightly less taxes. Finally, ventures that are mainly financed by debt are larger in size and have more fixed assets.

Ventures that chose the same type of financing as before the crisis, i.e., those that were financed by debt, increased the use of this source of financing, and those that were financed mainly by equity used more internal funds to finance themselves during the crisis. As mentioned before, the crisis brought about an increase in profitability and liquidity for ventures; either they are financed mainly by debt or mainly by equity, while experiencing an increase in growth during the crisis, more sharply noticed for ventures mainly financed by equity. In both types of financing, ventures decrease their size and fixed assets.

Does the Capital Structure of New Ventures Differ as a Response to a Financial Crisis?

Table 4. Mean of variables, for new ventures by predominantly source of financing and split by crisis

Variable	Founded before the crisis		Founded during the crisis	
	Financed (mainly) Debt	Financed (mainly) Equity	Financed (mainly) Debt	Financed (mainly) Equity
Short term debt	0.546	0.287	0.571	0.296
Profitability	0.100	0.176	0.132	0.272
Growth	0.097	0.074	0.260	0.200
Liquidity	1.581	2.707	1.589	2.753
Tangibility	0.229	0.186	0.206	0.173
Effective Tax Rate	0.207	0.198	0.202	0.190
Non-debt Tax Shield	0.050	0.053	0.054	0.057
Size	1.673	1.481	1.471	1.217
Age	6.279	6.699	3.113	3.289

Notes:

N = 241,284 venture-year observations, representing a total of 75,826 new ventures established between 2006 and 2015 and followed until 2017.

N=59,197 new ventures mainly financed by debt and 16,629 new ventures financed mainly by equity.

N= 24,750 new ventures established before the crisis and 51,076 new ventures established during the crisis.

* p<0.10, ** p<0.05, ***p<0.01

In summary, taken together with the results of equality of means, the results show that the crisis has some effect on capital structure determinants because the relative importance of each determinant may change, which indicates that new ventures need to adapt their financial decisions to recessionary period events. Therefore, the hypothesis in this study is confirmed.

CONCLUSION

This paper provides empirical evidence on the capital structure of Portuguese new ventures founded before and during a crisis.

The results show that new ventures founded during the crisis have higher debt ratios for total and short-term debt and that these new ventures have higher profitability, growth and liquidity ratios. The profitability and liquidity ratios are higher in the case of new ventures financed mainly by equity. In the case of growth, the opposite effect can be verified: new ventures financed mainly by equity have a lower growth rate than those financed mainly by debt, which is more evident for firms founded during the crisis. Ventures financed mainly by equity seem to benefit slightly more from nondebt tax shields and pay slightly less taxes. Finally, ventures founded before the crisis are larger in size and have more fixed assets in their asset structure, especially new ventures mainly financed by debt.

This research focused on new ventures in Portugal, a country with economic and financial specificities. In Portugal, the credit constraint drastically reduced the financing alternatives available to smaller firms, thus making them more dependent on domestic bank credit and the conditions available to them. Alternatively, the government has set up an Entrepreneurship and Self-Employment Support Program to support the creation of new businesses by unemployed individuals, young people or disadvantaged

people looking for a job. This line of credit and support for new ventures has been very important for creating conditions for firms to access bank loans on more favorable terms to meet the initial investment underlying the projects, which would otherwise not be accessible to them. As such, the results may not be generalizable to some other countries. Future studies, on the one hand, should focus on countries that face similar restrictions and the effects of the crisis (Greece, Ireland, Italy or Spain) to see if the results are comparable. On the other hand, studies of countries that were not so affected by the crisis can confirm or bring about additional insights about the capital structure of new ventures in recessionary periods.

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Chapter 6

The Impact of Macroeconomic Factors on the Hotel Industry Through the Financial Leverage Trends: The Portuguese Case

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ABSTRACT

In Portugal, news shows that the impact of COVID-19 in the hospitality sector was more noticeable compared to other sectors. This chapter aims to understand the historical trends of hotel industry financial leverage and to analyse the impact of macroeconomic factors on it. Based on the Portuguese reality, it aims to propose a model to be used by managers and shareholders to control the effect of financial leverage over their companies. Two issues are supporting this study: one is if companies evaluate the impact of the chosen financing sources on shareholders' return; another is to understand whether there is a change in the financial leverage effect, either due to macroeconomic factors or due to cyclical factors not controlled by the market, such as the current pandemic (COVID-19) which demands new challenges to companies. Results highlight that the perception of financial leverage by hotel managers is crucial in crisis situations, as the current case of the pandemic caused by COVID-19.

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INTRODUCTION

The financial mix of each company impacts its risk and performance, being a key factor to sustain its competition and to create value for society (Damodaran, 2016). Therefore, companies should monitor their financial mix.

The pecking order argues that managers prefer to use self-financing to fill financial needs (Myers, 1984; Myers & Majluf, 1984). Although not always self-financing is enough, and so managers must look for liabilities, being the most used the credit from suppliers (commercial credit) and/or bank loans. These two types of financing offer advantages and limitations. On the one hand, commercial credit requires less information about the company, allows greater flexibility in terms of credit data and has less direct financial costs. However, more agency problems may arise, such as information asymmetries that are reduced in bank credit, since banks control managers opportunistic behaviours, and usually only give finance to profitable investments (Lau & Schaeede, 2020).

The first question that arises is whether companies evaluate the impact of the chosen financing sources on shareholders' return. In other words, is the effect of the financial leverage positive? To answer this question an analysis model is proposed to help managers to analyse whether investment return is enough to cover financial expenses due to financing sources decisions. Starting by the DuPont decomposition of return on equity, an alpha (α) and a financial leverage ratio (FL) are calculated to give specific information about whether the use of liabilities contribute to improve the shareholders wealth.

Another relevant issue is to understand whether there is a change in the financial leverage effect due to cyclical factors not controlled by the market, such as the current pandemic caused by the Coronavirus (Covid-19). Therefore, this chapter also aims to understand the historical trends of financial leverage, and to analyse the impact of macroeconomic factors on it. For it, mean values of several ratios for the accommodation sector in Portugal for the period of 2006 till 2019 are analysed. With this sample period we cover the financial crisis of 2007/2008 that help us to understand the impact of economic downturns on hotel companies' financial leverage, and to give insights about covid-19 impact on these companies.

The Portuguese accommodation sector – hotel industry, is an interesting case study. In 2019, the tourism sector was responsible for 52.3% of services exports and 19.7% of total exports in Portugal. Moreover, employment in tourism represented 6.9% of the Portuguese economy, and its revenues contributed 8.7% to national GDP (Turismo de Portugal, 2020). Additionally, this sector was one of the sectors with highest impact of Covid-19. Compared to the same period, the number of guests decreased 62.6% (March), 97.4% (April) and 95% (May) (INE, 2020a). Moreover, the overnight stays have decreased 98.1% (April). In the 2nd quarter of 2020, only 57% of this sector was working. In the 2nd half of June 82% of the companies were operating, 16% temporarily closed and 2% permanently closed.

The information provided in this chapter will help managers to make decisions based on the impact that the use of liabilities on return on equity. Naturally, the option for different types of financing at different costs is important, but the more relevant is to understand whether the average cost of debt improves shareholders' return, without jeopardizing the financial equilibrium and the sustainability of hotel companies. Moreover, managers can understand the impact of economic downturns on companies' return, information relevant to adapt financial sources in the way to minimize costs and increase return.

This chapter is organized into eight sections. After this first introductory section, the tourism sector in Portugal is introduced to explain its relevance and evolution. Then, a theoretical context about financial sources is presented, following by the proposed model. The section five explains financial leverage trends in the hotel accommodation in Portugal and show the relevance of the use of the proposed model.

Some suggestions and recommendations are given in the next section. The main conclusion of the study is presented in section seven, and in the last section future lines of research are addressed.

Tourism

The year of 2020 was tagged with an international crisis, caused by the corona virus, with great impact in all companies and countries. In the world there is a prevision of a decrease between 3.5% and 5.2% in 2020 (OECD - Organisation for Economic Co-operation and Development, IMF - International Monetary Fund, EC - European Commission, WB – World Bank) (GEE, 2020 e). In 2021 growth is expected, although with reservations (GEE, 2020a).

Portugal is following the global trends (GEE, 2020a). The GDP (Gross Domestic Product), at current prices, increased from 2014 (173,054 million euros) till 2019 (213,301 million euros). However, this tendency was not followed in 2020 (GEE, 2020c). In the two first quarters of 2020, goods and services exports and imports registered historical decreases, compared to the same period of the previous year (GEE, 2020c). According to IMF, the real growth rate was about -10%. The unemployment rate has increased every month of 2020, and in August it was 8.1% (GEE, 2020d). This situation has impacted all industries, without exception, but with greater relevance in some, as in the tourism sector.

Portugal is one of the countries in which tourism contributes most to the economy. In 2019, it was responsible for 52.3% of services exports and 19.7% of total exports. Employment represented 6.9% of the Portuguese economy, and tourist revenues contributed 8.7% to national GDP (Turismo de Portugal, 2020).

Moreover, the tourism sector was one of the industries with more death rate during the 2007/2008 international financial crisis (figure 1). The number of death companies from this sector was superior to new entries of companies from 2007/2008 till 2013, which call the need to understand the impact of controlling financial leverage in recession periods for this specific sector.

Even with this evolution of the number of companies, the tourism sector is showing a great evolution over the last years. In the beginning of 21st century overnight stays in hotels have always been increasing in annual terms. Nonetheless, some decreases were found out in 2002, 2003, 2008, 2009 but these decreases were never more than 7.1%, as it can be seen in figure 2. After 2013 both residents and non-residents overnight stays increased, as well as the number of companies in this industry.

The evolution of overnight stays was reflected in revenues, as it can be seen in figure 3. Till 2013 the increase in revenues was almost inexistent, but it started to growth after it. In 2019, the revenue reached close to 4,300,000 thousand euros.

In 2017, there were 65.8 million overnight stays in tourist accommodation establishments, with an average stay of 2.7 nights. The bed occupancy rate was 48.9% (INE, 2018). In 2018, total hotel revenues reached 3.6 billion euros and the number of guests 20.5 million guests. There was an increase in overnight stays which reached the value of 67.1 million (INE, 2019).

According to the classification of the NUTS II, Lisbon (€ 73.96) and Algarve (€ 52.62) regions had the highest values of the RevPAR (revenue per available room) in 2018, while Alentejo (€ 29.60) and Centro (€ 24.47) regions the lowest ones. Regarding the occupancy rates per room, Lisbon (75.7%) and Madeira (74%) show better results, in opposition to Alentejo (53.6%) and Centro (45%) regions which register the worse results (Deloitte, 2019). The city of Porto had a bed occupancy rate of 56.6%, whereas the city of Lisbon recorded a bed occupancy rate of 79.8%. Compared to other European cities, Lisbon has occupancy rates and RevPAR like those of large European cities, and is even higher than those

The Impact of Macroeconomic Factors on the Hotel Industry Through the Financial Leverage Trends

of Brussels, Madrid, Vienna, Berlin, and Frankfurt. The 4-star category is the one that prevails in the Portuguese market, both in terms of tourist developments (38%) and in terms of the number of accommodation units (49%) (Deloitte, 2019).

Figure 1. Evolution of death and birth rate

Source: Data collected from Pordata (2020)

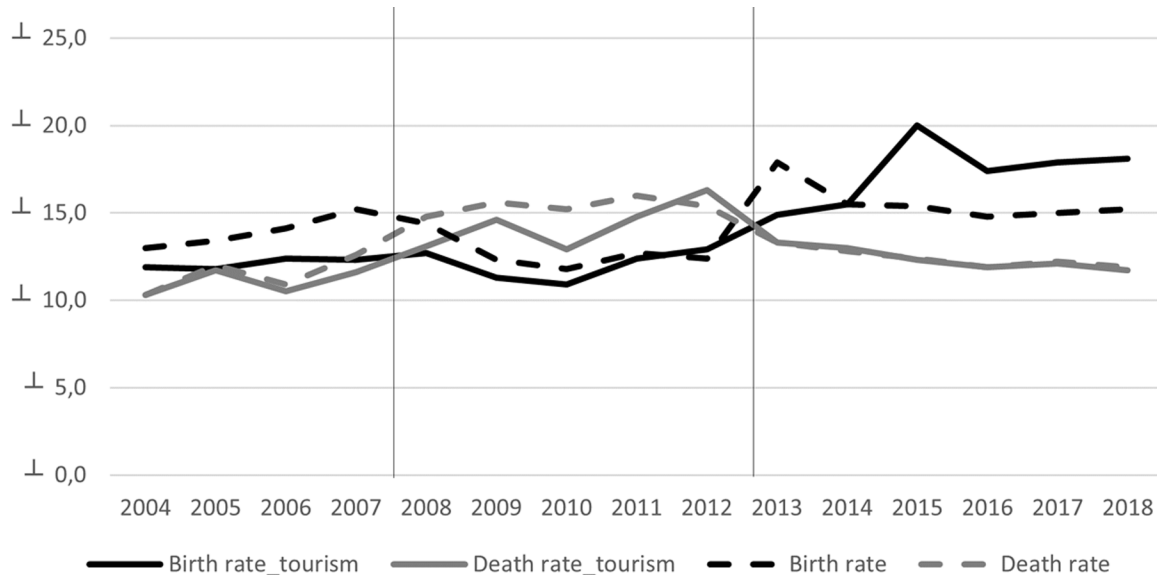


Figure 2. Evolution of overnight stays in the 21st century

Source: Data collected from GEE (2020b)

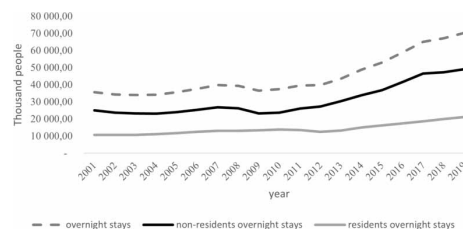
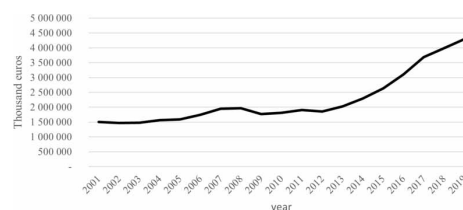


Figure 3. Evolution of total revenues in hotel establishments

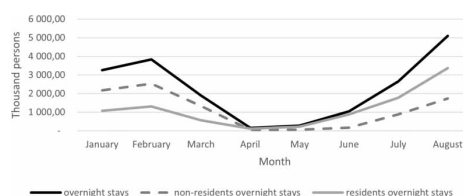
Source: Data collected from GEE (2020b)



In 2019, considering most of the tourist accommodation establishment, around 7,155 establishments were in operation (hotel establishments: 1,923; local lodging: 3,223; rural hotel: 1,687; campsite: 240 and summer camp: 82) (INE, 2020c). Relatively to hotel industry, 2019 was a record year, but a period of decreasing trend followed. In the first semester of 2020, overnight stays decreased 65.9% and hotel guests decreased 64,1% compared to the same period of the previous year (INE, 2020d). In 2020, from March onwards, after Covid-19 appeared in Portugal, there were historical decreases, with similar impact over all regions of the country. In April 2020, the tourist activity (tourist accommodation sector: hotels, local accommodation, tourism in rural and housing spaces) was almost null. Compared to the same period, the number of guests decreased 62.6% (March) and 97.4% (April), and the number of overnight stays decreased 58.7% (March) and 97% (April). Both overnight stays for residents and non-residents in Portugal show marked decreases (INE, 2020a). All of this can be seen through the following graph (figure 4), which highlights a sharp drop until April, and then there is a slightly increased in overnight stays until August, but not to the levels of August of previous years.

Figure 4. Evolution of overnight stays in 2020

Source: Data collected from GEE (2020b)



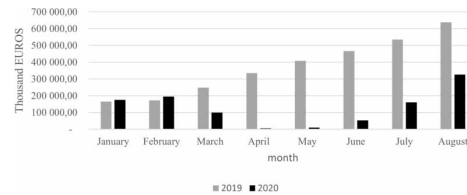
The total income also decreased by 59.9%, 98.3% and 48.9% in March, April and August, respectively. The bed occupancy rate had a big drop (in April it was 7%; in August it was 42,3%); the RevPAR was € 14.60 in March, and it dropped to € 4.50 in April. The RevPAR increased in August to € 49.2, but compared to the previous year it decreased -41,7%. The ADR (Average Daily Rate) was € 65.7 in March, € 47.8 in April and € 107.6 in August. Both RevPAR and ADR registered a huge decrease compared to the same period in the previous year (INE, 2020a; INE, 2020g).

Considering the type of establishment and category (hotels, local accommodation and rural tourism), hotels showed the most relevant decrease in April of RevPAR, around 92.2% compared to the previous year. Local accommodation decreased by 80.7%, while tourism in rural areas recorded a decrease of 69.8% (INE, 2020a). In May, the tourist accommodation sector continued with negative annual growth of 93.9% with regards to guests, and 95% concerning to overnight stays (INE, 2020b). With respect to August, the negative impact persisted but with smaller impact, guests with 43,2% and overnight stays with 47.1%.

The comparison of total revenues between 2019 and 2020 can be observed on figure 5, where the sharpest breaks occur in April and May of 2020. In the following months it can be observed an increase, but total revenues remain lower than in the previous year.

Figure 5. Evolution of total revenues in hotel establishments in 2020

Source: Data collected from GEE (2020b)



Comparing April of 2019 and 2020, at the level of NUTS II regions, the overnight stays in tourist accommodation decreased among 92.6% in Alentejo, 99.1% in Madeira and 99.9% in Azores. Compared the 1st quarter of 2020 and 2019 the overnights stay decreased among 39.3% in Alentejo, 39.4% in Madeira, and 53.3% in Algarve (INE, 2020a). Analysing only the hotel industry, it had a decrease of overnight stays of 98.1%, being the local accommodation the one that presents a smaller decrease (about 91.4%) (INE, 2020a).

Focusing in the month of August, the scenario is slightly better, although the annual rate of change remains negative, varying between 15.3% in Alentejo and 72.2% in Madeira (INE, 2020g). In the hotel industry there was a decrease of 48,9% of overnight stays (INE, 2020g). In the first eight months of the year 2020, the overnight stays decreased 62.5%, 37,1% to residents and 73.6% to non-residents.

Observing all the accommodation indicators, the average stay is the only indicator in April that has increased, having registered the value of 2.92. In Madeira, the average stay was 21.02 in terms of tourist accommodation developments due to the fact that many guests have been stranded in the country, staying more nights in hotel establishments than the foreseen (INE, 2020a). Nevertheless, in August the situation changed, and the average stay decreased 6.9% compared to the previous year, having the value of 2.69 (INE, 2020 g).

Tourism activity did not recover in September, as the annual rate of change registered 52.2% and 53.4% in guest and overnight stays. In August and September 21% and 24.3% of lodging touristic establishment were closed, respectively. At the level of NUTS II regions, Alentejo had the smaller decrease (-19.9%), whereas Lisboa metropolitan area registered the bigger decrease (-71.8%). (INE, 2020d). In August, it is important to highlight positive annual growth with regard to overnight stays of residents in the Centre, Alentejo and Algarve.

Regarding the annual change in overnight stays from tourist accommodation establishments by country of residence, in August and September, there was a decrease in all countries. However, it was worth noting the biggest decreases, above 90%: United States, Ireland, Canada and China (INE, 2020f).

FINANCING SOURCES

Every company must take on a set of financial decisions that have consequences in its efficiency, financial performance, and value maximization for shareholders. These decisions include investment and financing decisions (Damodaran, 2016). Investment decisions are indispensable for a company to thrive in an increasingly competitive market. Financing decisions should allow the company to be competitive, profitable and create value for society. Although, if not monitored, financing options can increase the

company's risk and uncertainty, which can cause problems to the company's survival (Tang & Moro, 2020).

The trade-off theory argues that companies should find an optimal structure which is the one that reaches the equilibrium between the benefits and the disadvantages of debt (DeAngelo and Masulis, 1980). This means that companies must look for debt whenever financial costs, financial and bankruptcy risk do not surpass the benefits to have access to capital that allow new investment and fiscal benefits.

Moreover, the pecking order theory argues that managers have a hierarchical preference for using funds (Myers, 1984; Myers & Majluf, 1984). First, managers look for internal funds (via self-financing) to finance the company's activity. This source of funds avoids the company's indebtedness and loss of control. Although when self-funding is not enough, managers look for debt (liabilities). This financial type increases the company's uncertainty and can add more costs in case some financial expenses are required. If there is still a need for financing then, managers resort to increase equity through the issuance of new capital. This last financial source increases the information asymmetries within the company due to the increase of its stakeholders.

When looking for liabilities, managers can use credit from suppliers (commercial credit) and/or bank loans. Both sources are forms of treasury management in the short term, that offer advantages and limitations. Usually, commercial credit changes over the years and increases when bank loans are limited, due to more informal relationship between supplier and customer (Lau & Schaeede, 2020). In fact, suppliers require less information about the company when giving credit. The commercial credit also allows greater flexibility in terms of credit data and has less direct financial costs. Although, some agency problems may arise in the company as managers are not controlled by external parts and can take some opportunistic behaviours that can damage the firm value. Moreover, suppliers can easily suspend the supply of goods whenever a receipt is not paid, pressing its payment as it can put in question the company's activity (Cuñat, 2007).

Agency costs decrease when a bank monitor the company as bank loans decrease the company's free cash flows, limiting managers expropriations of companies' wealth. The cost of debt can also be smaller than the cost of commercial credit, when no cash discount is given (Cuñat, 2007). Although, banks to give loans to companies, usually require some guarantees, making it difficult to access to this financial source (Lau & Schaeede, 2020). As not only the capital needs to be paid back but also financial expenses, bank loans increase companies' financial risk. Likewise, companies must follow a strategy of diversifying financial sources to minimize its risk (Tang & Moro, 2020).

PROPOSED ANALYSIS MODEL

Companies must control the benefits of issuing debt to understand its impact. For most companies, financing source choice is based on its cost. In fact, in dynamic companies, this decision is a manager's day-to-day work. However, the cost of debt is not enough to sustain a better decision making. To have enough information about the appropriate option, managers must compare the overall cost of financing operations with the benefit obtained. In other words, managers need to understand whether the cost of financing is recovered through the profitability obtained from that same financing.

Managers can understand if the financial mix is being beneficial to the company by knowing how to read and understand his company's accounts. For it, five items from the company's annual accounts are needed: total assets, total equity and total liabilities - on the balance sheet - and financial expenses and net

income of the period - from the income statement. With these five items is possible to verify the relationship between equity's return and liabilities cost, in other words, to calculate the financial leverage effect.

The process starts with the return on equity ratio (equality 1):

$$ROE = \frac{NI}{E} \times 100 \quad [1]$$

With:

ROE – return on equity.

NI – net income (for the period).

E – equity.

ROE can also be decomposed using the multiplicative formula, as the DuPont equality. In equality 2 return on equity is breaking down into three quotients:

$$ROE = \frac{NI}{NI+FE} \times \frac{NI+FE}{A} \times \frac{A}{E} \times 100 \quad [2]$$

With:

FE – financial expenses.

A – total assets.

Rearranging the parts of the whole in order to highlight the return on assets (see equality 3), it is obtained the following result:

$$ROE = \left[\frac{NI+FE}{A} \times 100 \right] \times \frac{A}{E} \times \frac{NI}{NI+FE} \quad [3]$$

Considering that in the right side of the equality the first quotient and multiplication for 100 represents the return on assets (ROA) ratio, the equality can be represented as follows (equality 4):

$$ROE = ROA \times \frac{A}{E} \times \frac{NI}{NI+FE} \quad [4]$$

Analysing equality 4 it is possible to argue that ROE equal ROA times a quotient whose meaning is financial leverage (FL), as shown previously (equality 5):

$$\frac{A}{E} \times \frac{NI}{NI+FE} = \text{financial leverage} \quad [5]$$

Simplifying, the formula in equality 2 could be represented as follows (equality 6):

$$ROE = ROA \times FL \quad [6]$$

With:

$$FL = \frac{A}{E} \times \frac{NI}{NI+FE}$$

Although, more important than the formula itself, it is to understand how managers can assess the impact of using liabilities on the return on equity. This process starts with the calculation of what could be understood as the company global profitability rate, available to shareholders (owners' equity) and to creditors (liabilities). Equality 7 follows:

$$ROA = \frac{NI+FE}{A} \times 100 \quad [7]$$

The second step is the calculation of the cost liability ratio, it means the company's credit cost rate. It compares the financial expenses with the total liabilities (equality 8).

$$CL = \frac{FE}{L} \times 100 \quad [8]$$

With:

CL – cost of liabilities.

L – liabilities.

The next step is the calculation of the liabilities differential use, which represents the difference between the return rate of total financing (return of liabilities) and the liabilities cost rate. This liability's differential use is represented by alpha (α), as it is presented in equality 9:

$$\alpha = (RL - CL) \times L \quad [9]$$

With:

α = differential use.

RL – return of liabilities rate (in practice it is the ROA).

When:

$\alpha > 0$ means good use of credits, since the company's return is higher than the cost of liabilities.

$\alpha = 0$ is a neutral use of debt.

$\alpha < 0$ represents difficulties to recoup the cost of credits, as liability's cost is higher than the company's return.

Compiling information, it is possible to calculate net income which would be obtained if the owners' equity were "returned" with the rate in equality 7 (ROA), that is, with global profitability rate. Equality 10 naturally follows.

$$NI \text{ before} = E \times ROA \quad [10]$$

With:

NI before – net income before the impact of using liabilities.

The real net income of the period (equality 11) could be calculated adding the result obtained in the previous two steps, equality 9 plus or minus equality 10, depending on whether α is positive or negative.

$$NI = NI \text{ before} \pm \alpha \quad [11]$$

Finally, to confirm the value of the financial leverage, represented by the letters "FL" meaning Financial Leverage, ROE should be compared with ROA (equality 12):

$$FL = \frac{ROE}{ROA} \quad [12]$$

When:

- $FL > 1$ means good use of credits, as the financial leverage effect is positive.
- $FL = 1$ is neutral.
- $FL < 1$ represents difficulties to recoup the cost of credits, since shareholders return is smaller than those of total assets.

Using this methodology, through financial leverage managers can understand if using liabilities, they improve shareholders wealth. Naturally, negative net incomes can influence the meaning of the financial leverage (FL), which is why that meaning must be confirmed with the meaning of the value of alpha (α), that does not allow for misinterpretations.

Financial Leverage in Hotel Industry

To understand financial leverage impact in the hotel industry in Portugal some ratios (mean values) will be analysed as well as the impact of financial mix on return on equity. The sample includes all companies registered with the Portuguese economic activity code (in Portuguese, Código das Atividades Económicas - CAE) "55 - Accommodation", in the period 2006-2019. The data was collected in Bank of Portugal (Banco de Portugal, 2020).

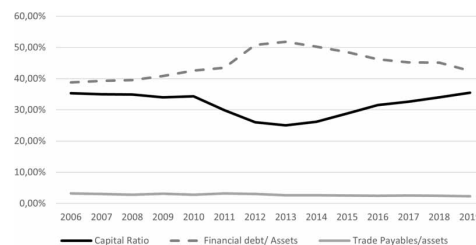
The total sample varies between 4,078 companies (in 2006) to 11,517 companies (in 2019), showing the increase in the number of companies, especially after 2013 (as showed in figure 1).

The Impact of Macroeconomic Factors on the Hotel Industry Through the Financial Leverage Trends

The next graph shows the weight of different financial sources to finance the company's total assets.

Figure 6. Weight of equity, financial debt and trade payables over total assets

Source: Data collected from Banco de Portugal (2020)



Analysing figure 6 it can be observed that equity over total assets (capital ratio) was more a less stable till 2010 (around 35%), but it decreased after it and till 2014. From 2015 ongoing the capital ratio started to increase again, reaching its maximum value (35.5%, mean value for the sector) in 2019. In the opposite situation is the ratio financial debt as a percentage of total assets. When the weight of equity over total assets increases (decreases), the weight of liabilities decreases (increases), and therefore the weight of financial debt (an item of liabilities) follows the same impact of liabilities.

This evolution goes in line with the pecking order theory which argues that companies prefer to use internal funding (net income, an item of equity) whenever available, and look for liabilities when the company still has financial needs.

Trade payables are almost irrelevant to finance the company's investment in this sector. Trade payables as percentage of total assets was similar over the years (2%-3%), suggesting that the hotel industry does not use commercial credit to finance its activity.

The graph also shows that from 2014 till 2019, companies from the hospitality sector have become less indebtedness, particularly with regards to financial debt. The 2007/2008 international financial crisis caused several problems in economies and countries, and Portugal was not an exception. From 2011 until 2014, Portugal was assisted by the economic and financial assistance program, and several austerity measures were applied. Results show that in turbulent periods, the hospitality sector look for liabilities to finance its activity as capital ratio decreased. Although, this sector recovered its economic and financial situation after this downturn periods.

The figure 7 shows the evolution of assets, equity and liabilities over 2006 till 2019.

Analysing figure 7 it can be seen that total assets increased all over the years, meaning that hospitality companies did not stop to make new investments, even in turbulent economic periods. Although, total equity did not follow this tendency from 2010 till 2014, meaning that in recession periods, companies from this sector increased its leverage to sustain their investments.

In the following graph the evolution of financial expenses and net income are showed:

Figure 8 shows that net income started to decrease after 2007, and only after 2012 it increased again, showing a new slight decrease in the year of 2019. Financial expenses were more a less stable over the years (200,000 – 250,000 thousand euros). Comparing the data with figure 6, in 2012 the increase in financial debt as percentage of assets was followed by a slight increase in the financial expenses paid.

The Impact of Macroeconomic Factors on the Hotel Industry Through the Financial Leverage Trends

Figure 7. Yearly evolution of total assets, equity and liabilities

Source: Data collected from Banco de Portugal (2020)

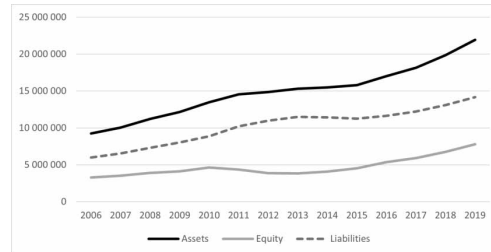
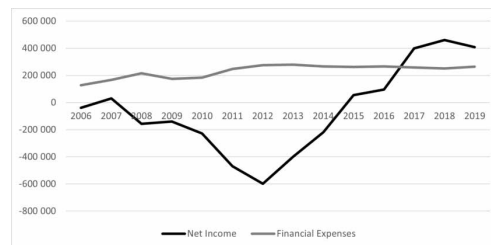


Figure 8. Yearly evolution of net income and financial expenses

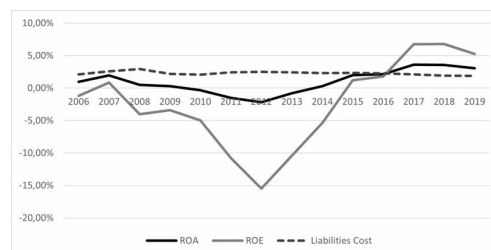
Source: Data collected from Banco de Portugal (2020)



The figure 9 shows the evolution of return on assets (ROA), return on equity (ROE) and cost of liabilities (CL)

Figure 9. Return on assets, return on equity and cost of liabilities.

Source: Data collected from Banco de Portugal (2020)



From 2008 till 2014, the downturn period of the Portuguese economy, the cost of liabilities of companies from the hospitality sector was superior to return on assets, and the return on equity was mainly negative in this period. This result suggests that financial debt was not creating value to companies of the hospitality sector in moments of crisis. The figure 9 also shows that in 2016 return on equity was higher than return on assets, which is followed by a small decrease of the cost of liabilities.

Therefore, due to results found managers of this type of companies should start looking for financial information to sustain their decisions regarding financial mix choices. This can be done by analysing

the financial leverage (FL) showed in the proposed equality 12. This ratio will help managers to decide whether, if necessary, to use equity or debt capital.

Figure 10. Yearly evolution of financial leverage (FL)

Source: Data collected from Banco de Portugal (2020) to calculate the equality 12 (FL)

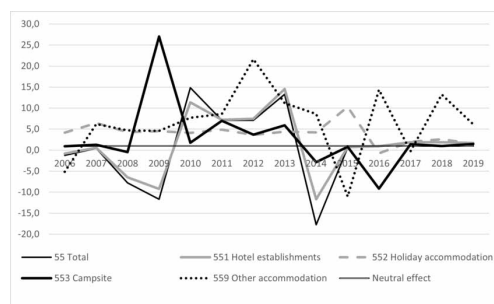


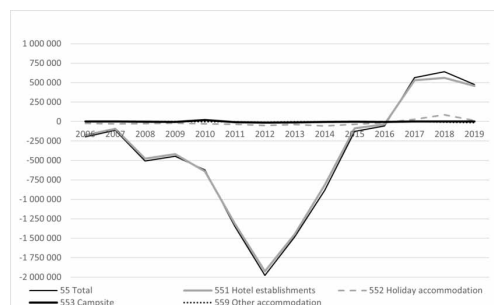
Figure 10 shows not only financial leverage (ROE/ROA) of the total sample (accommodation), but also of its subsectors: 551 – hotel establishments, which represents around 58.7% of the total sector, 552 - holiday accommodation with a weight around 38.6%, campsite (1.8%), and other accommodation (0.9%). The graph also shows the neutral effect of financial choices, which is when ROE = ROA (FL = 1).

To the total sector – the accommodation sector (CAE 55), the financial leverage is superior to 1 in 2010-2013 and 2017-2019 periods, which, at first glance, seems to imply that the use of liabilities is benefiting the return on equity. This scenario is repeated for the subsector “Hotel establishments” (CAE 551), as expected as this subsector represents more than half percent of the total sector.

The subsector “Holiday accommodation” (CAE 552) has always a leverage greater than 1 except in the year of 2016. The other two subsectors: “Campsite” (CAE 553) and “Other accommodation” (CAE 559) present irregular values of leverage, although, over the years, it is mostly superior to 1 (neutral effect).

Figure 11. Yearly evolution of alpha (α)

Source: Data collected from Banco de Portugal (2020) to calculate the equality 9 (alpha)



In a synthesis, it can be argued that with some exceptions, specially to the subsector “Hotel establishments” (CAE 551), the financial leverage is positive (greater than 1), meaning a good use of credits. Although the main issue of this chapter is to make sure about the impact of the use of liabilities over

the owner's profitability, which is why the alpha (α) values will be analysed in the next graph (proposed equality 9). In fact, the relevance of financial leverage over ROA and ROE was found by Nguyen, Nguyen, Tran and Nghiem (2019), who confirm a negative impact on ROA and a positive impact on ROE. This calls the need to analyse financial leverage effect with the alpha value to validate results.

Figure 11 reveals that in the accommodation sector – total sample (CAE 55) alpha is negative in the 2006-2016 period, being positive from 2017 to 2019. This situation is also presented by subsector "Hotel establishments" (CAE 551) since this is the subsector with greater weight in the total. This means that the use of liabilities as a source of finance only benefited ROE after the year of 2017, even if the financial leverage had a positive impact in the years 2010-2013.

The values of financial expenses to the total sector and the subsector "Hotel establishments" were similar during the period studied (figure 8) which, combined with the increase in the value of liabilities (figure 7), led to a reduction in the financing rate (figure 9). Taking it all together with the succession of positive net incomes in the 2017-2019 period, the use of liabilities has benefited the return on equity. If the financial leverage was analysed in separate (figure 10) the use of liabilities seems to be positive in the period from 2010 to 2013, but in that period net income was mainly negative justifying the impact in the alpha indicator.

In the subsectors "Holiday accommodation" (CAE 552), "Campsite" (CAE 553) and "Other accommodation" (CAE 559) the financial leverage effect is usually negative but very smooth and almost around zero, the neutral effect.

This alternative way to look for financial leverage effect can help to understand mix results. For instance, Shahzad, Ali, Ahmad and Ali (2015:88) argue that "there is no definite answer to the question whether financial leverage and corporate performance are positively or negatively related."

SOLUTIONS AND RECOMMENDATIONS

The COVID-19 pandemic caused a change in every person life, with a huge impact in all companies and the way these companies work. Most companies had a colossal reduction in the revenues and are not expecting changes in the short-term. This leads to serious difficulties in companies' financial situation and, in extreme cases, the risk of bankruptcy.

The tourism sector is one of the economic activity most affected by this situation, since the number of travels and overnight stays reduced due to the afraid of people to be infected by the virus and due to travel and tourism restrictions, namely those caused by health authorities' impositions. Therefore, several companies are without working or working far from their normally activity, which cause a huge impact in companies' turnover, profits and returns.

The 2007/2008 financial crisis had impact in hotel industry net income, being mainly negative. In turn, the use of liabilities did not contribute to the increase of return on equity, even if in some years return on equity was greater than return on assets (positive financial leverage effect).

This new crisis caused by Covid-19 call the need for companies in the accommodation sector, to select and renegotiate commercial and financial liabilities, to decrease financial risk in this turbulent period. For this task, managers must have a solid knowledge of the balance sheet structure of their companies and, depending on the cost of liabilities, meet the conditions to make accurate decisions based on the calculation of the financial leverage and, consequently, the impact factor (alpha). This analysis is a tool

that can support right decisions for the benefit of owners and the sustainability of companies, which is very important in crisis scenarios.

Since the 2007/2008 financial crisis, hospitality companies have taken around 10 years to reach record years. If the managers are aware of all the facts reported here, it may be possible to reduce the time to reach the top years again.

CONCLUSION

This chapter aims to understand financial leverage trends in hotel industry, and the impact of downturn and recover periods on it. For it, a sample of Portuguese firms from the accommodation sector was analysed, during the period from 2006 till 2019.

Additionally, this work also intends to propose a way to analyse if companies' return is enough to cover financial expenses due to financing sources decisions. Therefore, two ratios were proposed to understand if financial leverage effect is positive (FL higher than 1) and if it contributes to improve return on equity (alpha higher than zero).

Results show that to accommodation industry the financial leverage is above the neutral effect in 7 of the 14 years studied (2010- 2013 and 2017-2019 periods). At first glance, this seems to imply that the use of liabilities is benefiting the return on equity. Although, alpha is negative between 2006 and 2016, being positive only from 2017 and for three years. Even if in some years financial leverage impact is positive, it does not contribute to increase return on equity due to negative net profits. In fact, only from 2017 till 2019, the cost of debt was higher than return on assets, meaning that financial leverage was creating wealth to companies' shareholders. In fact, in that years the accommodation sector exhibited the highest values in terms of overnight stays and total revenues.

The values of financial expenses were very similar during the period studied which. This situation additionally with liabilities increase, led to a reduction in the financing rate. These facts together with the succession of positive net incomes in the 2017-2019 period, benefited the return on equity. This conclusion allows to correct the reading made on the basis of the financial leverage, by which benefits for shareholders using liabilities were perceived in the period 2010-2013. In reality, only between 2017 and 2019 the cost of liabilities improves owners' incomes. It means that in the last three years the use of debt capital benefited ROE.

Moreover, results show that the situation of the whole sector is similar to those of the subsector "Hotel establishments", since this subsector is the biggest contributor to the aforementioned main sector results. The other subsectors "Holiday accommodation", "Campsite" and "Other accommodation" present irregular values of leverage being, over the years, mostly above the neutral effect. This is not confirmed by the values of alpha (α) since, for most of the studied period, are negative.

With these new indicators provided in this work, managers of the hotel industry (as well as other industries since the ratios can be used to all sectors) can improve the quality of their decision making and easily surpass turbulent periods.

FUTURE RESEARCH DIRECTIONS

The chapter fulfil the proposed aim. Although, more can be done in the future. In fact, the accommodation sector is very important to the Portuguese economy, having high impact on employment and GDP. The subsector “Hotel establishments” closely follows the behaviour of total sector since is the main driver the sector. However, results in the subsectors “Holiday accommodation”, “Campsite” and “Other accommodation” require a more detailed analysis of the impact of debt capital on the financial leverage, namely the cost of its use, since results are singular and need to be explored.

Moreover, it will be relevant to understand which factors/determinants can help to explain the alpha value evolution. Results suggest that macroeconomic factors impact it, but other determinants can also help as for instance the companies’ characteristics as size, age, among others. It would be interesting to build a model where the influence of several variables on the relationship of debt capital and financial leverage would be analysed.

Finally, this work proposes two ratios to help managers to sustain their decisions about whether the use of liabilities contributes to improve return on equity. For future, these ratios can be used to other industries in order to verify if macroeconomic factors impact all industries in the same way or which is more relevant.

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The Impact of Macroeconomic Factors on the Hotel Industry Through the Financial Leverage Trends

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Chapter 7

Financial Analysis During the Pandemic and New Consumption: Oil and Gas Sector

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ABSTRACT

The economic consequences of the COVID-19 pandemic are not yet known. It is, however, observed that the consumptions in the world have changed dramatically in 2020, and it will keep changing as the pandemic evolves. It is already observed that in consumer confidence, there is a change in the use of energy and petroleum. People are not moving a lot during this pandemic, and they also discovered that they might stay this way in some occasions. It is affecting the petrol sector, maybe one of the most affected in the pandemic, because of the social isolation. This chapter analyzed 44 companies from the oil and gas sector around the world in relation to their financial distress. The Altman's Z-score was the methodology used, and the mean of the sector was compared with the five most distressed firms and the five least distressed. It is possible to observe that the sector suffered with this pandemic, and most of the companies are already in financial distress.

INTRODUCTION

Initiated in China, the pandemic has reached every continent and records tens of thousands of deaths around the planet, challenging health authorities around the world. Once that the pandemic was announced, in March 2020, given the rapid spread of COVID-19, many countries around the world adopted several public health ways of prevention, including the social distancing, requiring that as part of this

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prevention, businesses, schools, community centres and every place that could spread the disease should be closed for undetermined time (Fong et al., 2020).

The economic consequences are still unknown and how long it will last is still a challenge to be answered. Many articles describing the response of governments and economic interventions since the beginning of the pandemic, and some of them are still trying to predict what the impact will be on private companies (Brodeur et al., 2020).

Consumption changed drastically because of the social distance. The more people stay in their home, the more they change the way they spend their money. Also, thousands of jobs were jeopardized, and other thousands are not going to be the same for the next years. According to Brodeur et al. (2020), it was already observed a decline in consumer confidence, as well as a fall in fuel sales and higher unemployment insurances. Demirguc-Kunt et al. (2020) also estimated that the social distancing had impact in electricity consumption, nitrogen dioxide emissions and mobility records, causing a 10% decline in the economic activity in Europe and Central Asia countries.

In this scenario, International Energy Agency (IEA, 2020), has indicated an 8% drop in world oil consumption in 2020 and the Agency still predicts pre-pandemic consumption figures will only return in 2023 (considering the best scenario).

We may also remember that the change in consumption habits (electric cars, sustainable products, among others), which was happening before the pandemic, together with the drop in consumption with the pandemic (industries stopped, people doing home office and so on) have caused a perfect storm for the oil sector.

England announced for 2030 a ban on the sale of new cars powered by gasoline or diesel. Japan expects similar restrictions and China wants to have a rule in place in 2035. In the USA, California will have gasoline or diesel vehicles off the market in the same year. The worldwide advance in environmental discussions limits sales and puts pressure on the oil industry.

In a nutshell, falling consumption and rising production are making oil prices one of the lowest in recent years. This scenario has not been favorable to the financial health of these companies in this moment and to the future. Some companies, however, have their financial health with an inverse correlation to the crisis, which means that the economic situation worsens, but these companies improve their financial health. Others have a direct relationship with the crisis, worsening financial health.

Predict companies bankrupt is a challenge, however, in a difficulty economic moment as today, with the effects of COVID - 19 on companies, it is natural to be concerned with increasing the risk of bankruptcy and assessing the financial health of companies.

This context is concerning because the bankruptcy of an oil company may be a huge impact on the economy, since they are large companies, which generate many jobs, tax collection and often political control in the countries where they have been installed.

In order to prevent a financial disaster that we could see to the sector, there is many financial tools that are used to predict companies operating in financial difficulties and has been always a matter of particular interest to many academics, companies, and governments. This type of research on bankruptcy forecasting with accounting data is used by banks and financiers in risk assessment and credit granting.

The Altman's Score Method for Financial Distress Prediction

One of the most reliable predictors to bankruptcy is the Altman's Z-score (Dallocchio et al., 2020) and has been used by many researchers around the world. Altman (1968) is based in a five-factor multivari-

ate discriminant function based on profitability, liquidity, and financial leverage with the intention to predict the bankruptcy of manufacturing firms.

Considering this context of pandemic and changing consumption habits, the research question of this study is: how the Petrol Sector Altman's z-score may predict the financial distress of these companies, once we have been observing some financial distress during the pandemic? Since the objective of this chapter is to explore the risk of bankruptcy (the deaths of companies), during COVID-19, as a sample, oil companies in the world were chosen. And it was considering the mathematical model of the Z-Score for the prediction of bankruptcy. In addition to analyzing the z score of several international companies, the case of Petrobras was also studied, in order to better demonstrate the impact of the pandemic crisis on the oil sector.

This research is contributing to the literature to measure specific cases of bankruptcy in companies that are globally influenced by the economy. Also, the practical implication of this chapter is producing a financial analysis of this sector, discussing the problems and the scenario that we could forecast after this pandemic, in the petrol sector.

The organization of this chapter is as follow: first is the actual introduction of the subject and of the objective of this research, second the background with the literature review and discussions are presented, in the third item we presented the main focus of the study, analyzing the sector and the companies proposed, by the Altman's z-score statistics, and we conclude with solutions and recommendation for the sector and further studies. Finally, we also present, the general conclusion of the research.

Background

As the literature brings a clear view, investors, and stakeholders in general needs tools to find out if the companies that we are dealing may be distressed. Li & Li (1999) argued that is difficult to find information that shows that some firm is distressed, since the managers tend to mimic the firms that stay in control and the information disclosure is very hard to achieve in these cases.

Bankruptcy and firm failure received different definitions and approaches in the literature (Lukason, 2018). According to White (2016), bankruptcy is a legal process where firms solved the debts in financially distressed situations. We may approach the failure by the insolvency legislation (Balcaen & Ooghe, 2006), the way the economic environment influences the bankruptcy (Bazy el al., 2008) and, also, the financial prediction used by Altman (Altman, 1968; Caouette et al., 2008).

Bankruptcy literature has been developed under the concept of legal bankruptcy and the procedures and the advantages of the procedures over the private negotiations between debt and creditors to solve the firm's financial distress (Li & Li, 1999). The author that has the leading in number of articles about this subject is Harrell, Alvin C. which researches are mainly in Law and Consumer Bankruptcy (Coulson & Harrell, 2004). The second one is William Thomson (Thomson, 2015) whose papers are using the game theory in bankruptcy problems.

Many of the studies found on the literature uses the accounting information as the main focus to use the statistical techniques. As well as the use of statistical techniques, this studies try to predict the failure using the accounting numbers (Yazdanfar et al., 2020). We may also find a range of models predicting bankruptcy in the literature, as Javaid & Javid (2018) pointed out. Among them, Altman (1968) is one of the most known methods in the world according to Yazdanfar & Öhman (2020).

Failure prediction models are fundamentals to bankers, investors, asset managers, rating agencies and even to the competitors and failure firms in general. There are some models that had been devel-

oped along times as the univariate model from Beaver (1966), Ohlson (1980) proposed a logit model to predict failure; another model of z-score was developed by Taffler (1984) in companies in the United Kingdom; Dimitras et al. (1996) compiled a revision of studies in failure prediction models. The more recent study comparing the models were made by Altman et al. (2017) that compared and assesses the performance of the Z-score model, showing that is still a great tool to predict financial distress to researchers and practitioners.

It has been conducted a research in order to identify the main researches that published articles using the Z-score method. Altman (1968) is the leading author with 9 articles published.

Table 1. Main authors about Z-score model

Main authors in Bankruptcy and Z-score	Number of Articles
Altman, Edward	9
Smith, Malcolm	8
Agarwal, Vineet	8
Taffler, Richard	8
Salehi, Mahdi	5
Sufian, Fadzlan	4
Agrawal, Khushbu	3
Ghosh, Saibal	3
Bandyopadhyay, Arindam	3
Singh, Amrik	3
Konno, Yukiko	3

The formula can be used to predict the likelihood that a company will go bankrupt in the next two years. The Z-score is used to predict corporate defaults, in addition to being a control measure that is easy to calculate and define companies' financial difficulties status.

The most used financial ratios to calculate the probability of bankruptcy in the literature are liquidity, solidity or solvency, cash flow sufficiency and profitability (Lukason & Laitinen, 2018).

In the prediction models, it is important to tell that the quality of financial information is determinant to the success of the prediction model. Serrano-Cinca et al. (2019) called the attention to this subject in their paper, also informing that there should be observed aspects such as earnings management, creative accounting, income smoothing and accounting fraud to analyze the prediction using accounting numbers. It is clear, however, that to predict financial distress, these accounting numbers should be audited. In this paper, we choose only the public companies, considering that they are willing to have less distortion and more quality when publish their reports.

Besides the accounting information, Elsayed & Elshandidy (2020) also affirms that the some disclosures of the companies can indicate financial distresses, related to the the economic context where the companies are working. So, it means that not just the financial numbers, but the economy may have great influence on this analysis.

PANDEMIC AND THE PETROLEUM SECTOR

The COVID-19 brought to the world a new challenge in 2020. As never seen before in this century, lockdowns, social distancing, countries, and companies suffering from an outbreak because of the fast spread in this disease turned this year the most discussed in the economic area.

According to Barro et al. (2020), compared to the Great Influenza Pandemic that arose in 1918, and impacted more than 10% of the GDP in the whole world, this COVID-19 pandemic killed a number of famous people and personalities, spread of all countries and has showed that the impact to decline the economy as predicted in many other studies.

Demirguc-Kunt et al. (2020) also discussed that there is a relationship between health and economic performance and supply and demand will play a fundamental role to this pandemic. It is though expected that some sectors in the world will have financial threats due to the social distance and the change in the dynamic of the world's new way of living.

The first epicenter of the disease was in China, being the country that suffered the greatest initial impact. The International Energy Agency (IEA, 2020) estimated that Chinese demand for oil would be 1.8 million barrels a day lower than in 2019 in the first four-month period of 2020.

Also, in the petroleum context of China, oil companies in the world suffered from the lack of equipment at the beginning of the pandemic, since the Asian country is one of the major producers of Floating Storage and Transfer Units, used for offshore oil production. The possible delay caused by the operation stoppages and the interruption in the supply of materials, can reach 1 year, which represents an increase about 30% in the initial forecast for the construction of these structures in next years.

In April 2020, the 13 OPEC (Organization of the Petroleum Exporting Countries) members and 10 Russian-led producers agreed to cut joint production by 9.7 million barrels a day, what is going to be a record in reduction of production. The agreement provided for the reduction to be reversed gradually, in stages of 2 million barrels per day, every six months, assuming that the worst of the pandemic would be overcome this year (IEA, 2020).

Since then, however, international oil prices have started to recover and the barrel is, in the middle of 2020, being trading for around \$ 50, up 25% predicted before. However, demand from China and the rest of Asia continues to grow during the pandemic, and the promising results from vaccines against covid-19 also raised prices (IEA, 2020).

Price volatility creates uncertainties that induce the postponement of investments and, consequently, reduces economic activity.

This optimism has affected members of OPEC, who are eager to turn on the taps again to take advantage of higher prices. The United Arab Emirates is one of the countries that most advocates an increase in production, according to a source with knowledge of the discussions (IEA, 2020).

In this context, the petrol sector seems to be one of the most impacted sectors, considering that a reduction of consumption and mobility will impact considerably the selling of petrol all over the world. Petroleum is a leading global energy commodity, and it is a non-renewable energy resource. It is responsible to 30% of the total global primary energy supply (Market Research Reports, 2020). It is an important sector that has a global impact when their financial results are compromised due to economic influence as the world is facing due the Covid-19 pandemic in 2020.

In this study, the Altman Z-Score (Altman, 1968) was used as the methodology in a descriptive exploratory study of the petroleum sector with a sample selected from 44 companies in the oil and gas production sector. The companies researched are spread across the world, located in the 5 continents:

Financial Analysis During the Pandemic and New Consumption

Europe, North America, South America, Africa, and Asia. The data for analysis were collected from the financial statements from companies published quarterly and available in the S&P Capital IQ database, for the period from March 2018 to June 2020.

The sample has 10 periods (quarters) observed, to evaluate the effects before pandemic and during the pandemic.

It was used a linear regression as determined by Altman's Z-Score (Altman, 1968) that was calculated by the following equation:

$$Z = 1,2\beta_1 + 1,4\beta_2 + 3,3\beta_3 + 0,6\beta_4 + 0,999\beta_5 \quad [1]$$

Where:

β_1 = Working capital/Total assets

β_2 = Retained Earnings/Total assets

β_3 = Earnings before interest and taxes/Total assets

β_4 = Market value of equity/Book value of total liabilities

β_5 = Sales/Total assets

Z = Overall Index

According to Altman (1968), if the total value of Z is greater than 2.99, the entity is in a safe zone, that is, in a non-bankruptcy zone. If the value of Z is less than 1.80, the entity is in a bankruptcy zone. For values between 1.80 and 2.99, there is no definition of the entity's situation, usually called as a gray zone.

The evolution of the average Z-Score is shown in the table 2 showing the 44 companies researched in this paper. It is possible to see that June 2020 presented the worst mean score for the set of companies observed.

Table 2. Evolution of Z-score means in 44 companies

mar/18	jun/18	sep/18	dec/18	mar/19	jun/19	sep/19	dec/19	mar/20	jun/20
2,37	2,39	2,3	2,29	2,34	2,17	1,97	2,17	2,08	1,79

The effect of the pandemic on the Z-Score was significant, considering that the index dropped in March and September 2020. However, it is interesting to note that the drop in the Z-Score (average) already begins in March 2019, indicating that there are variables beyond the pandemic that are affecting the score. The figures show that the sector's average Z-Score, in the period analyzed, was never very high, but always staying within the gray zone.

Figure 1 presented the image of the Z-score for these companies. It is possible to see that, since 2019 the Z-score mean already presented values below the previous year. However, we may see that the score in June 2020 is clearly below the previous quarters.

Figure 1. Mean Z-Score.



The oil companies are very exposed to Z-Scores, as they have a massive capital investment, the need of large financing, with cash generation that depends on the commodities prices. However, their costs do not vary accordingly to the value of the commodities. In addition to the variation in the value of commodities, these companies are subject to exchange variation, since the commodities and their leases are made in foreign currency (dollar).

Allied to the impacts of the spread of the new coronavirus, the lack of a functional OPEC plus the agreement to reduce production brought down the price of Brent oil in early 2020. At the same time, a rift between Russia and Saudi Arabia caused a fall of more than 30% in the price of a barrel of oil. This was the perfect storm and never seen or imagined. Combined facts made the barrel of Brent reach the lowest price in the futures market of the last 18 years.

With barrel prices below \$ 40.00, large producers such as the USA and Brazil have no viability for production, as the cost of extraction and production exceeds this value. Other countries like Russia and Saudi Arabia depend on the oil sector to ensure the fiscal balance of their economies.

With the drop in demand, countries have tanks reserved to almost the maximum capacity, depending on sales in futures contracts (a fact that is not yet happening). This increase in the stocked volume, turn impacts in the fluctuations of the price of oil in the International market.

Despite OPEC having reached an agreement to withdraw around 10% of world production from the market as of May, the stockpiled volumes continued to grow above the average of previous years, even considering additional cuts from other countries, such as Brazil, Canada and the USA, as a result of the cooling demand for oil and oil products and the reduced level of prices in the international market

Until the creation of OPEC, the administration of the global oil supply was conducted by the Seven Sisters with the aim of preserving its stability and, thus, stimulating its consumption. The dispute for oil income launched by OPEC has transformed this context, giving rise to the volatility that characterizes the current oil market.

Considering the Z-Score of the 5 worst companies, it can be analyzed that the price movement can be seen in the indexes of these companies in table 3.

Financial Analysis During the Pandemic and New Consumption

Table 3. The 5 worst companies, considering the Z-score

Company	mar/18	jun/18	sep/18	dec/18	mar/19	jun/19	sep/19	dec/19	mar/20	jun/20
Echo Energy plc (AIM:ECHO)	-	0,38	0,637	(0,943)	-	(4,22)	(4,63)	(3,27)	(3,88)	(3,9)
Changchun Sinoenergy Corporation (SHSE:600856)	1,61	1,48	1,27	0,682	0,373	0,128	(0,069)	(1,24)	(1,46)	(1,57)
Pieridae Energy Limited (TSX:PEA)	7,04	6,75	2,87	(0,511)	(0,575)	(0,88)	(0,926)	(0,375)	(0,323)	(0,316)
Delek Group Ltd. (TASE:DLEKG)	0,178	0,173	0,141	0,223	0,209	0,199	0,187	0,363	(0,244)	(0,241)
Shanxi Guoxin Energy Corporation Limited (SHSE:600617)	0,563	0,491	0,539	0,44	0,524	0,429	0,481	0,37	0,34	0,325

Figure 2. Graphic of the 5 worst companies along the last 10 quarters.

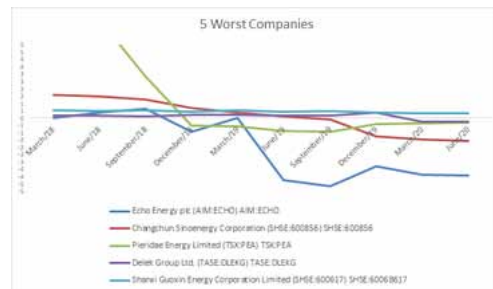


Table 4. Best 5 companies along the last 10 quarters.

Empresa	mar/18	jun/18	set/18	dez/18	mar/19	jun/19	set/19	dez/19	mar/20	jun/20
Exxon Mobil Corporation (NYSE:XOM)	3,81	3,86	3,89	4,06	3,83	3,71	3,64	3,54	3,41	3,09
PJSC LUKOIL (MISX:LKOH)	3,43	3,51	3,79	4,04	4,13	4,01	4,25	3,93	3,87	3,32
Total Cote d'Ivoire S.A. (BRVM:TTLIC)	5,48	4,57	-	-	4,11	4,14	-	-	4,53	4,56
Saudi Arabian Oil Company (SASE:2222)	-	2,67	3,67	4,1	-	3,8	3,59	13,0	13,5	7,66
Elinoil Hellenic Petroleum Company S.A. (ATSE:ELIN)	9,3	10,3	9,93	11,0	11,9	12,0	10,2	9,51	10,6	9,85

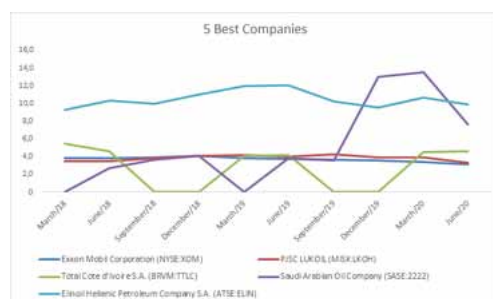
It is possible to see that, besides the fact that all of the companies are worst in June 2020, some of them suffered a decline of z-score since 2019.

All the 5 companies have remained constant in the last quarters with numbers close to zero, Echo Energy showed a drop in June 2019, but later maintained the consistency in the results. Pieridae Energy also draws attention, as until June 2018 it had good numbers in the index, which worsened dramatically after that period.

Considering the 5 oil companies with the best financial health, it is presented Table 4 and Figure 3 and it is possible to see that their scores are high if compared with the average of the sector.

All of them always presented good financial health, without risk of “breakdown”. The Saudi Arabian Oil Company and Elinoil Hellenic Petroleum Company are highlights with very high values in financial health. Total Cote d’Ivoire also draws attention, as there was an improvement in results after the pandemic.

Figure 3. Graphic of the 5 best companies along the last 10 quarters.



The Petrobras Case: An Analysis of its Financial Distress

In order to understand better about the financial distress in the companies analyzed, the authors decided to choose one of the 44 companies presented and give a special focus on the description.

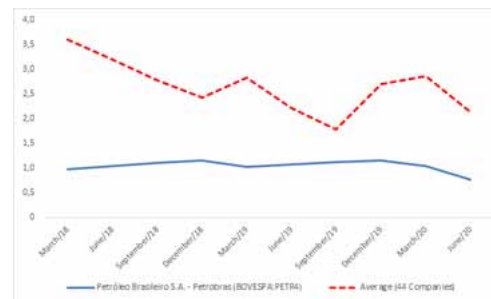
Petrobrás is an oil and gas extraction Brazilian company, founded in 1953. According to Abreu et al. (2018), this company has been in the ranking to recognize the transparency of its financial statements of publicly traded companies with revenues exceeding \$ 5 billion in 2014.

Brazil was an oil importer until the end of the last century and the concern of the economic authorities of that period was centered on the reduction of imports. After this period, the country became an oil exporter, and along with that, came Petrobras and the decision to link its price policy to those practiced daily in the international market.

Table 5. Petrobras Z-Scores

Company	mar/18	jun/18	sep/18	dec/18	mar/19	jun/19	sep/19	dec/19	mar/20	jun/20
Petróleo Brasileiro S.A. - Petrobras (BOVESPA:PETR4)	0,972	1,04	1,11	1,16	1,02	1,08	1,13	1,15	1,05	0,771
Mean score (44 companies)	3,6	3,2	2,78	2,43	2,84	2,22	1,79	2,7	2,85	2,14

Figure 4. Petrobras Z-scores along the 10 quarters.



We also must take into account that this company was the target of a huge investigation in Brazil, from the dates 2009 to 2014. According to the data disclosed in the Financial Statements Notes to the 2014 Petrobras, published in 2015 (after a comprehensive review of accounting numbers), by the Brazilian Federal Police, seeking to ascertain practices money laundering by criminal organizations in several Brazilian states. This is one of the motives that Petrobras suffered with financial distress until the present date. It has been one of the most profitable public companies in Brazil before 2008.

The Z-score of Petrobras has been quite constant in the last 10 quarters, a fact that is different from the industry average, which suffered a lot of variation in that same period. Despite the constancy and a slight worsening in June 2020, Petrobras' figures are not encouraging, following the logic of the indicator the company remains in a bankruptcy risk zone.

Petrobras has another aggravating factor in the crisis, as China absorbs more than half of the oil exported by Brazil. With the retraction in Chinese demand, the sales levels for this country returned to the standard of 2018, once the country reduced the industrial, transport and tourism sectors, with the cancellation of 200 thousand flights and the stoppage of production lines.

According to company ex-president Roberto Castello Branco, the Chinese market is very attractive to Petrobras and there is no economic or geopolitical difficulty for Petrobras not to continue selling products to China or fail to benefit from low-cost Chinese equipment. It is worth mentioning that Petrobras has 5 Floating Storage and Transfer Units, used for offshore oil production ordered from Chinese shipyards.

In the company during the month of May, 34 fields had their respective production temporarily interrupted in the Covid-19 pandemic, of which 16 seafarers and 18 onshore, and a total of 60 post-production facilities were interrupted. In April, they moved to 38 fields and 66 facilities.

Today, gasoline and diesel drive about 90% of new cars sold in the world. And these products are a very important part of the earnings of oil companies. In the case of Petrobras, for example, 50% of the current production is gasoline and diesel for road transport.

The company's situation worsened in February 2021, when the president of Republican of Brazil, Jair Bolsonaro, appointed General Joaquim Silva e Luna as president of the company in place of economist Roberto Castello Branco. On 02/22/2021, Petrobras preferred shares closed the trading session with a 21.51% drop, quoted at R \$ 21.45, in the second biggest drop in assets in its history. The biggest drop, so far, had occurred at the height of the uncertainties caused by the covid-19, on March 9, 2020, when the paper collapsed 29.68%.

There are questions about the way in which Castello Branco was removed from office and doubts, for example, about the effects that the change in the company's command may have on fuel price policy.

Despite the recovery in oil prices in 2020, Petrobras financial results in the fourth quarter should be negatively impacted by the drop in oil and gas production in the period.

CONCLUSION

The change in consumption habits (electric cars, sustainable products ...), which was happening before the pandemic, together with the drop in consumption with the pandemic (industries stopped, people doing home office ...) seems to have caused a perfect storm for the oil sector. Falling consumption and rising production are making oil prices one of the lowest in recent years.

Between 2020 and 2030 global emissions of greenhouse gases have to be cut in half, to avoid the most dangerous impacts of climate change and contain global warming within the limits set out in the Paris Agreement.

That implications have a huge negative impact in oil companies and in economies, since they are large companies, which generate many jobs, tax collection and often political control in the countries where they are installed.

The curse of oil is popularly spoken, as it can create distortions, since it is necessary to effectively manage the fiscal regime and create sovereign wealth funds. It is easy to depend on oil alone, but it is necessary, for example, to encourage entrepreneurship and strengthen the legal system. For some countries, oil is beneficial, such as Malaysia and Norway. It brings money for education and health, but it needs to be managed. It is a challenge for countries that receive a lot of revenues to manage them in the economy.

The price of a barrel of oil has benefited from the growing hope that covid-19 vaccines will help improve demand trends in the economy, which have been weakening with the impact of the pandemic on business activity.

However, if vaccines do in fact have delays in regulatory approvals, it will affect the market that has bet on a brief recovery in oil demand, hoping the world can travel freely again sooner than expected.

To avoid the bankruptcy of oil companies, being competitive in the energy transition is important. Saudi Arabia and Russia are low-cost producers, and this is an advantage. Large producers have the challenge of diversifying the economy, which is not a problem today, but it will be in the future. China has significant advantages because of the focus on new technologies, such as the value chain for batteries, solar panels and electric cars.

There are many signs that the era of declining oil is underway: China announced a zero-emission target in 2060, England will ban the sale of new gasoline cars in 2030 and with the election of Joe Biden in the USA, this pressure it will be even bigger. All this puts pressure on oil companies, while they cannot accelerate production because there will be a little demand. Moreover, in the immediate future, the pandemic and the shutdown of industries and the decrease in transport seems to have had an important impact on the immediate financial performance of the oil industry, reducing its financial sustainability.

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Chapter 8

Financial Management for the Successful Company Value

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ABSTRACT

This chapter deals with the issue of valuation of business entities. Based on literary research, which forms the basis of the chapter, two practical examples are given. The aim of the first example is to evaluate the financial situation of the concrete company for the period of 2007-2019 using valuation tools (financial analysis, creditworthiness and bankruptcy models, EVA). The purpose is to capture the course of an expansion disrupted by the great financial crisis that erupted in 2008 and to monitor the gradual return of corporate activities. The results of the analysis show that the financial crisis initially had a significant impact on the company but was nevertheless averted. The aim of the second example is, with the help of neural networks, to determine the relationship between the value generators of a company and EVA equity of small and medium-sized enterprises operating in rural areas of the Czech Republic in the period of 2013-2017. It is found that successful companies are distinguished from unsuccessful ones by the degree of human capital involvement.

INTRODUCTION

We can say that the majority of expert literature including the leading world economists share the opinion that the primary strategic aim of every business entity, regardless of its industry should, in general, always rely in the growth of its value. Knowledge of business value is very important, mainly because it is necessary to continuously increase the wealth of shareholders and the interests of other interested

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groups. Mainly due to this, it is equally important to understand and also determine the factors that influence the value of the business entity. The aim of running a business is, thus, the value of the business that is of course dependent on its ability to generate future yield. That means that it quite significantly depends on the uniqueness and quality of product or service on offer influencing the product's demand, on an efficient cost management, on the business's position on the market, innovative ability of the business employees, efficiency of the use of available resources or the ability to search for new investment options (i.e. manage processes and activities within the business). At the same time, it means that all decisions within the given business must be accepted from the perspective of impact on the value of the business. At the moment, the process of determining the value of a business entity is among very promising fields. To get to the most exact result possible, it is necessary to pay great attention to this issue, and give it enough space as well.

In today's still transforming economic environment, the problem of business evaluation keeps on growing its importance. The process of evaluating business entities represents the main element serving the understanding of resources serving the competitive ability of an enterprise and it represents the source of support in establishing enterprise strategy. Even the current generation of entrepreneurs is fully aware of how significant it is to know both their value and financial condition, mainly in case of strategic decision-making. It may be declared that information about the financial situation of a company is practically necessary. Information about the past may help the company discover in which areas it was doing well, which goals and tasks were fulfilled, but it may also point at situations, which the company was not able to deal with or which situations may be expected in the nearest future. Some expert literature even claims that the success of a business entity is directly dependent on an exact prediction of its future development. There are opinions, very often, that the motto of a company where the managers are capable of high-quality management and decision-making it is necessary to have truthful information, both about its situation as well as its current situation, but also about the situation of its individual branches. Due to this, it is useful to know about methods that are determined for the purpose of predicting the future development of the company as well as its financial situation.

We may claim that in practical terms, there is a whole range of tools with the use of which the financial condition, respectively the economic situation of a company may be evaluated. Completely primary methods of business evaluation were used mainly by tools of financial analysis the potential of which lies in an answer that refers to the total financial position of a business entity.

The basic material for this chapter will consist of a high-quality current literature review using the sources of renowned world databases such as Web of Science and Scopus. The chapter deals with theoretical as well as practical aspects, and presents specific cases of how to analyse and manage the main aim – maximization of company evaluation for shareholders. Further, examples of financial evaluation at specific types of companies using standard and innovative methods (superficial intelligence) will be processed.

The chapter deals with the financial analysis of a selected business and its analysis using artificial neural networks. The aim of the first example is to evaluate the financial situation of the concrete company for the period of 2007 - 2019 using valuation tools (financial analysis, creditworthiness and bankruptcy models, EVA). The aim of the second example is, with the help of neural networks, to determine the relationship between the value drivers of a company and EVA Equity of small and medium-sized enterprises operating in rural areas of the Czech Republic in the period of 2013 - 2017.

First, the theoretical background is described. In this context, terms such as business value, business value drivers, tools to measure business value, and artificial neural networks are defined. Furthermore,

an example of financial analysis is presented including the description of the results achieved. In the following part, the calculation of Economic Value-Added indicator. Finally, a second example is presented with the application of artificial neural networks. This is followed by a summary of the results achieved and recommendations for further research. The conclusion presents new findings and the most important results achieved within this chapter.

THEORETICAL Background

Business Value

In the current changing and very dynamic world, the position of businesses in the market and business activities is really complex, as market requirements include maximum performance, optimal adaptation, and prospects. Competitive advantage is determined by the way a business is able to work efficiently and how it manages its own assets and resources. A competitive environment enables healthy functioning only of those businesses that have excellent control of their finance.

The approaches concerning the evaluation of a business performance have undergone considerable development in recent years. For this reason, the priority is not the maximization of profit but the maximization of the value of the business. To achieve this long-term goal, it is necessary to achieve all the sub-goals of the business. Zareba (2014) believes that in general, the main target of every business entity is the value creation for its owner. Due to the complexity of current business entities and the increasing customer desires and demands they compete for, the business objectives focused on value must be efficiently managed at all levels of the business. A properly considered corporate strategy will be successful only if business goals are transparent, controllable, and understandable for employees.

According to Gamayuni (2015), business value plays a significant role; for this reason, it is necessary to constantly increase the wealth of the individual shareholders as well as the interests of other stakeholders. It is therefore very important to understand and determine the factors that affect the value of a business entity.

Managers' efforts consist in the maximization of growth, since the increasing business growth rate affects also the profit and the market share. Too high growth can result in excessive consumption of corporate resources or even bankruptcy. According to Vochozka (2011), it is thus necessary to maintain optimal growth. The author also adds that the expected growth is directly linked to the expected FCFF (free cash flow to firm). In this context, there are questions about how to ensure growth opportunities. One possibility is to reinvest more and further invest in projects that will ensure higher capital appreciation. In the case that a business does not have any growth opportunities, it is recommendable to consider acquisitions which would lead to an increase in value in the longer term.

Value Drivers for Businesses and Examples of their Application

The current, constantly transforming economic environment is characterized by a possible occurrence of many risks of decline in business performance and business value. According to Kazlauskiene and Christauskas (2008), this transformation in business value can be predicted by means of monitoring so-called value drivers. Kazlauskiene and Christauskas (2008) describe value drivers as activities or abilities that add value to a product, brand, service, or the business as such. According to the authors, value

drivers specifically refer to the activities or abilities that reduce risk, increase profitability, and encourage growth in accordance with the strategic goals. According to Hogan and Evans (2015), value drivers are factors that have a major impact on the success of a business, and are specific for many industries and businesses, with the exception of sales and earnings per share, which are constant in all industries.

Rylková and Bernatík (2014) state that value drivers enable the determination of the overall performance of a business entity. The authors also add that it is essential for businesses to measure their performance properly and sufficiently, otherwise, they will not be able to manage and control their activities adequately. In professional literature, this method of business management is referred to as Value-based Management (VBM). The implementation of VBM is a very complicated issue in terms of the identification of value drivers. Increasing value drivers in identification causes an increase in the value of the business entity as such (Salaga, 2015).

In practice, the issue of value drivers has been addressed by many authors. As an example, there is research conducted by Hall (2016), who determined variables creating the value of a business. The author focused on various categories of businesses and industries. Similar research was conducted by Kuzey et al. (2014), who examined the influence of financial indicators on the value of a multinational company. They paid particular attention to the leverage effect, profitability, liquidity, or the size of a business. Vidgen et al. (2017) identified the main areas of business that need to be focused on to achieve the ideal value. According to the authors, the popularity of big data and business analysis have increased tremendously in the last decade, and it is a key challenge for organizations to understand how to use them for achieving the ideal value. A different perspective is shown by Panaretou (2014), who assesses the influence of corporate activities in risk management on the value of a business. For this purpose, the author analyses a sample of large British non-financial firms.

What is also interesting are the examples of using value drivers in various industries. For example, Bluszcz et al. (2015) focused on increasing the value of businesses in the mining and metallurgy sector. A similar survey was conducted by Horák et al. (2019), who identified the value drivers of a business operating in mining in the Czech Republic. To achieve this objective, a practical methodology was proposed to identify the value drivers of the business. There were selected a total of 13 variables most participating in the creation of the value of the business. To measure the value, economic value added (EVA) Equity was used. The most important variables are as follows: total assets, capital, material consumption, energy consumption, depreciation of fixed tangible assets, amortization of fixed tangible and intangible assets. The aim of the work by Machová and Horák (2020) was to identify specific value drivers of forestry and logging companies in the Czech Republic in 2016. For this purpose, the best possible methodology for its determination was created. Artificial neural networks were used to identify and by means of EVA Equity to measure a total of 14 indicators most frequently involved in the process of creating the value of a business. The identified value drivers of the company were the following key variables: external resources, long-term liabilities, material and energy consumption, other operating costs, and sales of goods. Similar research was conducted by Strnadová et al. (2013), who tried to identify quantitative factors that positively or negatively affect business performance and thus its value. The research was conducted in businesses operating in the manufacturing industry in the Czech Republic. The purpose of the article by Vochozka and Machová (2018) was to identify the value factors of a transport company in the Czech Republic, if the value of the company is measured by means of EVA equity. The dataset contained complete financial statements of 1,500 transport companies in the CR for the year 2016. EVA Equity was calculated for each company. In total, there were determined 12 variables involved in the process of creating the value of companies. The main objective of the work by Vochozka and Machová

(2017) was to identify value creators in a construction company. A suitable methodology was created for this purpose. For the Czech Republic, value drivers were created in construction companies for the period 2006 - 2015. In total, there were identified 28 variables included in the process of creating business value, which is measured by means of EVA Equity. The most significant variables included the following ones: profit or loss for the current accounting period, equity, bank loans and disbursements, trade receivables, fixed assets, short-term assets. Yoo et al. (2012) focused on media industry. To understand and identify the real value of start-up companies in the media industry, the authors needed to examine the key value factors. The results showed that the phases of developing the product, market size, technological competence, and key talent are the five key factors of start-up companies in the Korean online gaming industry.

Tools for Measuring Business Value

In order to determine the value of a business, its success, performance, or overall financial situation, a wide range of tools, methods, and indicators is used in practice. One of the possibilities to e.g. measure the value of a business is to use the financial performance indicator EVA. EVA is a very important and useful means to assess business performance. EVA is capable of combining factors such as accounting, information on the market, and economics (Issham et al., 2008). Morard and Balu (2009) state that this indicator aims to express the real economic profit of a business. Its advantage consists in a clear assessment of economic performance of a business and also in taking into account the degree of investment risk. Kollar and Klietnik (2014) consider EVA to be the most advanced tool to measure business performance based on the principle of value management. According to Bluszcz and Kijewska (2016), EVA depends on the amount of capital invested and economic dimension expressed as the weighted average costs of equity and return on investments.

As traditional indicators started to be criticized over time, new approaches and methods were developed in business practice, which were also used for the evaluation of businesses. The best-known ones include e.g. the aforementioned EVA, benchmarking, creditworthiness and bankruptcy models, Balanced Scorecard, and also currently the increasingly popular artificial neural networks. The method of artificial neural networks is characterized by Vochozka (2017), who considers it to be an innovative and modern method which represents a flexible and non-parametric model tool based on historical data and the ability to make predictions for the future. The author further adds that there are many advantages of applying neural networks in business practice, including e.g. the ability to provide a quality prediction. As Sánchez and Melina (2015) state, artificial neural networks are applied in many areas and become increasingly popular due to the growing volume of the data acquired. Another advantage includes the fact that they are flexible and capable of fast and precise analysis of complex patterns. Nevertheless, Hossain et al. (2017) mention also the disadvantages of artificial neural networks, which include e.g. the requirement for a large amount of data on samples or optimization of hidden layers' topology, which is very time-consuming and complicated for computing process. Artificial neural networks were in practice used e.g. by Liu and Yeh (2016), specifically in relation to value drivers. The authors assessed the relationship between joint value creation and innovation in technologically managed businesses. Wilimowska and Krzysztozek (2013) use neural networks to predict value drivers.

Artificial Neural Networks (ANN)

According to Wu and Feng (2018), ANN are examples of artificial intelligence, which becomes applied in an increasingly higher number of industries and disciplines; it can be used in information technologies, medicine, psychology, as well as in ecology or economics. Industry 4.0 is a great example of the fact that the simple creation of ANN enabled further technological development in many fields. However, even before Industry 4.0, ANN were implemented in many industries as their integral part (Fertsch, 2020). As NN work with a large number of variables, and as a large number of financial variables participate in the operation of business, this method can be applied also for the prediction of the business value development. By their specific application in the business, the improvement in production may be achieved (Aka and Akyuz, 2018). The application of ANN is currently more widely used in various areas of finance, especially banking financial systems (Paule-Vianez et al., 2020) and predictions of stock prices development (Caliskan and Deniz, 2015).

Golizadeh et al. (2017) pointed to a great advantage of ANN. Thanks to the ANN's function, it is possible to correct the budget for individual investment activities of a business. This contribution deals with the budget of constructing dam projects. Another advantage of the ANN application in economics is the possibility to use them for predicting and warning businesses of possible financial distress. ANN can thus be used to simplify the computational process of individual bankruptcy and solvency indices (Lin, 2010). In predicting time series such as the creation of financial plan of business and estimating the development of its financial situation and future value on the basis of the plan, ANN can be used for eliminating possible errors and inaccuracies in the created financial plan (Wong et al., 2010). According to Babikir and Mwambi (2016), ANN are much more efficient in predicting the financial situation of a business than other linear combined predictive methods and show lower error deviation of predictions (2 - 12%). Thanks to these advantages, predictive methods based on ANN are preferred by individual researchers over linear predictive models. In addition to predicting the situation of a specific business, ANN can also be used for predicting the future situation in the market. This enables businesses to prepare themselves better for possible situations and respond to them promptly and easier (Ebrahimi, 2019). Yacim and Boshoff (2018) used ANN also for predicting the future development of real estate value to prove that predictions made using ANN are much more accurate and efficient than other linear predictive models.

In contrast, Sakalas and Virbickaite (2011) suggest using crisis situation diagnosis in a company (CSDC) rather than ANN in crisis situations when it is necessary to predict the future performance of the company. CSDC describes the causes of the crisis situation and is more useful in the process of crisis diagnostics, as it enables the evaluation of the depth of the crisis in the company and estimate the results and consequences of the crisis situation for the company. According to Ding et al. (2013), ANN show also certain shortcomings. One of the main disadvantages of ANN is the fact that the importance of ANN is evident only in their application for very complex and extensive data structure. Another disadvantage is that ANN work only with numerical data; it is thus not easy to convert the given problem into a numeric expression and subsequently find a given prediction from the resulting values. This problem, however, is eliminated in business economics.

CASES OF BUSINESS VALUE ANALYSIS

Following the theoretical basis above, the following chapters will deal with practical examples of a specific use of traditional and innovative methods applied for business evaluation.

Financial Analysis: The Case of Engel

The financial analysis will be prepared for the company Engel strojírenská s.r.o., which specializes in the production of plastic injection moulding machines and which is a part of the multinational concern Engel Holding GbmH. The analysis will be carried out on the basis of audit reports for current accounting period. In the case of Engel strojírenská s.r.o., it is the period between 1 April to 31 March of the following year. There will be used the data on the state of assets and capital (liabilities) at the end of the accounting period and from profit and loss account. The monitored period consisted of ten consecutive years, starting from the accounting year 2007/2008 to 2019/2020. The financial analysis was carried out in order to capture the course of the expansion affected by great financial crisis which started in 2008, and to monitor gradual recovery of corporate activities.

In terms of methodology, there will be first carried out the analysis of absolute indicators based on assets, liabilities, and profit and loss account. The purpose is the creation of a system of hypotheses that will be further elaborated in the analysis of ratios. Afterwards, the analysis using selected creditworthiness and bankruptcy models will be carried out. Also, the calculation of (EVA), in the variants of EVA equity and EVA entity must not be neglected. All ratios involved are specified below:

1. Profitability ratios:

- a. ROA (Return on Assets) – Profit before interest and tax / Assets.
- b. ROS 1 (Return on Sales) – Profit before interest and tax / Sales.
- c. ROCE (Return on Capital Employed) – (Profit before interest and tax) / (Equity + Long-term debt).
- d. ROE (Return on Equity) – Profit after tax / Equity.
- e. ROS 2 (Return on Sales) – Profit after tax / Sales.
- f. Return on own financial resources – Cash flow / Equity.
- g. Wage intensity of sales II – Personnel costs / Sales.
- h. Total assets turnover – Sales / Total assets.
- i. Financial leverage – Total assets / Equity.

2. Activity ratios:

- a. Assets turnover – Sales / Assets.
- b. Inventory turnover – Sales / Inventory.
- c. Asset turnover period – Assets / (Sales / 360).
- d. Inventory turnover period – Inventory / (Sales / 360).
- e. Average collection period – Receivables / (Sales / 360).
- f. Payables turnover ratio – Payables / (Sales / 360).

3. Debt ratios:

- a. Equity Ratio – Equity / Assets.
- b. Debt Ratio I. – Debt / Assets.
- c. Debt Equity Ratio – Debt / Equity.

- d. Interest coverage I. – Profit before interest and tax / Interests.
 - e. Interest coverage II. – (Profit before interest and tax + Depreciation) / Interests.
 - f. Cash Flow / ((Borrowed capital - Reserves) / 360).
4. **Liquidity ratios:**
- a. Net Working Capital – (Current Assets – Payables).
 - b. Working capital on Assets – (Current Assets - Payables) / Assets.
 - c. Capitalization ratio – Fixed Assets / Long-term capital.
 - d. Overall liquidity – Current Assets / Payables.
 - e. Current liquidity – (Short-term receivables + Financial assets) / Payables.
 - f. Monetary liquidity – Financial assets / Payables.
 - g. Payables turnover ratio – Payables / (Sales / 360).

Within the methods of comprehensive business evaluation, creditworthiness and bankruptcy models, as well as economic value added (EVA) methods will be used:

1. **Bankruptcy and creditworthy models:**
- a. Altman Z-Score for companies non-tradable on financial markets and modification intended for Czech companies.
 - b. Indexes of Mr and Mrs Neumaier (IN 95, IN 99, IN 01, IN 05).
 - c. Taffler model.
 - d. Kralicek Quick Test (original and modified).
 - e. Solvency index.
2. **Economic value added** (EVA Equity, EVA Entity). EVA Equity is calculated by means of the NN method, EVA entity by means of Capital Asset Pricing Model (CAPM).

In terms of methodology, it is necessary to present the facts to process economic value added (EVA). When calculating EVA Entity, (unlevered) beta for the accounting period of 2007/08 - 2010/11 will be obtained from the data of the United States of America, specifically from the section “Electronics”. Since the accounting period 2011/12, data from Europe is available, also from the section “Electronics”.

In the case of EVA Entity, there will not be calculated the rate using borrowed capital and the ratio of borrowed capital to overall capital, since borrowed capital or loans in Engel strojírenská s.r.o were of a short-term character and of a very low value (CZK 4,000).

Analysis of absolute values

The financial analysis of Engel strojírenská s.r.o. (hereinafter referred to as “Engel”) will first be carried out using absolute ratios. The data will be obtained from assets, liabilities, and profit and loss accounts for individual accounting years. All data are given in thousands CZK. For illustration, the shortened versions of assets, liabilities, and profit and loss account are presented in the following tables. Due to their extent, there will be always presented the tables representing more recent periods, i.t. from 2013/14 to 2019/20.

Table 1. Assets and liabilities of Engel for the period of 2013/14 - 2019/20

ASSETS		2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	ASSETS IN TOTAL	1,088,224	1,175,502	1,237,353	1,570,342	2,134,773	2,197,081	2,130,787
A.	RECEIVABLES FOR SUBSCRIBED CAPITAL	0	0	0	0	0	0	0
B.	FIXED ASSETS	528,943	531,040	495,654	868,730	1,443,921	1,515,714	1,462,495
C.	CURRENT ASSETS	559,032	643,647	739,424	697,878	689,542	676,932	666,081
D.	OTHER ASSETS – temporary asset account	249	815	2,275	3,734	1,310	4,435	4,435
LIABILITIES		2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	LIABILITIES IN TOTAL	1,088,224	1,175,502	1,237,353	1,570,342	2,134,773	2,197,081	2,130,787
A.	EQUITY	602,203	719,934	805,619	858,720	969,932	1,032,765	1,096,371
B.	BORROWED CAPITAL	486,021	455,568	431,734	711,622	1,164,841	1,164,316	1,034,416
C.	OTHER LIABILITIES – temporary liabilities account	0	0	0	0	0	0	0

Source: Authors

Table 2. Profit and loss account for the period of 2013/14 - 2019/20

Item		2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
II.	Performance	1,970,459	2,319,654	2,551,713	2,716,989	3,213,863	2,961,719	2,723,750
I.	Sales of own products and services	1,968,523	2,310,795	2,551,713	2,716,989	3,213,863	2,961,719	2,723,750
+	ADDED VALUE	383,224	474,132	478,732	457,309	568,572	638,392	805,663
*	OPERATING RESULT	56,432	125,807	104,224	54,517	92,232	65,072	122,991
*	FINANCIAL ECONOMIC RESULT	5,396	-31,164	-22,553	-6,138	16,785	-1,298	-50,789
**	ECONOMIC RESULT FOR ORDINARY ACTIVITIES	68,779	97,513	81,671	48,379	109,017	63,774	72,202
***	Economic result for accounting period	68,799	97,513	85,685	53,101	111,212	62,833	63,606

Source: Authors

In the period of 2013/14, the company started the construction of new social facilities. From the economic point of view, this meant a certain slowdown. There was a slight increase in performance (by 2.3% in the interim period); on the other hand, production consumption increased by nearly 4%, personnel costs by 4%, and other operating costs by 46%. This results in the decrease in the operating result by 47% (to CZK 56,432). Due to higher interest income and other financial income, the financial result showed a positive development (CZK 5,396). The resulting earnings after tax (EAT) decreased by 38% (to CZK 61,828). From the perspective of assets and capital, current assets increased slightly, while fixed assets decreased. With growing volume of current assets, there is also an increase in the borrowed capital in the company. The growing trend was also shown in the case of equity, which was to a large extent due to the economic result from the previous years.

In the following accounting period (2014/15), the Engel management declared a growth in orders and important investments in purchasing new lands and new technologies. There was also significant investment in fixed assets. Here, investment optimism is understandable, since the operating result increased more than twice (to CZK 125,807). Given the investment costs, the financial result in the interim period decreased by CZK 36,560. The level of borrowed capital in Engel was maintained between CZK 443,727 and 486,337.

The accounting period of 2015/16 meant certain compromises for Engel from the economic point of view. The operating result decreased nearly by 18% due to its higher production consumption. The financial result was again very negative (CZK -22,553). The share of borrowed capital in the interim period decreased; the management of the company used selling of fixed assets and material to increase liquidity. A more important accounting period appears to be the period of 2016/2017. In 2016, Engel started to dramatically increase its production capacity, and expand its office building and parking areas. The amount of investment exceeded CZK 1,000,000, thus achieving the current historical maximum of fixed assets (CZK 868,730). The value of current assets decreased by 6%, while for investments, it was necessary to increase the amount of borrowed capital in the interim period by 64%. The operating result decreased by 48% (again, due to increasing production consumption and operating costs). The stabilization of financial result can be evaluated positively, as despite of being negative (CZK -6,138), it was significantly lower in the interim period. EAT decreased to CZK 53,101.

The remaining two accounting periods can be summarized using the same results. The asset and capital structure of Engel did not change significantly. The financial management after the development stage during the period of boom showed the signs of stabilization. EAT for the periods of 2018/19 and 2019/20 can be evaluated as positive, although the operating results were inconsistent and the financial result in the last accounting period showed the second worst result (CZK -50,789) within the monitored period due to other financial costs. Despite of this, it can be stated that the COVID-19 has not had much effect on the overall economic result so far. Figure 1 below shows the development of equity, borrowed capital, and other liabilities of Engel for the whole monitored period. Naturally, it is also possible to monitor the development of other items, such as the asset structure (other, current, fixed assets) or the structure of economic results (financial, operating).

Ratio analysis

In this chapter, the analysis of Engel will be carried out using ratios. First of all, selected profitability, activity, debt, and liquidity ratios will be used. Individual ratios are given in the tables, where they are presented in their shortened form, that is, not for the whole monitored period but only for the period of 2013/14 - 2019/20. In some cases, there are also presented graphs which show the development of the company for the whole monitored period.

Figure 1. Equity, borrowed capital, and other liabilities of Engel for the whole monitored period

Source: Authors

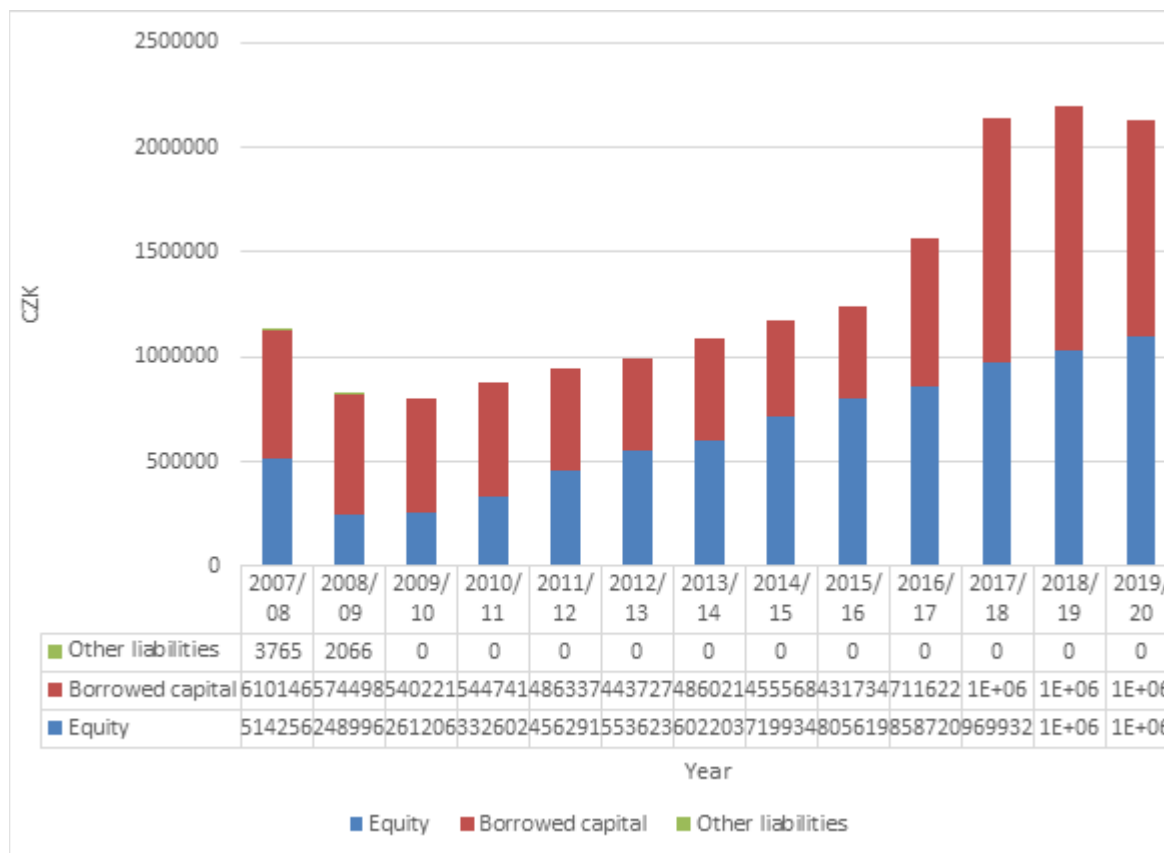


Table 3. Profitability ratios for the period of 2013/14 - 2019/20

Ratio	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
ROA – Return On Assets	6.42%	8.66%	7.07%	3.36%	5.36%	3.14%	3.57%
Return On Sales	3.55%	4.41%	3.43%	1.94%	3.56%	2.33%	2.80%
Total assets turnover	1.81	1.97	2.06	1.73	1.51	1.35	1.28
ROCE – Return On Capital Employed	8.55%	11.17%	9.09%	4.59%	7.01%	3.78%	4.16%
ROE – Return On Equity	11.42%	13.54%	10.64%	6.18%	11.47%	6.08%	5.80%
Total assets turnover	1.81	1.97	2.06	1.73	1.51	1.35	1.28
Financial leverage	1.81	1.63	1.54	1.83	2.20	2.13	1.94
Return on own financial resources	12.58%	13.94%	10.64%	6.18%	11.47%	6.08%	5.80%
Return On Sales	3.49%	4.22%	3.36%	1.95%	3.46%	2.12%	2.34%
Wage intensity of sales II (from total personnel costs)	13.41%	13.25%	13.76%	15.30%	15.93%	19.74%	22.27%

Source: Authors

Figure 2. Development of ROA, ROE, and ROCE for the monitored period

Source: Authors

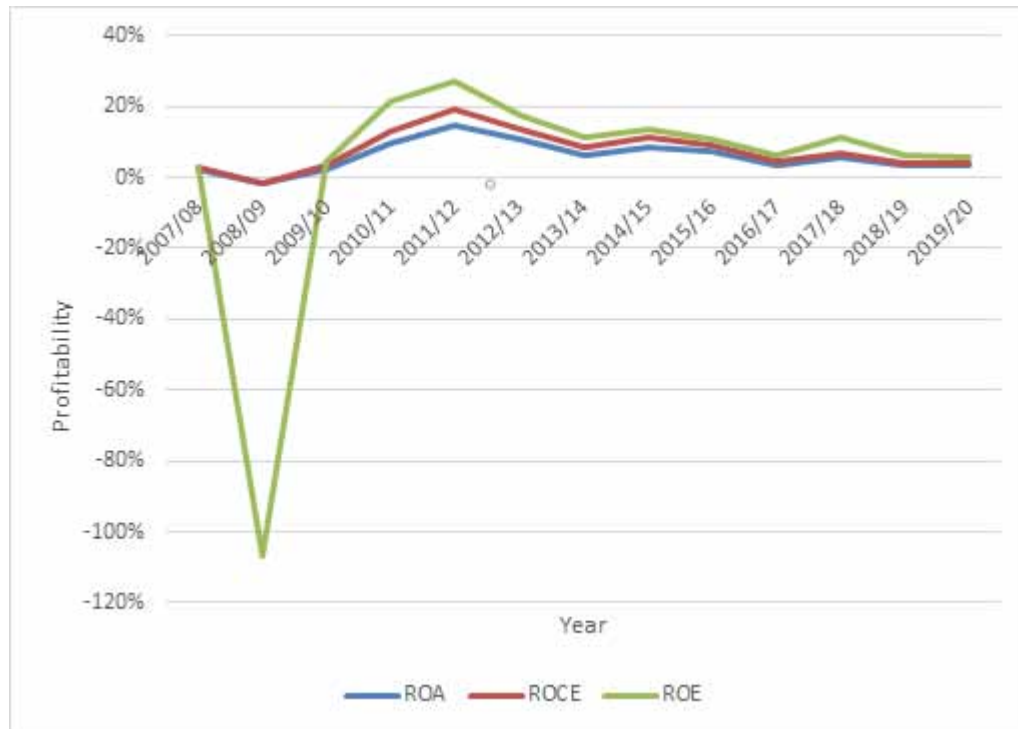


Table 4. Activity indicators for the period of 2013/14 - 2019/20

Ratio	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Asset turnover	1.81	1.97	2.06	1.73	1.51	1.35	1.28
Inventory turnover	9.21	12.78	12.51	10.30	10.88	9.83	8.08
Asset turnover period	199.01	183.13	174.57	208.07	239.13	267.06	281.63
Inventory turnover period	39.11	28.16	28.79	34.97	33.08	36.63	44.55
Average collection period	23.62	23.53	20.98	26.45	33.79	32.69	23.47
Payables turnover ratio	43.13	35.73	33.97	51.13	52.63	43.45	39.88

Source: Authors

ROE showed very confusing values within the whole monitored period. The cause is disproportionate growth of equity and Earnings Before Interest and Taxes (EBIT). The resources of the company were not used fully efficiently. ROA did not exceed 10% for the 85% of the whole monitored period. In this case, it is up to the financial management to consider whether the power of total assets should not be reassessed, as they are not actively involved in the generation of profit. ROCE takes into account the involvement of long-term capital in generating gross profit (EBIT). It is appropriate that its percentage value is higher than the interest rate from long-term loans (liabilities). In the last two years of the monitored period, it

decreased to 3.78% (2018/19) and 4.16% (2019/20). The total assets turnover is very similar to ROA. It illustrates how many times assets turned into sales. In the period of 2015/16, Engel managed to achieve this more than double. This correlates with the ROA values and confirms the excess of the company's "non-engaged" assets.

Based on the results, it can be stated that Engel's assets were substantial, as the best result for the whole monitored period refers to roughly double the asset transformation in sales (2015/16).

The results of the ratios such as inventory turnover are relatively stable and show relatively active involvement of inventory in generating the outputs of the company. An alternative to assets and inventory turnover is their daily expression – asset turnover period and inventory turnover period. These ratios show how many days it takes the company to conversion of assets/inventory into sales. The shortest period was necessary in the accounting year 2014/15 (184 days). In the last five accounting years, there can be seen a growing development trend caused by enormous growth of the total assets. At the end of the monitored period, it took 282 days to convert assets into sales, which was the second highest number. Inventory turnover period fluctuated between 31.90 (2012/13) and 44.52 (2019/20).

The overall development of the inventory turnover period did not show any significant growing or decreasing trend, its values can be described as relatively stable. Payables turnover ratio was between 79 and 32 days. The last three accounting years show a decreasing trend in the payables turnover ratio, which is a positive ratio. Engel thus appears to be a relatively reliable business partner.

Table 5. Debt ratios for the period of 2013/14 - 2019/20

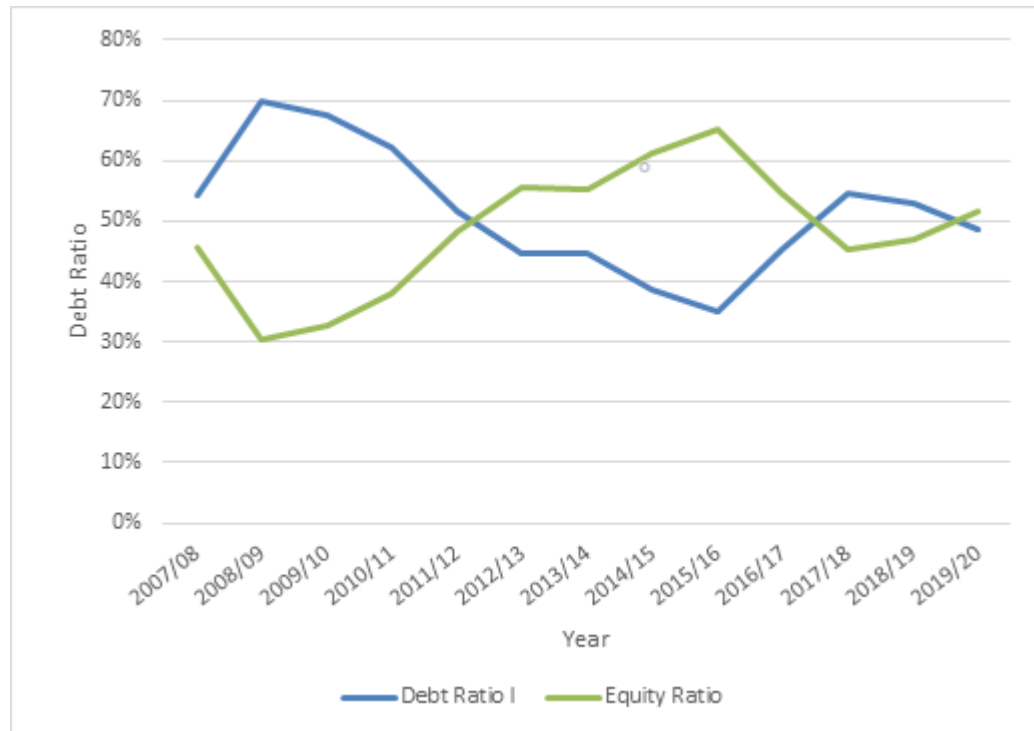
Ratio	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Equity Ratio	55.34%	61.24%	65.11%	54.68%	45.43%	47.01%	51.45%
Debt Ratio I.	44.66%	38.76%	34.89%	45.32%	54.57%	52.99%	48.55%
Debt Equity Ratio	0.81	0.63	0.54	0.83	1.20	1.13	0.94
Interest Coverage I.	8.69	14.21	15.00	12.07	20.90	13.21	19.35
Interest Coverage II.	14.94	21.47	23.75	22.97	29.91	30.68	50.13
Cash Flow / ((Borrowed capital – Reserves)/360)	63.71	93.34	85.35	30.25	37.59	21.39	24.73

Source: Authors

The first is the Equity ratio, which compares equity with total assets. Its development can be described as quite inconsistent. An even more interesting phenomenon is how borrowed capital was reflected in the fixed assets of Engel. This information is provided by Debt Ratio I. Its values oscillated especially in the accounting year 2015/16 (34.89%). In terms of Interest Coverage I., Engel performed well, as it was able to "overpay" its interest payable by its was EBIT, even almost 21 times in the accounting year 2017/18. Interest Coverage II. using depreciation was even better, with the highest value achieved in the last accounting year, 2019/20 (50.13).

Figure 3. Development of Debt Ratio I and Equity Ratio for the monitored period

Source: Authors



The development of Debt Ratio I shows the period of investment incentives of Engel, the efforts to “invest through” the crisis period to obtain new orders by means of new modernized production capacities in the accounting year 2008/09, which was followed by a decline in debt. In the last three years, with the expansion of production and administrative capacities, Engel became more indebted again. The inverse of Debt Ratio I is Equity Ratio. The data can be verified on the course of its curve.

Table 6. Liquidity ratios for the period of 2013/14 - 2019/20

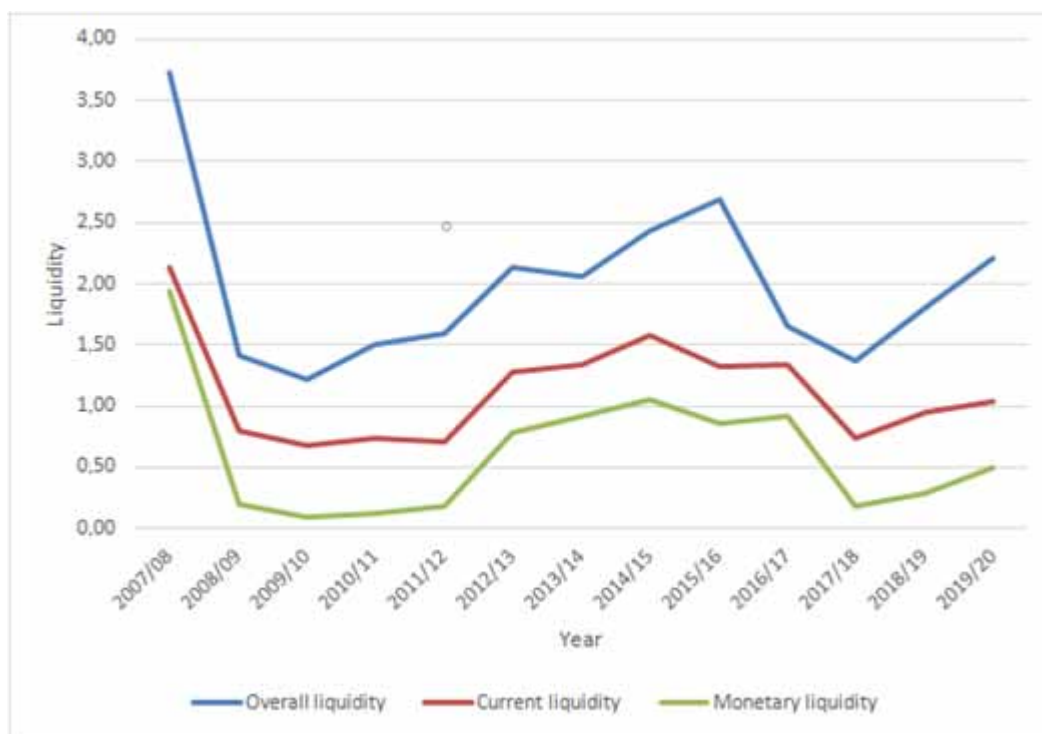
Ratio	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Working Capital	275,705	365,180	447,391	255,951	163,490	280,165	349,759
Working Capital to Assets	0.25	0.31	0.36	0.16	0.08	0.13	0.16
Capitalization ratio	0.65	0.58	0.52	0.76	0.88	0.83	0.80
Overall liquidity	2.06	2.43	2.69	1.66	1.37	1.81	2.21
Current liquidity	1.34	1.58	1.33	1.34	0.74	0.94	1.04
Monetary liquidity	0.91	1.06	0.85	0.92	0.18	0.29	0.50
Payables turnover ratio	43.13	35.73	33.97	51.13	52.63	43.45	39.88

Source: Authors

It can be said that working capital is a part of current assets net of all short-time debts. The lowest values of net working capital (NWC) were recorded during the period of economic crisis, in the accounting year of 2008/09 (CZK 83,562) and 2009/10 (CZK 47,522). This was followed by growth, which stopped in the accounting period of 2015/16, and afterwards, by decline for the two following accounting years (2016/17 and 2017/18). In the last two accounting periods, NWC showed growth again. The key agent in the growth of NWC had very dominant and growing current assets. In the following part, attention will be paid to overall liquidity, current liquidity, and monetary liquidity.

Figure 4. Development of overall liquidity, current liquidity, and monetary liquidity for the whole monitored period

Source: Authors



Interestingly, at the beginning of the monitored period, current and monetary liquidity showed very similar values. It was due to the low value of short-time receivables. All three types of indicators decreased afterwards, especially the values of monetary liquidity were very close to axis x. This was followed by the increase in the liquidity of all three ratios. In the accounting year of 2016/17, where there was a decline in liquidity again, all three types of liquidity showed very similar values, as the share of short-time receivables and financial assets on current assets was highest. Subsequently, there was a decline in liquidities, achieving the second lowest local values (in the accounting year of 2017/18). Finally, the last two accounting years of the monitored period showed a positive growth of liquidity.

Table 7. Selected ratios of creditworthiness and bankruptcy models for the period of 2013/14 - 2019/20

Ratio	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Altman – Modification for Czech companies	4.92108592	5.92108592	6.92108592	7.92108592	8.92108592	9.92108592	10.9210859
Altman Z-Score – Companies non-tradable on financial markets	2.05791803	3.05791803	4.05791803	5.05791803	6.05791803	7.05791803	8.05791803
IN 95	3.24157782	4.24555884	4.33736194	3.22681075	4.09397069	2.98436249	3.65339582
IN 99	1.23561271	1.42321557	1.39407233	1.06599868	1.03595781	0.85108775	0.78879022
IN 01	1.51605447	1.94517503	1.99481445	1.42267019	1.69980032	1.27414439	1.53015611
IN 05	0.92232724	1.04950074	1.12813321	0.8123493	0.66495872	0.6266297	0.62310644
Taffler model	5.64862707	6.64862707	7.64862707	8.64862707	9.64862707	10.6486271	11.6486271
Kralicek Quick test - (original) Average grade	1.5	1.75	1.75	1.5	2.5	2.5	2.5
Kralicek Quick test I (modified) – Average grade	4.25	5.25	6.25	7.25	8.25	9.25	10.25
Solvency index	1.27663302	1.57552	1.42148183	0.85892768	1.06300909	0.73701914	0.77475243

Source: Authors

Table 8. Calculation of Eva Equity for the period of 2014/15 - 2019/20

	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Risk-free yield	0.67%	0.49%	0.53%	1.50%	2.01%	1.51%
Ratios characterizing the size of the company	2.68%	2.56%	2.51%	2.33%	2.26%	2.15%
Ratios characterizing the production power	0.00%	0.00%	0.00%	0.01%	0.68%	1.00%
XP ¹	0.034	0.036	0.031	0.054	0.152	506.179
EBIT/Assets	8.66%	7.07%	3.36%	5.36%	3.14%	3.57%
Ratios characterizing the relationship of assets and liabilities	0	0	0	0	0	0
Overall liquidity	2.81	3.07	1.81	1.47	1.89	2.21
Current liquidity	2.02	2.22	1.12	0.84	1.05	1.09
Weighted average costs of capital (NN²)	3.35%	3.05%	3.04%	3.84%	4.95%	4.66%
Return On Equity	13.54%	10.64%	6.18%	11.47%	6.08%	5.80%
Alternative costs of Equity (NN)	3.28%	2.92%	2.93%	3.58%	4.62%	4.37%
Repayment resources (Equity + bank loans + issued bonds)	877,606	926,137	944,725	1,018,480	1,049,212	1,096,375
Corporate tax rate	19%	19%	19%	19%	19%	19%
EVA Equity	73,931	62,189	27,909	76,497	15,107	15,655

Note: ¹auxiliary variable for calculating business risk;

²build-up model.

Source: Authors

Table 9. Calculation of EVA Entity for the period of 2014/15 - 2019/20

	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Profit before tax and interest	101,805	87,503	52,750	114,496	68,995	76,137
Corporate income tax	19%	19%	19%	19%	19%	19%
Total capital	877,606	926,137	944,725	1,018,480	1,049,212	1,096,375
Borrowed capital	157,672	120,518	86,005	48,548	16,447	4
Borrowed capital/total capital	0.18	0.13	0.09	0.05	0.02	NA
Rate of using borrowed capital	4.54%	4.84%	5.08%	11.29%	31.74%	NA
Equity	719,934	805,619	858,720	969,932	1,032,765	1,096,371
Equity/Total capital	0.82	0.87	0.91	0.95	0.98	1.00
Alternative costs of Equity (CAPM)	2.55%	2.40%	2.15%	3.18%	4.13%	4.06%
Risk-free yield	0.67%	0.49%	0.53%	1.50%	2.01%	1.51%
Beta levered	0.82	0.81	0.78	1.02	1.08	1.15
Beta unlevered	0.97	0.91	0.84	1.06	1.09	1.15
Risk premium	1.05%	1.11%	1.00%	0.81%	0.98%	1.11%
Weighted costs of equity (CAPM)	2.76%	2.60%	2.33%	3.47%	4.47%	4.35%
Costs of Equity	24,185	24,067	21,977	35,318	46,911	47,733
EVA Entity	58,277	46,810	20,751	57,424	8,975	13,938

Source: Authors

Analysis Based on Creditworthiness and Bankruptcy Models

The table below presents the results of bankruptcy and creditworthy models. For illustration, the table presents only the results for the period of 2013/14 - 2019/20. This analysis was performed from the beginning of the monitored period.

Kralicek Quick test classified Engel as an unstable company in the 61% of the monitored period. The evaluation based on the modified version of the Kralicek Quick test is even worse, as it classifies Engel as an insolvent company. Finally, the text also mentions solvency index, which can be seen as very unstable in terms of the evaluation of the company, as during the peak of the crisis, its creditworthiness was evaluated as “extremely poor”. In the following “expansion” period, it pointed to the problems with creditworthiness, thus ruling out a stable development.

Calculation of EVA

In the following text, EVA will be constructed using a build-up model (EVA Equity) and CAPM (EVA Entity). The calculation of EVA Equity and EVA Entity is given in the tables below. Due to the large amount of the data available, there will be presented only the tables describing the latest period, specifically the period of 2014/15 - 2019/20.

EVA Equity constructed using the build-up model is based on the internal corporate structure. Its application in the calculation under these conditions is suitable for owners or managers within the company. The principle of calculation algorithm is given by multiplying the value of equity by the difference

of ROE and alternative costs of equity (NN). In the period of 2014/15, EVA Equity showed a positive development, although in the previous accounting year (2018/19), there was a significant decrease due to a lower ROE and higher costs of equity.

The model of EVA Entity constructed using the CAPM method uses a whole range of external variables (beta coefficient, risk premium etc.). It is suitable for potential investment subjects operating outside the company. EVA Entity is calculated as EBIT reduced by the tax, from which costs of equity are subtracted.

Also EVA Entity achieved positive values in this period. In the accounting year of 2018/19, EVA Entity showed a similar declining trend as EVA Equity. This result was caused by nearly 40% decrease in EBIT in the interim period, with the costs of equity growing nearly by 33%.

Table 10. Active networks: value drivers

Index	Network	Train. perf.	Test. perf.	Valid. perf.	Train error	Test error	Valid. error	Train. algorithm	Error function	Activation of hidden layer	Output activation function
1	MLP 6-9-1	0.553456	0.304536	0.443421	284492002	305580778	168203420	BFGS (Quasi-Newton) 84	Sum of squares	Tanh	Logistic
2	MLP 6-7-1	0.561726	0.398765	0.443425	282033996	281408284	168076256	BFGS (Quasi-Newton) 83	Sum of squares	Logistic	Logistic
3	MLP 6-5-1	0.526475	0.353425	0.457463	298412060	292169990	164808540	BFGS (Quasi-Newton) 68	Sum of squares	Logistic	Identity
4	MLP 6-11-1	0.519654	0.363623	0.440123	302318885	290697617	166504593	BFGS (Quasi-Newton) 113	Sum of squares	Exponential	Sinus
5	MLP 6-7-1	0.573425	0.383543	0.456372	275783357	286465671	166744171	BFGS (Quasi-Newton) 92	Sum of squares	Tanh	Logistic

Source: Authors

Artificial Neural Networks Analysis – The Case of Czech SMEs Operating in Rural Areas

For the purposes of this example, data from the Albertina database from Bisnode will be used, specifically, profit and loss accounts of SMEs operating in the rural area of the CR between 2013-2017 within the whole range of CZ-NACE. The dataset generated from the database includes a total of 193,122 data rows and will be further modified in MS Office Excel, i.e. there will be calculated ratios such as ROA, ROE, necessary components, and individual ratio EVA Equity. In the following step, the data will be cleaned of extreme and nonsensical values. After these modifications, a total of 42,592 data rows will remain.

Volumetric breast density (VBD) is calculated using Tibco's Statistica software, version 13. There will be applied modules such as DATA MINING, Neural networks, regression analysis. The whole procedure will be carried out in two steps – experiments, where in the case of the first experiment, the independent variables will represent value drivers only, while the second experiment will include region as well (i.e. the place of business). There will be sought the dependence of EVA Equity on independent VBD and place of business. Moreover, sensitivity analysis will be performed, which will characterize the importance of VBD and place of business. The result expected is a set of value drivers which will enable the managers to regulate the growth of EVA Equity or its value for owners.

Table 11. Sensitivity analysis: value drivers

Retained NN	Personnel costs	Services	Costs of goods sold	Interest payable	Material and energy consumption	Depreciation of FA
1.MLP 6-9-1	1.197400	1.163747	1.203727	1.139382	1.077382	0.990382
2.MLP 6-7-1	1.276765	1.148372	1.169002	1.141002	1.060222	0.997373
3.MLP 6-5-1	1.573547	1.053833	1.090292	1.130027	1.047712	1.009393
4.MLP 6-11-1	1.118736	1.383838	1.077433	1.129222	1.109372	0.990043
5.MLP 6-7-1	1.616473	1.255236	1.209111	1.140711	1.089392	0.998266
Average	1.353626	1.203727	1.140393	1.130022	1.077382	0.991010

Source: Authors

Value Drivers and Eva Equity

The following table presents active networks, or networks that were trained and retained. These are networks with the best characteristics, i.e. the best ratio of performance and errors in the individual datasets.

It follows from above that the performance of NN models is not very high; however, this statement could be used to describe the relationship of value drivers (production factors) and EVA Equity. The most interesting model is considered to be NN 2. MLP 6-7-1, whose performance is 0.56 in the training dataset, 0.4 in the testing dataset, and 0.44 in the validation dataset. This network was trained using the algorithm Quasi-Newton 83, and to assets, it applies logistic function for the activation of the hidden and output layer of neurons.

The second best network is NN 5. MLP 6-7-1, which was trained using the algorithm Quasi-Newton 92.

This step is followed by obtaining the model's results, which were calculated using the dataset on which the networks were created. There are sought the networks whose calculated outputs are as close to the values of the original datasets (including all its subsets) as possible. At the same time, it is necessary to monitor the values of the residuals, which should be as low as possible. The network, whose values are closest to the actual EVA Equity values, provides the best description of the actual situation.

Table 12. Active networks: value drivers, place of business

Index	Network	Train. perf.	Test. perf.	Valid. perf.	Train error	Test error	Valid. error	Train. algorithm	Error function	Activation of hidden layer	Output activation function
1	MLP 19-10-1	0.450323	0.268733	0.409643	326102527	312542518	174054743	BFGS (Quasi-Newton) 55	Sum of squares	Tanh	Identity
2	MLP 19-8-1	0.456372	0.269383	0.404332	327317147	313677788	174719963	BFGS (Quasi-Newton) 59	Sum of squares	Tanh	Identity
3	MLP 19-13-1	0.537373	0.322123	0.409932	294010096	301083462	173606200	BFGS (Quasi-Newton) 93	Sum of squares	Logistic	Logistic
4	MLP 19-5-1	0.447383	0.270483	0.390871	328160906	309321339	176128249	BFGS (Quasi-Newton) 61	Sum of squares	Logistic	Identity
5	MLP 19-12-1	0.463838	0.289312	0.409372	323575104	307227762	173571801	BFGS (Quasi-Newton) 64	Sum of squares	Logistic	Identity

Source: Authors

The following table shows the sensitivity analysis on the individual value drivers.

As seen from the table above, according to NN 5.MLP 6-7-1, the most important VBD is human labour, services (substitutes for machine and human labour), costs of goods sold (business activities of the monitored SMEs). Furthermore, there are evaluated interest payables, which represent the price for

using borrowed capital, followed by material and energy consumption, and depreciations of FA. For the company, the use of all production factors is important. The model compares successful companies with those less successful. The comparison is thus only relative.

Table 13. Sensitivity analysis: value drivers, place of business

Retained NN	Interest payable	Personnel costs	Costs of goods sold	REGION	Services	Material and energy consumption	Depreciation of FA
1.MLP 19-10-1	1.106262	1.049932	1.03832	1.038773	1.013724	1.003321	1.001502
2.MLP 19-8-1	1.109283	1.057373	1.038821	1.020123	1.018832	1.009472	0.991173
3.MLP 19-13-1	1.118828	1.110331	1.090022	1.090723	1.056372	1.020424	1.000037
4.MLP 19-5-1	1.094523	1.040746	1.031123	1.029321	1.019374	1.008274	1.000213
5.MLP 19-12-1	1.118254	1.041581	1.038338	1.030394	1.016472	1.000023	1.000523
Average	1.107573	1.059923	1.046577	1.043842	1.026352	1.018614	0.999645

Source: Authors

Generators, Eva Equity, and Place of Business

The procedure is the same as in the case of the first experiment, with another variable included in the form of region (place of business). Place of business specifies the place where the company is located and thus pays the income tax.

The table clearly shows that the new variable has a certain influence on the NN structure, since there were 19 neurons identified instead of 6. One of the most successful networks is 3. MLP 19-13-1, whose performance is not high, achieving the value of 0.53 in the training dataset, nearly 0.32 in the testing dataset, and nearly 0.41 in the validation dataset. This network was trained using the algorithm Quasi-Newton 93, and to assets, it applies logistic function for the activation of the hidden and output layers. As in the case of the first experiment, the data were also divided into training, testing, and validation datasets.

As in the first experiment, this step was also followed by searching for the NN whose calculated outputs are as close to the original dataset's values (in all of its subsets). The following step will be sensitivity analysis.

The table above clearly shows the greatest influence of interest payables on the value of EVA Equity. There is also a significant influence of personnel costs, costs of goods sold, place of business, services, material and energy consumption, and depreciations of FA.

The table below shows the results of two most successful networks in both experiments.

Table 14. Comparison of most successful NN from both parts of experiment

Index	Network	Train. perf.	Test. perf.	Valid. perf.	Train error	Test error	Valid. error	Train. algorithm	Error function	Activation of hidden layer	Output activation function
5	MLP 6-7-1	0.573425	0.383543	0.456372	275783357	286465671	166744171	BFGS (Quasi-Newton) 92	Sum of squares	Tanh	Logistic
3	MLP 19-13-1	0.537373	0.322123	0.409932	294010096	301083462	173606200	BFGS (Quasi-Newton) 93	Sum of squares	Logistic	Logistic

Source: Authors

At first sight, there can be seen the great difference between the networks. 5.MLP 6-7-1 is characterized by much better performance in all datasets; at the same time, it shows a small error rate.

SOLUTIONS AND RECOMMENDATIONS

As part of the evaluation of the company Engel (first practical example), an analysis of absolute indicators was first carried out, which provided a first look into the economic situation of the company. In the beginning, the asset structure reflected the still outdated production capacities, nevertheless the company was preparing for an expansion with significant cash reserves. Current assets recorded a clear growth trend after the crisis. However, with the new expansion of production capacities in the period of 2016/17, they declined as expected. The capital structure was similar. After the crisis, equity increased almost linearly. As expected, borrowed capital was dominant in the first stage of expansion, the period of crisis and the second stage of production plant expansion. In the period after the crisis, the company Engel strojírenská s.r.o. maintained its indebtedness with stability.

The analysis with the help of ratio indicators was more specific and put into context the initial insights obtained from absolute indicators. Selected profitability indicators defined the impact of the crisis, especially ROE, which declined very deeply due to a very negative EAT value and the lowest level of equity in the entire period under review. Activity indicators were no less important for the company. We can mention, for example, the time of asset turnover, which was relatively high and has increased in the last five financial years. Indebtedness indicators corresponded to the notes on the state of capital in the absolute indicator analysis. As for liquidity indicators, they also played a very important role for the company.

In the case of valuation using creditworthiness and bankruptcy models, it can be stated that in most cases their predictions aligned. Altman's analysis in its modified version for Czech companies viewed the company Engel strojírenská s.r.o. as a business located in the grey zone of the first accounting periods affected by the crisis, at the time of expansion the company was even able to survive financial distress. Altman's version for companies not traded on the financial markets was somewhat stricter in its judgment. The company was in the grey zone only from the period of 2013/14, then it was able to survive the financial distress. IN 95 and 01 can be classified as positive (oscillation between the grey zone and the ability to overcome financial distress). IN 05 classified the period of crisis as bankrupting, after which Engel strojírenská was in the grey zone. IN 99 was the most critical towards the company, perceiving it as bankrupt in the entire monitored period. The Tafler index was also positive - its course can be assessed as not heading towards bankruptcy. Kralick's test in the original and modified versions looks at the company Engel strojírenská s.r.o. relatively negatively (bankrupt and poor business), and the creditworthiness index was not clearly one-sided either.

The EVA Equity and EVA Entity indicators clearly illustrated the course of the economic crisis with their negative values at the beginning of the monitored period. It is important to mention that EVA Entity was a more sensitive indicator in this matter. It can be assessed that after the crisis period, the management was able to keep the value added in positive numbers. Nevertheless, the development lacks a stable trend because the values were inconsistent.

Although financial analysis is often criticized and described as insufficient, it can be recommended to companies as a basic tool for assessing their condition. Thanks to financial analysis, the company can reveal whether it is reasonably profitable, whether it uses its assets effectively, whether it pays its liabilities or whether its capital structure is appropriate. In addition, through financial analysis, the company is able to identify its financial strengths and weaknesses and make better decisions about its investments. However, a certain disadvantage of this method is seen in the fact that individual indicators alone have limited explanatory power, as they characterize only a certain section of the company's activities. For this reason, companies are recommended to apply this method ideally in combination with more modern evaluation tools. Through financial analysis, important indicators are monitored, such as various types of ratios, the value of creditworthiness and bankruptcy models, and the EVA indicator is also monitored, which plays an important role in determining the value of a company.

In the second practical example, 10 models were identified that represent the relationship between VBD and EVA Equity. The first five NNs were purely focused on the relationship between VBD and the company's top priority goal. In the case of the other five NNs, another variable was included in the calculation, namely the region (place of business). Sensitivity analysis was performed on all obtained models. Based on the results of the most successful NNs, it can be stated that

- The monitored companies have approximately the same technological level.
- Successful companies differ from unsuccessful ones in terms of the degree of human capital involvement.
- The monitored companies focus on both production and trade.
- Companies apply a large number of substitutes for factors of production, probably executive work.
- The involvement of borrowed capital is likely to result in a positive leverage effect.

It follows from the above that it would be useful for business owners (management) to focus more on human resource management, as employees are the way to gain a competitive advantage in the market. In addition, management should consider replacing part of the workforce with substitutes (agency employment). And, with regard to financial leverage, to consider greater involvement of borrowed capital.

FUTURE RESEARCH DIRECTIONS

In future research, in connection with business practice, it would be appropriate to focus more attention on the issue of artificial intelligence, or on artificial neural networks. Conducting research in this area can be considered very important, and it would be good to use other than conventional neural networks such as multilayer perceptron (MLP) and radial basis function (RBF). Due to the fact that the use of artificial neural networks is rarely utilized in business management, research focused on this area would certainly have significant added value.

It would also be interesting to conduct research that would focus on smaller businesses that do not have enough funds to automate their processes and acquire the necessary equipment using artificial neural networks for their work.

CONCLUSION

Throughout this chapter, issues related to the valuation of business entities were addressed. First, a theoretical basis was given, which addressed the most important questions of this topic and for which resources were drawn from renowned world databases such as Web of Science and Scopus. Based on this literary research, we further elaborated on practical examples dealing with the valuation of business entities, through traditional and innovative evaluation methods. Specifically, for the company Engel strojírenská s.r.o., a financial analysis was carried out, on the basis of which it can be argued that the entire thirteen years of monitoring their financial statements have yielded their results. It must be said that the management of the company was not in a situation with a simple solution. The first stage of the expansion of production capacities took place at a time when the financial crisis broke out. The impact on society and the pressure on management was significant, as confirmed by the analysis. Nevertheless, the crisis was averted, and the investment project was successfully completed. What could be pointed out as flawed is the size of assets (especially in recent accounting periods), as it extended their daily turnover into sales.

The next goal was to determine the relationship between the value drivers of the company and the EVA Equity of small and medium-sized enterprises operating in rural areas of the Czech Republic. The procedure was performed in two experiments. In the first case, only value drivers were the independent variables. In the second case, the place of business was also involved. We sought to find the dependence of EVA Equity on independent generators of company value and place of business. A sensitivity analysis was performed, on the basis of which the meanings of individual value drivers and place of business were identified. The result was a set of value drivers, with which the company's managers were able to regulate the growth of EVA Equity, i.e. the value for owners. It was also found that successful companies are distinguished from unsuccessful ones by the degree of human capital involvement, that companies use a large number of substitutes of factors of production and the involvement of borrowed capital is likely to cause a positive effect of financial leverage.

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KEY TERMS AND DEFINITIONS

Artificial Neural Network: Computational models used in artificial intelligence.

Business Investment: The part of a company's income that is invested in capital.

Business Performance: The company's ability to make the best use of the resources it manages in its business activities.

Business Value: The expected future income for the company owner.

Economic Value Added: A financial indicator defining the difference between net operating profit and capital costs. Currently, this is a very important value measure of the company's performance.

Financial Management: A set of analytical tools needed for financial management and decision-making in the company.

Value Drivers: The main business indicators that determine the value of the company.

Chapter 9

Analyzing the Impact of the COVID-19 Pandemic on Value Creation: The Case of Euronext Lisbon

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ABSTRACT

Operating in an already challenging business environment, companies have faced yet another difficulty since March 2020, when the World Health Organization (WHO) declared a global pandemic situation related to the COVID-19 disease. The study's purpose was to analyze the value creation in Euronext Lisbon companies from the first semester of 2019 to the first semester of 2020. The aim was also to identify the areas with the most impact on value creation. To measure value creation, the indicator economic value added (EVA®) was used. The results revealed that the capacity to create value decreased for all companies. The variables included in the study that showed a statistically significant relationship with EVA® were operating profit, sales revenue, and cost of equity. This pandemic situation poses a significant threat to value creation, enhancing the idea that, more than ever, business management needs to focus on long-term value creation strategies.

INTRODUCTION

The first Coronavirus (COVID-19) disease cases were reported in December 2019 in Wuhan, China. Despite preventive and control measures promptly implemented, the number of cases increased exponentially, at an alarming rate, which leads the World Health Organization (WHO) to declare it a pandemic in March 2020.

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The responses to managing the effects of COVID-19 on public health have originated a crisis that is “a once-in-a-lifetime systemic shock to the global economy” (ACCA, 2020, p.7). The world is currently facing a global crisis with the potential to be a major economic recession due to this crisis that no one was prepared for. As a result, of the responses to managing Covid-19, society as we know it has changed, now including social distancing, the use of face masks, and working from home whenever possible. With a new normal due to changes in society and in dealing with a major crisis, several adaptations in the way businesses are conducted have occurred.

However, one thing has not changed, the purpose of an organization which is to create value. A company creates value when its operating profit is higher than the cost of the total capital invested.

There are several ways a firm’s value can be measured, one of them being economic value added. Economic value added corresponds to the value of the firm’s net operating result after tax deducted with the cost of capital invested in the firm (Grant, 2016).

Although management performance has shown significant advances, moving from a conventional posture of profit and profitability to a focus on value creation for the shareholders (Assaf Neto, 2014), they now once again need to adjust to a new reality. This trend focusing on shareholders’ value creation has been most noticeable in Anglo-Saxon countries, where managers have felt increasing pressure to maximize the company’s value in a context of value creation for their shareholders (Kijewska, 2016).

Having to manage the effects of COVID-19 on their business outcome, more companies now realize that they must take a long-term approach to their strategies (Strebel, 2020). A long-term approach means focusing on financial and non-financial value drivers. Companies must adopt a business model that ensures long-term shareholders’ value creation as well as stakeholders’ value creation.

According to Ernst & Young LLP, based on recent trends and the increasing adoption of long-term value creation strategies at many companies, there will be a shift in capital investment away from companies “that focus on shareholder value exclusively to those that seek to create value across a broader group of stakeholders including employees, consumers, society and shareholders” (Ernst & Young, 2020: 3).

Not forgetting their shareholders, managers need to widen their focus of value creation to include all their stakeholders. To ensure value creation, managers need to focus on other value creation stakeholders besides shareholders because they need motivated employees, satisfied customers, and suppliers that meet their needs. They also have to be engaged with the surrounding community, aware of its social responsibility. Adaptation to COVID-19 impact “is creating a sharper distinction between those chasing short-term financial wealth by all means possible, and those pursuing long-term shareholder value benefitting other stakeholders and societal needs. For the health of the western liberal economies, we must hope that the COVID-19 reset indeed prevails” (Strebel, 2020, p.3).

This study will be amongst the first to analyze the impact of restrictions imposed by covid-19 on value creation in a sample of companies, namely Euronext Lisbon. The study will also provide valuable insight focusing on fundamental changes in the way value creation is perceived due to changes in society’s new normal and how business is conducted while managing the effects of Covid-19. This study also aims to contribute to the development of academic research on the analysis of value creation.

The purpose of the study is to analyze the value creation in Euronext Lisbon companies. To measure value creation Economic Value Added (EVA®) was selected. The analysis includes an appreciation of the EVA® value evolution to understand how the changes caused by the effects of dealing with the Covid-19 pandemic have affected the companies’ value creation identifying the factors with the most significant impact on value creation.

The sample refers to the non-financial companies listed on Euronext Lisbon. The period refers to the three last semesters of financial data available: from the 1st semester of 2019 to the 1st semester of 2020. The data was analyzed using a panel data regression model.

This chapter is composed of four sections. After this introduction, a section referring to the literature review regarding value creation will follow. The next section contains the detailed methodology followed by the results and key findings. The last section refers to the conclusion. Finally, the references are also included.

LITERATURE REVIEW

Value Creation

COVID-19 and Long-Term Value Creation

The first cases of COVID-19 were reported in December 2019 in Wuhan, China. Despite all preventive and control measures taken, the disease spread quickly, which led the World Health Organization (WHO) to declare it a pandemic on March 11, 2020. Portugal reported its first case on March 2, 2020, declaring an emergency state from March 19 to May 2, 2020, issuing a major lockdown. The covid-19 outbreak had several implications not only on public health but also on the global economy, society habits, and the way companies conduct their business.

In dealing with the pandemic, several transformations take place in the way business is done. An example is working from home whenever possible, with its impact on transportation and restaurant services as well as others. Major crises like this present several challenges, but they can also be great opportunities to create value. For example, online sales have increased, favoring businesses with a strong online presence since people prefer less personal contact exposure. So companies need to adjust and transform in order to deal with new challenges, now more susceptible to risk, in order to survive and remain competitive in the long-term. For this, companies need to collect information about the consequences of this pandemic, like changes in customer behavior, population new habits due to social distancing, digital services importance amongst others in order to prepare for the future and hopefully soon the recovering, focusing on long term value creation.

The report, *The CFO and Finance Function Role in Value Creation*, issued by IFAC (IFAC, 2020), addresses this issue, defending a value-creation agenda. According to the authors, success depends on a broad and long-term view of value creation that considers various stakeholders instead of just focusing on shareholders.

This idea is also reflected in some governments' response to the COVID-19 pandemic and its global impacts. They urge companies to focus not only on shareholders but to prioritize key stakeholders, particularly employees. Some even legislate on the subject; it is the case of the resolution adopted on April 17, 2020, by the EU Parliament, insisting that public financial support should be conditional on companies using those funds to benefit employees amongst other conditions like preventing tax evasion (*Business & Human Rights Resource Center*, 2020).

The COVID-19 pandemic poses a major threat to value creation, representing a challenging time for every executive manager considering that the social impact of their decisions is under the spotlight, having to balance the interest of all stakeholders. However, "Stakeholder and sustainability issues were

already at the forefront of public discussions prior to the COVID-19 crisis”. Presently shareholders believe that acting for the benefit of all stakeholders will in the near future benefit them (Williamson & Koller, 2020, p.2).

While managing the impact of covid-19 in the business world, companies need to rethink and adjust their purpose in order to serve a broader range of stakeholders, focusing on long-term strategies towards value.

Concept of Value

There are significant advances in the way a company is managed, going from a traditional posture concerned with obtaining profit to an approach focused on value creation for the shareholders (Assaf Neto, 2014). Nowadays, value creation, according to Neves (2012), is considered to be the financial manager’s primary concern.

Because the term value can have several interpretations, it is important to clarify the concept of value. When referring to value, one can refer to Book Value (BV), the value of a company calculated based on the financial accounting statements. Also, to Market Value which can be understood as the value of a company that investors are willing to pay, or commonly understood as the market capitalization of a publicly-traded company. Alternative financial analysis methods have introduced the concept of added value, referring to economic gain, which is not reflected in the financial statements (Berzakova et al., 2015).

A company creates value when its profitability is higher than the cost of the total capital invested. According to Assaf Neto (2014), it is not enough for a company to generate accounting profits; it is necessary for this profit to be higher than the total invested capital cost, thus creating value.

Presently, value creation is considered to be one of business management’s major objectives; management should focus on value creation rather than profits. A management system based on value creation opposite to earnings induces managers to pay more attention to expense control, to more efficient use of assets as well as a higher awareness of the need of pursuing strategies that provide higher returns on the companies invested capital (Hawawini & Viallet, 2010).

One of the major contributors to the dissemination of value creation was Alfred Rappaport, with his work during the 80s decade focusing on shareholder value creation (Rappaport, 2001). Other authors such as Assaf Neto (2014), Neves (2012), and Ferreira (2002) share the same opinion as they consider as the main objective of any company to create value for its shareholders. On the other hand, Copeland, Koller, and Murrin (2000) consider that the focus on creating value for the shareholders benefits not only shareholders but also the economy and other stakeholders.

It is generally accepted that value creation is one of the primary goals of any firm, but under this principle, another question arises: what is the focus of value creation?

The firm’s value created is distributed amongst different stakeholders like owners, employees, government, customers, suppliers, society in general, as well as any other parties with a stake in the company (Grant, 2016). The stakeholders refer to anybody that affects or is affected by value creation.

Under the theory of value management, it is possible to determine two different approaches to value creation: value creation for the shareholders who own the firm associated with the capital invested and its opportunity costs and, on the other hand, the value approach for stakeholders that covers all stakeholders (Berzakova et al., 2015).

Accounting for all stakeholders means having different ways to measure value since different individuals have different needs and values (Freudenreich, Lüdeke-Freund, & Schaltegger, 2020); therefore, it is more complicated than measuring shareholder value.

The wide application of shareholder value stems from the fact that it is easy to quantify; there are several value-based measures focusing on shareholder value creation. Also, because shareholders are in fact, the owners of the capital invested in the company, and therefore, they expect the best use of it, the best return on their capital.

Under the stakeholder approach, the company has the objective to benefit multiple parties. Value creation is based on the contributions of each stakeholder that should be paid according to their implications in the value creation process (Oubihi & Elouidani, 2016). “Currently, Stakeholder approach is a strategic management tool of long-term value creation” (Efimova & Samohina, 2014, p.63), based on the understanding that the interaction of every stakeholder with the company impacts its long-term sustainability (Vasile, 2013).

Shareholder capitalism has been dominating in Anglo-Saxon countries, with managers being pressured to maximize value creation for their shareholders (Kijewska, 2016). Also, during the late 20th century, many Continental European and Asian companies changed their strategies to focus on shareholder’s interests. However, during the 21st century, shareholder value has been criticized for being associated with short-term measures, financial manipulation, excessive CEO compensation, and risk management failures associated with the causes of the 2008 financial crisis (Grant, 2016). Presently several papers like the ones written by Efimova and Samohina (2014) and Rahdari (2016) argue the validity of focusing on stakeholders’ value creation.

Nevertheless, is there really a conflict of interests with these two approaches, can there really be shareholder value creation without taking into consideration other stakeholders?

When a company acts for the benefit of its stakeholders ultimately will be benefiting shareholders. For example, a company with the concern to motivate employees will likely have motivated employees in increasing the company value creation, thus benefiting shareholders.

Increasing company performance and value creation satisfy many interests, for example, the shareholder’s interest in the return of the capital invested and the risks taken. The managers’ and the employees’ interest in safe jobs and wages. For the domestic economy, value creation means the efficient use of resources and the increase in the Gross Domestic Product (GDP) that contributes to the population’s social welfare (Vasile, 2013).

Companies that gain their stakeholders’ trust guarantee their long-term business sustainability (Rahdari, 2016). According to Ernst & Young LLP, based on recent trends and the increasing adoption of long-term value creation strategies at many companies, investors will seek to invest in companies that create value focusing on a wide group of stakeholders rather than in those focusing solely on shareholder value (Ernst & Young LLP, 2020).

Not forgetting their shareholders, managers need to widen their focus on value creation to include all their stakeholders. In order to ensure value creation, managers need to focus on other value creation stakeholders because they need motivated employees, satisfied customers, suppliers that meet their needs and they have to be engaged with the surrounding community, aware of their social responsibility. By doing so, they will also be ensuring their shareholders’ value creation.

To assess value creation, several indicators of value creation were developed. Some of the most relevant are: Economic Value Added (EVA®), Market Value Added (MVA®), Refined Value Added

(REVA), Cash Value Added (CVA), Market equity to book value (MBV), Tobin Q-Ratio, Total Shareholders Return and Cash Flow Return on Investment (CFROI).

This study will focus on EVA® since it is one of the measures of value most broadly used, both by companies and financial consultants for financial performance measurement (Stancu, 2017), and is also of interest to portfolio managers looking for suitable investment opportunities (Damodaran, 2015).

Economic Value Added

One of the various ways to measure value is value-added, which corresponds to the income generated by the business minus the cost of using the capital necessary to run the business. One important measure of value added is EVA® (Economic value added).

Stern and Stewart developed and patented the Economic Value Added (EVA®) performance measure in 1991. At that time, companies like Coca Cola, Monsanto, and Procter & Gamble have begun using the EVA® concept (Kumar, 2017). EVA® focuses on measuring management value creation for the shareholders since it considers the cost of total capital employed. Its roots date back to 1890 with the definition of residual income by Alfred Marshall (Sabol & Sverer, 2017). According to Stewart (1999), EVA® is “the right measure to use for setting goals, evaluating performance, determining bonuses, communicating with investors, and for capital budgeting and valuations of all sorts” (p. 5).

Although EVA is commonly associated with shareholder value creation, if we consider it the excess profit after paying all financing investors, enhancing its value will enhance the company’s value and will benefit every other stakeholder. Whether from the Shareholders’ or Stakeholders’ perspective, value creation indeed exists whenever income generated exceeds direct and opportunity costs.

The stakeholders’ interests can be monitored through the efficient use of resources and maximization of the firm’s value. A company that has a stable financial situation and creates value offers credibility benefiting the economy, its owners, employees, suppliers, customers, and any other agents with a stake in it. This way, ensuring that both the interests of the shareholders and the other stakeholders are satisfied. In the study conducted by Chunduru, (2020), the author simulated the implementation of EVA as a culture and concluded that “effective implementation of EVA concept helps firms in building a culture of performance and enhance stakeholder value” (p.31).

According to Stewart (1999), EVA® represents the residual profit and can be calculated as follows:

$$\text{EVA}^{\circledR} = \text{NOPAT} - (\text{IC} \times \text{C}) \quad [1]$$

Or,

$$\text{EVA}^{\circledR} = (\text{ORIC} - \text{C}) \times \text{IC} \quad [2]$$

Where: **NOPAT** - Net Operating Profit After Tax; **C** - The Cost of Capital; **IC** - Total Invested capital; **ORIC** - Operating Return on Invested Capital.

Another possible way to calculate EVA® is deducting from Net Profit the Cost of Equity as follows (Neves, 2011):

$$\text{EVA}^{\circledR} = \text{NP} - (\text{E} \times \text{Ke}) \quad [3]$$

Where: **NP** – Net Profit; **Ke** – Cost of Equity Rate; **E** – Equity

So, EVA® is operating profit after tax reduced with the cost of total invested capital or the spread between the operating return rate on total invested capital minus the cost of that capital, multiplied by the total invested capital. When positive, the value of EVA® means value creation, when negative means value destruction, and a zero value denote no value creation or destruction.

Prior to calculating EVA®, Stern Stewart & Co. suggest a large number of adjustments to be made, this being its most contentious aspect that led several authors to criticize them, considering it as a disadvantage in using EVA® (Obaidat, 2019). Since EVA® is subject to some assumptions regarding, for example, the cost of equity and the adjustments Toft and Lueg (2015) argue that different researchers can calculate different values of EVA®.

On the other hand, Stewart (1999) considers EVA® the performance measure that most accurately measures the firms' actual profit. Some of EVA®'s selling points are: the fact that it takes into account all the business costs (including the cost of equity); it can be used to analyze the whole company or just some of its departments (Sirbu, 2012) and can align management goals with shareholder interests (Sahara, 2018).

Considering EVA®'s advantages and disadvantages, authors like Tripathi, Kashiramka, and Jain (2018) state that it is urgent to "standardize the computation of EVA® and ensure its mandatory disclosure in financial statements as an absolute measure of shareholders' wealth creation, a significant move towards offering flexibility in performance measurement to internal as well as external stakeholders" (p. 137).

Several authors like Stewart (1999) or Young & O'Byrne (2003) consider that EVA® should be used not only as a measurement of performance but also as a business model. So EVA® should be seen as more than just a way to measure value but also to identify and implement value-based business strategies. To this end, a more profound analysis to identify value drivers of EVA® is required in order for management to take appropriate actions towards value creation. According to (Assaf Neto, 2014), a value driver is any variable that effectively exerts an influence on the firm's value.

Performance and management should be closely linked to the firm's strategy and value creation drivers; otherwise, managers are more likely to ignore its impact when making decisions, thus compromising the firm's value (Dekker et al., 2012). Using EVA® allows the identification of value drivers, which makes the decision process and strategic planning more objective.

According to Rappaport (2001), the analysis of value drivers is a critical step in the identification of strategies that significantly impact value creation. The author considers that this analysis includes the following steps: designing a map of the business value drivers; identification of the drivers that have the greatest impact on value; and that can be influenced by managers. The author considers that shareholders' value creation depends on seven financial macro value drivers: sales growth rate, operating profit margin, income tax rate, working capital investment, fixed asset investment, cost of capital, and forecast duration.

Assaf Neto (2014) considers that analyzing value drivers should allow the study of every aspect that adds value to the company, identifying strengths and weaknesses. Value creation depends on adopting efficient financial strategies and differentiating capabilities. Regarding financial strategies, the author considers several value drivers related to the firm's activities: operating (sales growth; days of sales and purchases outstanding; inventory turnover), financing (capital structure; cost of equity; cost of debt; financial risk), and investment (working capital investment; fixed capital investment; investment opportunities; turnover and margin analysis; operating risk).

Some authors like Young & O'Byrne (2003) consider that to maximize value creation, management should consider a set of financial and non-financial value drivers. This study, however, focuses only on financial value drivers.

Given the importance of establishing value creation strategies, several scientific studies like the ones performed by Corrêa et al. (2012), Hall (2012), and Ganea (2015) attempt to identify value creation drivers. Considering the popularity and attention that EVA® has received, many of these studies use it as a value-based performance measure.

In the methodology used, regression analysis and factor analysis are the most common data analysis techniques used (Kijewska, 2016).

Ganea (2015) performed a study on a sample of 12 Romanian companies listed on the Bucharest Stock Exchange to identify the practical issues of the company's activity, which could influence the evolution of EVA® value. The author found as main determining factors in EVA® the return on invested capital, the average cost of invested capital, and the firms' solvency.

In Kijewska's (2016) study, the author analyzed EVA® value drivers for a Polish company finding as relevant factors operating profit margin and rotation of invested capital.

In the study performed by Khan, Chouhan, Chandra, and Goswami (2012), the authors found that profitability was an important factor for creating value, measured by EVA® in the sample firms analyzed.

Fiordelisi and Molyneux (2010) conducted a study that aimed to identify the determinants of value creation for European bank shareholders. To do this, they used several value drivers as independent variables and used the statistical technique of panel data to assess their impact on the dependent variable, EVA®. They found as value drivers of EVA® value cost efficiency and credit risk.

Several of the mentioned studies focus on identifying EVA® value drivers, although even if some results are consistent, like profitability, others are not. Even though it is possible to determine the factors that affect EVA® value, every firm has a different financial condition, so the factors that affect EVA® value may also be different. Also, industry specifications are different as well as the conditions of the country where firms are based, so factors affecting EVA® may differ (Kijewska, 2016). Therefore EVA® value should not only be identified but also managed.

METHODOLOGY/APPROACH

The empirical research follows a quantitative approach that, according to Prodanov & Freitas (2013), consists of quantifying information and analyzing it. As for the objective, the research is of an exploratory type, given that its "main objective is to develop, clarify and modify concepts and ideas, to formulate searchable problems or hypotheses for further studies" (Gil, 2008, p.27).

The literature review consisted of analysis from published scientific books and articles, consulted through the online databases: B-On, Proquest, Scielo, and Researchgate, therefore used the bibliographic method as the technical procedure. The empirical study used the case study methodology that, according to Yin (2003), is adequate for research in social sciences since it investigates a current phenomenon in-depth and in its context of the real world. For Gil (2008), the case study "consists of a deep and exhaustive study of one or a few objects, in a way that allows for its broad and detailed knowledge" (p. 57).

Purpose of the Study

The purpose of the study is to analyze the value creation measured by EVA® in Euronext Lisbon companies, that is, to understand how managing the restrictions imposed by the Covid-19 pandemic has affected the value creation in the companies listed on Euronext Lisbon. Thus, in the first phase, it is intended to analyze how value creation evolved in the companies of the sample during the pandemic period. This analysis will be performed on the basis of the sample companies' interim reporting from the 1st semester of 2019 to the 1st semester of 2020. The aim is to assess whether the companies create value during this period of crisis. To measure value creation, EVA® was the value-based performance measurement chosen.

Not all companies are affected by the crisis, in the same way, although several sectors have seen their income drastically reduced, others by the nature of the products they sell have precisely the opposite result. So, in a second phase, a set of variables are used to identify those that had the most significant impact on value creation, that is, to identify which areas of activity were most relevant to value creation in the period under analysis, which of course, represents a period of crisis. In order to manage value creation, managers need to identify the firm's value drivers.

Sample and Period

The population selected for the study consists of companies listed on Euronext Lisbon Stock Exchange. From which the sample of non-financial companies was extracted. The sample was further enhanced by removing companies with negative equity since they could distort the analysis of value creation values. Thus, a final sample of 25 non-financial companies operating in different industries was obtained, which corresponds to 83% of the population. The industry classification corresponds to the Industry level, as classified on Euronext Lisbon (*Euronext Lisbon*, 2020) according to the ICB (Industry Classification Benchmark).

Considering that at the time of the study, the financial data for the whole year of 2020 was not yet available, the data were obtained for the three last semesters available: from the 1st semester of 2019 to the 1st semester of 2020. The analysis refers to homologous periods to avoid distortions caused by activity seasonality.

Data Sources and Estimation Technique

The data necessary to calculate the variables under study was obtained through documentary research based on the analysis of published non-audited consolidated interim reports and accounts of the companies in the sample, available on the respective companies' websites. Data was also collected from Professor Aswath Damodaran's website (Damodaran On-Line, 2020) regarding equity cost, the National Institute of Statistics (*National Institute of Statistics (INE)*, 2020) regarding GDP and Inflation, and Euronext Lisbon regarding industry classification.

The data collected was then prepared using Microsoft Excel software in order to obtain an income statement adjusted for financial analysis and a functional balance sheet that reflects the firm's total invested capital, used for the variables' calculation. The data analysis was performed using statistical and econometric techniques. Descriptive analysis was used to characterize the sample and the variables

involved in the survey to provide an overview of the variables under analysis. The hypotheses formulated were analyzed through an econometric model using panel data regression analysis.

Panel data is a technique used when the sample consists of a dataset in which individuals' behavior is observed over time (Verbeek, 2017).

Hypotheses of the Study

Even though several measures can be taken to ensure the maximization of value creation, Stewart (1999) considers that they all belong to three categories, that is, EVA® increases when:

- the business generates more operating profits without increasing necessary investment;
- additional investment is made in projects with a return higher than the cost of obtaining the necessary capital for the additional investment;
- Substandard operations where inadequate returns are being earned are abandoned.

To summarize, as can be intuited by EVA®'s calculation, value creation is affected by operating profit, invested capital, and the cost of obtaining that capital, identified as value drivers in the studies mentioned in the literature review.

Another important factor in value creation maximization is risk exposure, identified by (Assaf Neto, 2014) as a value driver.

With this in mind, to identify the drivers with the most significant impact on the sample companies' value creation and address the second part of the study's purpose, the following hypotheses were formulated:

1. H_0 : NOPAT has no significant relationship with EVA® value.
2. H_0 : Sales Revenue has no significant relationship with EVA® value.
3. H_0 : Invested Capital has no significant relationship with EVA® value.
4. H_0 : The Cost of Equity has no significant relationship with EVA® value.
5. H_0 : The Cost of Debt has no significant relationship with EVA® value.
6. H_0 : Financial Leverage has no significant relationship with EVA® value.
7. H_0 : GDP variation has no significant relationship with EVA® value.
8. H_0 : Inflation variation has no significant relationship with EVA® value.

Variables of Interest

Value creation was measured using EVA®, a value-based performance measure easy to calculate that requires only information from the income statement and balance sheet, which according to Sabol and Sverer (2017), is one of the value-based performance measures most widely used for financial performance evaluation.

EVA® was calculated using the formula proposed by Stewart (1999) as follows:

$$\text{EVA}^{\circledR} = \text{NOPAT} - (\text{IC} \times \text{C}) \quad [4]$$

Where: NOPAT = Net Operating Profit After Tax; IC – Total Invested Capital; C – Cost of capital

Stern Stewart & Co., owners of the registered trademark EVA®, propose some adjustments to the accounting statements before calculating EVA®; however, there is still no consensus whether they should be considered or not. In fact, authors like Young and O'Byrne (2003) consider that adjustments should be made conservatively since they make EVA® more challenging to understand. Also, Obaidat (2019) argues that given their high number, they make EVA® too complex, which may reduce the impact of EVA® on decision making.

Therefore, with this in mind and considering that the study is performed from an external auditor's point of view and several of the information needed for the adjustments is not available, there were only minor adjustments to financial statements in order to prepare them for analysis. To this end, items referring to profit/loss related to fixed assets operations were excluded from operating profit, as well as profit/loss associated with investments in subsidiaries and other financial investments.

For the calculation of EVA®, NOPAT refers to the Net Operating Profit after the mentioned adjustments deducted with income tax.

The income tax rate was obtained by dividing the Income Tax Expense value by the Net Profit Before Tax (NPBT). Whenever the income tax expense is negative due to deferred taxes, it is calculated with the rate of 21%, the rate used for most companies plus 1.5% of municipal surcharge (<https://info.portaldasfinancas.gov.pt/>).

The total invested capital used in EVA®'s calculation is the sum of equity with financial debt used to finance the resources needed for the firm's activity development (Guni & Munteanu, 2014; Young & O'Byrne, 2003). For its calculation, a functional balance sheet was prepared, which, to reference Neves (2012), is an instrument that helps to understand better how the company captures and applies financial resources according to the management cycles: operating, investment and financing. In this model, all non-bearing interest liabilities are deducted from assets and liabilities, so financing refers only to Equity and Financial Debt (Neves, 2011). Considering that invested capital is calculated based on the balance sheet, a static document, it was used the simple mean value of each period's beginning and end.

The cost of capital corresponds to the weighted average cost of capital (WACC). This is usually the cost used to calculate value creation since it considers each financing source's weight in the capital structure with its respective cost. It refers to the weighted average of the costs of equity and debt. Since interest is tax-deductible, the cost of debt must be adjusted. WACC was calculated using the following formula (Damodaran, 2015):

$$WACC = K_e \times E / (E + D) + K_d \times (1 - T) \times D / (E + D) \quad [5]$$

where: **E** - Equity; **D** - Debt; **K_e** - Cost of Equity Rate; **K_d** - Cost of Debt Rate; **T** - Income Tax Rate.

The Cost of Debt Rate was obtained by dividing the interest expenses from the income statement with the value of the financial debt from the functional balance sheet as follows (Neves, 2012):

$$K_d = I / ((D_i + D_f) / 2) \quad [6]$$

where: **I** - Interest Expenses; **D_i** - Financial Debt beginning of the year; **D_f** - Financial Debt end of the year

The Cost of Equity refers to the mean value for Western Europe by industry calculated by Professor Aswath Damodaran, available on his website. Its calculation is based on the CAPM model, which is appropriated since the companies included in the sample are publicly-traded companies. Contrary to

the cost of debt, the cost of equity cannot be obtained directly from the financial statements it needs to be estimated (Ross, Westerfield & Jordan, 2010).

Calculating EVA® will give a clear understanding of the companies capacity to create value; however, it is still necessary to identify the factors impacting that capacity. So, for the second phase of the study, to identify the areas with most impact in value creation, variables that contribute to the calculation of EVA® were considered as the independent variables in the regression model. The firm's activity is also affected by risk exposure, therefore also value creation, so variables related to risk other than capital cost were also included, namely financial leverage, Gross Domestic Product (GDP) evolution, and inflation rate. To make the sample consistent only results in amounts of Euros were considered, not ratios.

Table 1 describes the variables included in the study regarding profitability, investment, cost of financing, and risk.

Table 1. Variables Included in the Study

Variables	Description
EVA®	Economic Value Added: $EVA® = NOPAT - (IC \times C)$
NOPAT	Net Operating Profit After Tax
SR	Sales Revenue
IC	Invested Capital: Equity financing + Debt financing
Vke	Total Equity Cost: Equity Cost Rate $\times$ IC
Vkd	Total Debt Cost: Debt Cost Rate $\times$ IC
FL	Financial Leverage: (Assets / Equity)
GDP	GDP variation (beginning - end period)
Inf	Mean inflation rate

Source: own elaboration

Results

For data analysis, descriptive analysis was used to characterize the sample and provide an overview of the variables involved in the research. To understand the relationships between the several variables over the period, an econometric model of panel data linear regression was used.

The analysis begins with a brief description of the variables involved in the research, with the descriptive statistics mean, standard deviation, the maximum value, and the minimum value, shown in table 2.

The sample has a total dimension of 75 observations, all of which are considered valid for analysis, consisting of 25 non-financial publicly traded companies listed in Lisbon's stock exchange market. The sample companies conduct their activity within different sectors of activity.

From the analysis of sales revenue, which can be considered as an indicator of the company's size, it appears that its mean value is 1.378.901 thousands of Euros and that its minimum value is 9.937 thousands of Euros, and the maximum value is 9.729.886 thousands of Euros, indicating that the sample includes companies with very different sizes.

From the analysis of table 2, it can be seen that the average value of EVA®, the study's dependent variable, of the companies in the sample is negative of -78.308 €, for the period from the 1st semester of

Analyzing the Impact of the COVID-19 Pandemic on Value Creation

2019 to the 1st semester of 2020. The minimum value is -866.640 €, and the maximum value is 106.377 € (considering the assumptions made). The difference between the maximum and minimum values indicates a wide range of data analyzed. There is also a standard deviation of 166.764, which indicates a large dispersion relative to the mean value.

Table 2. Descriptive statistics

	Mean	Standard Deviation	Min	Max
EVA	-78 308	166 764	-866 640	106 377
NOPAT	82 066	180 035	-305 000	898 766
SR	1 378 901	2 538 203	9 937	9 729 886
IC	3 304 340	6 092 597	75 425	29 248 883
Cost of Debt	77 021	171 617	-395	903153,8
Cost of Equity	126 261	224 016	1 366	930302,3
(thousands of Euros)				

Source: own elaboration

The analysis of the difference between the maximum and minimum values of the variables included in the models shows the wide range of the data interval, which, combined with the analysis of the standard deviation, which indicates a strong dispersion relative to the mean, reveals a poorly homogeneous sample.

Table 3 shows the values for EVA® and NOPAT for every company, thus verifying the trend evolution of these variables.

In the entire period under analysis, from the 1st semester of 2019 to the 1st semester of 2020, the average value of EVA®, obtained for the sample, is negative of -78.308 thousand €, considering the assumptions made. In the study conducted by Hall (2012), which used the sample of South African industrial companies, whose period also covered a time of financial crisis (the 2008 crisis), on average, there was also destruction of value for the period analyzed.

For the 1st semester of 2019, 44% of the companies in the sample indicate value creation, and the mean value of EVA® is negative, contrary to the 1st semester of 2020, where no firm has created value. Except for firms in the technology industry, all other firms in the sample decreased their capacity to create value in the first half of 2020, comparing with the homologous period of 2019, thus indicating the negative impact caused by the pandemic situation.

The EVA® results reflect the impact caused by the measures taken to contain the spread of COVID-19, such as the shutdown of schools and universities, the declaration of emergency state on March 18, which led to the temporary closing of various economic activities and restrictions on the free movement of people.

Due to the COVID-19 pandemic, Portugal's economy suffered a strong contraction. In the 2nd quarter of 2020, the Gross Domestic Product (GDP) registered a variation of -16.3% in volume, relative to last year's homologous period. To the decrease in GDP, a major contribution was the negative variation of the domestic demand reflecting the expressive contraction of private consumption and investment (National Institute of Statistics (INE), 2020).

Table 3. EVA® and NOPAT – 1st semester 2019 / 1st semester 2020

Firm	Industry	EVA		NOPAT	
		1S2019	1S2020	1S2019	1S2020
Altri	55, Basic materials	26 551	-24 226	76 326	17 823
Cofina	40, Consumer discretionary	400	-4 119	3 747	163
Corticeira Amorim	50, Industrials	-934	-10 660	43 590	37 059
EDP	65, Utilities	-456 858	-457 484	898 766	775 978
EDP Renováveis	65, Utilities	-166 312	-316 415	604 324	488 274
Galp	60, Energy	-371 000	-866 640	227 883	-305 000
Glintt	10, Technology	-5 122	-5 167	1 766	1 853
Inbersol	40, Consumer Discretionary	-16 751	-56 692	9 221	-31 803
Impresa	40, Consumer Discretionary	-8 346	-12 109	5 559	1 063
Inapa	55, Basic Materials	-13 015	-21 760	6 760	-1 238
J.Martins	45, Consumer Staples	39 115	-30 534	232 000	165 934
Media Capital	15, Telecommunications	-7 735	-24 470	6 853	-15 904
Mota Engil	50, Industrials	-40 121	-119 369	58 466	36 345
NOS	15, Telecommunications	-2 139	-57 473	99 337	36 295
Novabase	10, Technology	-5 086	-4 381	1 482	2 961
Ramada	55, Basic Materials	-9 091	-10 223	4 305	3 029
Reditus	10, Technology	-2 299	-1 105	901	690
REN	65, Utilities	-39 363	-44 199	68 500	60 592
Semapa	55, Basic Materials	-9 548	-78 383	118 857	78 961
Sonae	45, Consumer Staples	-154 123	-290 231	115 775	-41 574
Sonae Com	15, Telecommunications	-70 282	-77 363	8 365	2 271
Sonae Ind	50, Industrials	-8 198	-15 553	5 620	-1 107
Teixeira duarte	50, Industrials	-3 094	-18 301	38 900	17 273
The Navigator	55, Basic Materials	-919	-46 652	102 285	50 608
Toyota Caetano	40, Consumer Discretionary	-8 772	-15 981	7 296	156
Mean Value		-53 322	-104 380	109 875	55 228
(thousands of Euros)					

Source: own elaboration

Also, regarding operating profitability, the situation of the companies worsened considerably, since, in the 1st semester of 2019, all companies have positive operating profitability, which no longer happens in the 1st semester of 2020. During the first semester of 2019, despite the fact that all companies have positive operating profitability, it is not always sufficient to cover the cost of the total invested capital (Equity plus Debt), since in some cases, the EVA® registers negative values.

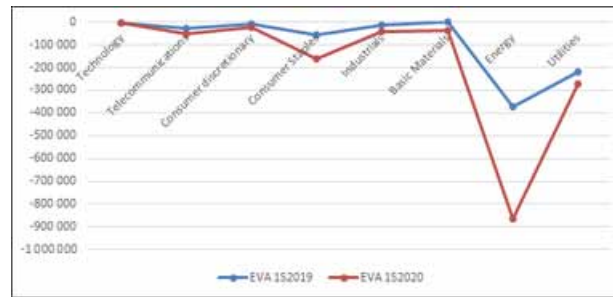
Although the sample is small and, therefore, has little representation by industry, the mean value of EVA® by sector of activity was also analyzed. Observing figure 1, it is possible to see that the average biannual value of EVA® presents a sharp drop in the 1st semester of 2020 compared to the 1st semester

Analyzing the Impact of the COVID-19 Pandemic on Value Creation

of 2019 amongst most sectors of activity in the sample, being more notable in the energy sector. Only the technology industry shows a slight improvement.

Figure 1. EVA® mean value by semester and industry

Source: own elaboration



After calculating EVA® and thus realizing the value creation capacity of the sample firms, it is now necessary to analyze the factors with more impact to its evolution. To this end, to test the hypotheses formulated, that is, to identify the variables with the most impact on value creation of the companies of the sample during the reference period, the following panel data regression model was constructed:

$$EVA = \beta_0 + \beta_1 NOPAT_{it} + \beta_2 SR_{it} + \beta_3 IC_{it} + \beta_4 VKe_{it} + \beta_5 VKd_{it} + \beta_6 FL_{it} + \beta_7 GDP_{it} + \beta_8 Inf_{it} + u_{it} \quad [7]$$

Where: EVA = Economic Value Added (dependent variable); β_0 = constant; β = estimated regression coefficients; SR = Sales Revenue; NOPAT = Net Operating Profit After Tax; IC = Invested Capital; VKe = Total Cost of Equity; VKd = Total Cost of Debt; FL = Financial Leverage; GDP = Gross Domestic Product variation; Inf = Mean Inflation Rate; u_{it} = the error term (i =each firm and t =each period analyzed).

The study's dependent variable is EVA®, and the independent variables are Sales Revenue, Net Operating Profit After Tax, Invested Capital, Total Cost of Equity, Total Cost of Debt, Financial Leverage, Gross Domestic Product variation, and Mean Inflation Rate. The panel data regression analysis was performed using STATA software.

The data panel used is strongly balanced; that is, the observations of all companies are available throughout the entire period analyzed. According to the panel diagnostics, the most appropriate model was first selected. Given the existence of fixed effects, two models were estimated using the method of ordinary least squares to decide which one is more appropriate to the data: a model with fixed effects and a model with random effects.

After performing the specification test, the Hausman test, to check the models' adequacy, the researchers opted for the use of a model of fixed effects, considered the most appropriate.

The model assumptions were validated. The sample has a dimension superior to 30 ($N > 30$); therefore, according to the central limit theorem, the distribution of the sample mean tends to the normal distribution (Maroco, 2007).

Heteroskedasticity was analyzed with the Breusch-Pagan test. Considering the result of the F test, the global significance test, the null hypothesis was rejected for any level of significance; that is, homoscedas-

ticity was rejected, so the model has problems of heteroscedasticity. To test the error autocorrelation, the Wooldridge test was used, whose result led to the rejection of the null hypothesis of non-autocorrelation, hence the model appears to have error autocorrelation.

Thus, the final model of fixed effects was obtained using the least-squares method with robust standard errors, to allow the correct statistical inference, the results of which are shown in Table 4.

Table 4. Fixed Effects Model – Dependent variable: EVA®

EVA	Coef.	Robust Std.Err.	P>z
NOPAT	1,00001	0,019208	0,000*
SR	-0,01863	0,007392	0,019**
IC	0,00054	0,004179	0,897
Cost of Debt	-0,57399	0,124757	0,003*
Cost of Equity	-0,40801	0,063763	0,000*
FL	843,341	912,404	0,365
GDP	-5076,853	11404,860	0,660
Inf	-5963,008	2339,471	0,018**
_cons	-42539,820	18329,270	0,029
N	75		
R ²	0,9972		
*** Significant at a level of 1%; ** Significant at a level of 5%; * Significant at a level of 10%			

Source: own elaboration

The model has a high determination coefficient. The R² indicates that the explanatory variables explain 99% of the variation in the EVA® value of the companies in the sample over time.

Based on the estimated value of the coefficients and their p-value, for any significance level, it appears that one of the variables with the most significant impact on the dependent variable during the analyzed period was NOPAT, which has a statistically significant and positive relationship with the EVA® value of the sample companies. This means that the higher the NOPAT value, the higher the EVA® value, thus constituting an important factor in value creation within the firms included in the sample.

Profitability is identified as a value driver by several authors such as Rappaport (2001), Assaf Neto (2014), Galvão, Teixeira, and Nunes (2018), and MacDiarmid, Tholana, and Musingwini (2018), so the result obtained is not a surprising one, confirming the importance of profitability in creating value.

Considering a level of significance of 5%, the results indicate that Sales Revenue has a statistically significant and negative relationship with the EVA® value of the sample companies. The results are indicating that the higher the value of Sales Revenue, the lower the value of EVA®. This result may reflect the effect of unit operating margins since an increase in sales is not always accompanied by an increase in profitability (sometimes it is even necessary to sacrifice profitability in order to increase the quantity sold), which will hinder the process of value creation. Considering that the period analyzed refers to a difficult time for business activity, it is possible that some companies felt the need to lower their margins in order to maintain sales volume.

A similar result was obtained in the study by Corrêa, Assaf Neto, Nakao and Osajima (2012) in which the Sales Revenue showed a statistically significant relationship with a negative sign. The authors justified the result by the fact that they were analyzing a regulated sector where companies cannot always adjust the selling price to their costs. They also point out that in order to see an increase in sales, it may be necessary to invest heavily in fixed assets, whose expenses do not compensate for an increase in benefits.

The Cost of Equity (VKe) and the Cost of Debt (VKd) have a statistically significant and negative relationship with the EVA® value of the firms in the sample. This means that the higher the VKe and the VKd value, the lower the EVA® value. The cost of equity is also considered a value driver by some authors, such as Assaf Neto (2014) and Galvão et al. (2018).

The inflation rate also seems to have an impact on EVA® value since it shows a statistically significant and negative relationship.

The remaining variables included in the study, Invested Capital, Financial Leverage, and GDP variation, do not show a statistically significant relationship with the EVA® value.

CONCLUSION

Amid a pandemic situation, the world is currently facing a global crisis with the potential to be a major economic recession. Around the globe, economic indicators show that economies are contracting. As a result, of the responses to managing Covid-19, society is changing, and with it, new habits are formed, causing businesses to adapt to new customer behavior.

In the literature review, the study addresses value creation as a primary goal for any company. Although management performance already shows significant advances, moving from a conventional posture of profit and profitability to a focus on value creation, there is a current debate whether this value creation should benefit shareholders or stakeholders.

Although shareholders have the biggest stake in the company, since they are the primary investors and require an adequate return when the company strategies focus on creating value for all the stakeholders, it is still increasing the company's value and ultimately benefiting shareholders.

The purpose of the study was to analyze the value creation in the companies listed in Euronext Lisbon. The aim was to understand how the restrictions imposed by Covid-19 have affected the value creation in the companies. For this purpose, an analysis of how value creation evolved during the period from the 1st semester of 2019 to the 1st semester of 2020 was performed, using (EVA®) as the value-based performance measurement. Since not all companies are affected by the crisis, in the same way, the study also attempted to identify the factors with the greatest impact on value creation.

The data of the study were analyzed through an econometric model using panel data regression analysis.

The study results show that for the entire period analyzed, the mean value of EVA® was negative of -78.308 thousand €. During the 1st semester of 2020, with the exception of firms in the technology industry, all other firms in the sample decreased their capacity to create value, indicating the negative impact caused by the measures set in motion to deal with the pandemic situation, such as the shutdown of schools and universities, the declaration of the emergency state, which led to the temporary closing of various business activities and restrictions on the free movement of people, reducing domestic demand.

The panel data regression revealed that Net Operating Profit After Tax (NOPAT) had a statistically significant and positive relationship with the EVA® value of the sample companies. Sales Revenue (SR) showed a statistically significant and negative relationship with EVA®. The cost of equity (VKe), the

Cost of Debt (VKd), and inflation have also revealed a statistically significant and negative relationship with EVA®. As per Invested Capital, Financial Leverage, and GDP variation, there was no statistically significant relationship with EVA®. Therefore, the study identifies as value drivers operating profit, sales revenue, capital cost, and inflation rate.

This pandemic situation poses a significant threat to value creation, so companies need to rethink and adjust their purpose in order to serve a wider range of stakeholders, focusing on long-term strategies towards value. Not forgetting their shareholders, management needs to focus on creating value for all other stakeholders. A profound analysis using EVA® to measure value creation and identify its value drivers can be a powerful tool at management's disposal. Focusing on the firm's value creation drivers makes the decision process and strategic planning more objective.

Some authors like Strebel (2020) consider that managing the effects of the COVID-19 pandemic is putting in evidence companies pursuing long-term shareholder value benefitting other stakeholders and societal needs. The author considers this as a benefit coming out of this pandemic situation.

The study had as limitations the fact that it only considered publicly available data from the sample companies and also the dimension of the sample, which did not allow for a more in-depth analysis.

In terms of future research direction, it would be of significant importance to include in this type of study besides financial indicators also non-financial indicators.

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Chapter 10

Impact of the COVID-19 Pandemic on the Financial Statements of Portuguese Stock Index 20 Companies

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ABSTRACT

COVID-19 emerged and spread all over the world. Portugal was no exception. Rules and measures applied, regarding the impacts of the pandemic, have affected the economy and, naturally, the entities life. The main objective of this chapter is to investigate the standards and rules entities have to obey and orientations that they have to follow vis a vis COVID-19, and to understand how COVID-19 has impacted interim financial statements of the entities included in the selected sample. Then it seeks to measure entities financial health using financial ratios and Zmijewski model and to compare those entities in order to try to find any relation among financial health and the disclosures made about COVID-19. It verifies that, as a rule, entities have followed the necessary procedures and that COVID-19 has had an impact, specially over credit risk, revenues, and expenses, and that the financially healthier entity is a quite transparent one.

INTRODUCTION

In Portugal as well as in, perhaps, every country in today's world Covid-19 pandemic (Covid-19) emerged and spread becoming a quite serious problem not only for people (unhappily deaths and diseases) but also for companies and economies as a whole.

Companies have to deal with growing costs derived from the appliance of Direção Geral de Saúde (DGS) rules to prevent the spread of the pandemic and also with the decreasing sales due to the confinement and the less financing capacity of people and other companies. Naturally, financial markets also suffer with Covid-19.

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The main objective of the present chapter is to investigate the standards and rules entities have to obey and orientations that they have to follow *vis a vis* Covid-19, and to understand how Covid-19 has impacted interim financial statements of the entities included in the selected sample. Then it seeks to measure entities financial health using some financial ratios and Zmijewski model; and, this way, to compare those entities in order to try to find any relation among financial health and the disclosures about Covid-19.

For this purpose, content and conformity analysis are used and the 1st semester 2020 interim financial accounts of the Portuguese Stock Index 20 (PSI20) companies on august 27th (with the exception of the financial companies due to their special characteristics), are the object of analysis. This is a bibliographic; documentary; qualitative and quantitative; and descriptive research. Primary and secondary data are used.

Requirements from related accounting standards about the present subject are reviewed and comparison between financial health, measured by some financial ratios, and compliance is performed. Comissão de Mercado de Valores Mobiliários (CMVM) main decisions and rules are, also, reviewed.

It is expected that the results provide information about the conformity of PSI20 companies financial statements with the accounting standards applied; show which companies, among those, are financially healthier and therefore better prepared to face Covid-19 crisis; and indicate that they are more transparent.

This study will provide information for students of both levels about the impact of the pandemic on the financial statements. It also will show preparers of financial statements the main efforts they have to undertake and investors how strong companies are to face Covid-19 crisis. Therefore, at least it is justified by academic and professional reasons. It is one of the first studies to inform about accounting and financial reporting impact of Covid-19.

This chapter is structured as follows: after this brief introduction, a revision of accounting standards and market rules related with the subject in study; and a brief approach to some financial ratios used to measure financial health is performed. Then the methodology used is explained, including the sample composition; the study is developed; and its results are presented. Finally, the conclusion is referred.

BACKGROUND

Companies listed in Euronext Lisbon, as those in the present study are, have to respond to the International Accounting Standards Board accounting standards when preparing financial statements and to decisions and rules derived from CMVM.

IMPACT OF COVID-19 ON ACCOUNTING AND FINANCIAL REPORTING

Interim financial statements should be prepared taking in consideration IAS 34. Specifically, providing “an update on the latest complete set of annual financial statements. Accordingly, it focuses on new activities, events, and circumstances and does not duplicate information previously reported” (IAS 34, § 6).

In what concerns information regarding the material impact of Covid-19, entities are encouraged to make its presentation included in the explanations of the amounts presented and recognized in the statement of financial performance, as a “single note as part of the notes to the financial statements” (ESMA, 32-63-972, may 20th 2020). And, as referred by PWC (2020, p. 8), “the steps taken to control the spread ...” must be disclosed.

The impacts of Covid-19 may occur on financial position, financial performance, and cash flows; and, in that case, information must be disclosed. Thus, the uncertainty related to the evolution of the pandemic drives the “need to review all the area of the accounts that are subject to judgment and estimation” (Gould & Arnold, 2020, p. 3). As EY (2020, p. 9) argue “The more the current environment is uncertain, the more important it is for the entity to provide detailed disclosure of the assumptions taken, the evidence they are based on and the impact of a change in the key assumptions”. Those impacts may occur on different levels, for example non-financial assets; financial instruments; revenue recognition; and/or non-financial obligations (PWC, 2020):

Non-Financial Assets

Due to the impact of Covid-19 on economies, demand, operations, revenues, and/or purchase and share prices, entities have to test their non-financial assets in order to understand if it is necessary to consider a corresponding recognition of an impairment.

- According to IAS 36 when the market value is under the carrying amount that indicates the presence of an impairment. In such situation it is created the need to test non-financial assets for impairment, even when preparing half-year financial statements. As assets can't be carried at more than their recoverable amount (IAS 36) entities have got to recalculate carefully future cash inflows over a relevant time horizon and to review the process to determine the discount rate reflecting current market assessments of the time value of money and the risks specific to the asset being tested and exclude risks and uncertainties that were already taken into account in the projected cash-flows, in order to integrate the impact of Covid-19 (IAS 36, §§ 23, 55, 56).

Financial Instruments

Financial instruments may also suffer the impact of Covid-19.

Entities must take in consideration their specific characteristics and, therefore, their different exposures to risk when disclosing information about the impact of Covid-19. So, besides considering the several types of risk related to the activities they develop but also to the different geographies in which they operate, entities are, now, confronted with the risks related to the pandemic.

Financial Risks

Therefore, entities have to manage those risks. Particularly financial risks must be managed and related accounting standards must be met. Among financial risks are credit risk, liquidity risk and market risk (IFRS 7, Appendix A):

IFRS 7 (Appendix A) state that “**credit risk** is the risk that one party to a financial instrument will cause a loss for the other party by failing to pay for its obligation”. According to the same standard

“Qualitative and quantitative disclosure enables users of financial statements to understand the effect of credit risk on the amount, timing and uncertainty of future cash flows. This includes the basis of inputs and use of assumptions and estimation techniques” (Gould & Arnold, 2020, p. 6).

Expected credit loss (ECL) estimate must, also, be reviewed in order to incorporate the impact of the pandemic, which means to reevaluate credit risk (risk of default); the amount at risk if the debtor defaults (exposure at default); and the estimated loss as a result of default (loss given default). According to Gould & Arnold (2020, p. 6) and EY (2020, p. 8) “ECL is a probability weighted amount that is determined by evaluating a range of possible outcomes”. Entities have to disclose information regarding the reviewed ECL (IFRS 9). They have “to incorporate reasonable and supportable information about past events, current conditions and the forecast of future economic conditions into the assessment of ECLs for financial assets not measured at fair value through profit or loss” (Gould & Arnold, 2020, p. 5). According to IFRS 9 and Deloitte (2020, p. 3)

The amount and timing of the expected credit losses as well as the probability assigned thereto must be based on reasonable and supportable information that is available without undue cost and effort at the end of the reporting period without the use of hindsight. In some cases, this may require significant judgment

IFRS 7 (Appendix A), also, states that **liquidity risk** is the risk that an entity will have difficulties in paying its financial liabilities.

Deloitte (2020, p. 4) argues that entities have to respect IFRS 7 in what concerns the disclosure of their liquidity risk management considering the use of working capital techniques to face the “disruptions in productivity and reduced sales” due to Covid-19 impact.

Finally, **market risk** is the risk that the fair value or cash flows of a financial instrument will fluctuate due to changes in market prices. This type of risk reflects interest rate risk, currency risk and other price risks (IFRS 7, Appendix A).

The main disclosures that must be made about these types of risk will be considered far ahead, under the caption Empirical study.

Fair Value Reviewed

Financial instruments that are written down at fair value have to integrate the impact of Covid-19 in their price and, subsequently, in their accounting value. As referred by Deloitte (2020, p. 3) fair value measurement (FVM) “should reflect market participant views and market data at the measurement date under current market conditions”. Gould and Arnold (2020, p. 4) observe that “the volatility of prices on various markets has also increased. This affects the FVM”. Investments in subsidiaries, joint ventures and investment properties that are measured at fair value are in the same situation as financial instruments and so must be treated the same way.

IFRS 13 (8 1) defines fair value as “the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date (i.e. an exit price)”. This standard (8 B2) establishes what is necessary to determine in order to find an appropriate measure of fair value.

In what concerns disclosures the standard requires both quantitative and qualitative information, above all, linked to the so called “three-level fair value hierarchy” (already existing in IFRS 7)

on the basis of the inputs to the valuation technique: Level 1 inputs are fully observable (e.g. unadjusted quoted prices in an active market for identical assets and liabilities that the entity can access at the

measurement date); Level 2 inputs are those other than quoted prices within Level 1 that are directly or indirectly observable; and Level 3 inputs are unobservable.

It is important to highlight, as referred by EY (2020, p. 7), that “entities should consider what information about the outbreak was known and knowable to the market participants at the reporting date in order to determine the fair value at that date”.

Revenue Recognition

Covid-19 has affected and continues to affect the level of sales and services, and also the capacity of customers to satisfy their obligations in time and other variable considerations. Such situation must be accounted for and corresponding disclosures must be met. As so IFRS 15 must be observed in what concerns the time and amount of recognition of the revenue. This standard (IFRS 15, IN7) establishes a five-step model framework required for the recognition of revenue: “Identify the contract(s) with a customer; Identify the performance obligations in the contract; Determine the transaction price; Allocate the transaction price to the performance obligations in the contract; Recognize revenue when (or as) the entity satisfies a performance obligation”. IFRS 15 (δ 110) defines its disclosure objective and establishes the qualitative and quantitative information required. Among those disclosures is the information regarding the “uncertainty of revenue ... flows arising from contracts with customers”.

Government Grants

Also, in case that there is a government grant to help entities to stand for the impact of Covid-19, situation that is seen worldwide, IAS 20 must be observed. The standard states the conditions that must be met to allow recording government grants (δ 7). Still according to IAS 20 “the grant is recognized as income over the period necessary to match them with the related costs, for which they are intended to compensate, on a systematic basis” (δ 12); and “non-monetary grants, such as land or other resources, are usually accounted for at fair value, although recording both the asset and the grant at a nominal amount is also permitted” (δ 23). However, if a grant is “receivable as compensation for costs already incurred or for immediate financial support, with no future related costs, should be recognized as income in the period in which it is receivable (δ 20).

It is also important to highlight that (IAS 20): a grant relating to assets may be presented either “as deferred income, or by deducting the grant from the asset’s carrying amount” (δ 24); and if it is “relating to income may be reported separately as ‘other income’ or deducted from the related expense” (δ 29). Both situations comprise treatment options (δ 32).

IAS 20 (δ 39) requires disclosures relatively to government grants as follows: “accounting policy adopted for grants, including method of balance sheet presentation; nature and extent of grants recognized in the financial statements; unfulfilled conditions and contingencies attaching to recognized grants”.

Non-Financial Obligations

Provisions, and other issues like onerous contracts; contingent assets; employee benefits and share-based payments; income taxes; breach of covenants; and events after the reporting period must be observed to have in consideration any impact of Covid-19.

Provisions

According to IAS 37 (§ 14) an entity must recognize a provision if, and only if: a present obligation (legal or constructive) has arisen as a result of a past event (the obligating event); payment is probable ('more likely than not'), and the amount can be estimated reliably. And the main disclosures requested are: "A reconciliation for each class of provision: opening balance; additions; used (amounts charged against the provision); unused amounts reversed; unwinding of the discount, or changes in discount rate; closing balance" (IAS 37, § 84); and "For each class of provision, a brief description of: nature; timing; uncertainties; assumptions; reimbursement, if any" (IAS 37, § 85).

Other Issues

Due to the impact of Covid-19 entities should, also:

- Assess if any of their **contracts** became **onerous** and, in that case, consider those contracts as such. That is to say that the unavoidable costs of meeting the obligations under the contract now exceed the benefits expected to be received (Deloitte, 2020, p. 3). However, the Amendment to IAS 37 (clarifies the costs that must be considered "for the purpose of assessing whether a contract is onerous") is, not yet, of compulsory application (only from 2022 on);
- Take in consideration if there is a need to revise the assumptions to measure **employee benefits** and share based payments; and any changes made to the terms of related plans; and, also, if there is any legal or constructive obligation to their employees (IAS 19, IFRS 2, IAS 37). Related disclosures must be met;
- Revise forecast profits and the recoverability of **deferred tax** assets (IAS 19) and the plans to distribute profits from subsidiaries, as future profits may be affected. Related disclosures must be met;
- Assess if there is a risk of **breach of covenants**. There may result a change in terms of repayment, so it is important to realize what is the capacity of the entities to satisfy their financial obligations in time and amount;
- **After the reporting date** verify if information that constitute adjusting events (provide evidence of conditions that existed between that date and the reporting date) had emerged and other that constitute non-adjusting events (indicate conditions that arose between that date and the reporting date). Adjustments in the amounts recognized in the financial statements must be made for the first and only disclosures must be made for the late in the notes to the financial statements. The events must be materially relevant.

Entities have to consider IAS 10 in order to incorporate the evolving change related to the pandemic. According to EY (2020, p. 4) "if the impact from the outbreak and the subsequent measures is mate-

rial, the entities should disclose such events and an estimate of its financial impact (if practicable) or a qualitative description of its subsequent operating situations”. As mentioned by EU (2020, p. 3), “The coronavirus is ordinarily an adjusting event for any reporting period ending as from 31 January 2020).

Going Concern

According to IAS 1 management have “to make an assessment of an entity’s ability to continue as a going concern”. The notes must include “information about the basis of preparation of the financial statements and the specific accounting policies used” (8 112).

So, entities have to consider if they continue as a going concern due to the impact of Covid-19, as that affects the recognition policy and related disclosures (IAS 1). As referred by EY (2020, p. 5) “Significant judgment and continual updates to the assessments up to the date of issuance of the financial statements may be required given the evolving nature of the outbreak and the uncertainties involved”.

EU (2020, p. 2) argues that entities “need to consider running several possible sensitivity analyses to determine whether there is any material uncertainty on its ability to continue as a going concern”.

Other Issues

Besides the disclosures required by specific standards, entities have to take in consideration those required by IAS1, namely regarding changes in accounting policies, judgments, and estimates, due to the referred impact. IAS 8 (8 14) states the conditions that must be met for allowing the entity to change an accounting policy.

Entities have to disclose concerning information (IAS 8, 8 28) and also information regarding changes in accounting estimates (IAS 8, 88 39-40). Finally, IAS 1 (8 122) requires an entity to

disclose, in the summary of significant accounting policies or other notes, the judgments, apart from those involving estimations, that management has made in the process of applying the entity’s accounting policies that have the most significant effect on the amounts recognized in the financial statements

Some entities have insurance policies that cover costs like those inflicted by Covid-19. These entities recognize the benefits of the insurance only when the recovery of the costs is virtually certain.

COVID-19 AND ENTITIES FINANCIAL HEALTH

It is always important to understand entities financial health but, specially, in times of crisis like the present due to the spread of the coronavirus. This situation and its consequences may origin financial distress. According to Khaliq *et al.* (2014, p. 141) this “is the situation when a company cannot meet or face difficulty to pay off its financial obligations to the creditors”. This means financial health may be in question.

Liao and Mehdian (2016), Nurhayati1 *et al* (2017), and a vast number of other authors, measure entities financial distress using financial ratios. To use the same ratios but making the inverse reading seems to be adequate. That is to measure entities financial health. The ratios used are: debts to assets ratio; current ratio; and return on assets (ROA).

Authors like Linsley and Shrives (2006); and Alves and Morais (2017), among so many others, compare the performance of these ratios and try to find any relation with their outcome and the disclosures about some issue, very often with risk. In the present study the issue is Covid-19.

Several discriminant analysis models use these, and others, financial ratios in order to understand if the entities are in distress. Perhaps the most well-known are the Altman's models. Khaliq *et al* (2014); Manalu *et al* (2017); Novietta and Minan (2017); and Kablan (2020) are examples of authors that have used these models in their studies. However, there are other models, among them is the Zmijewski model. Manalu *et al* (2017, p. 678) used both Altman and Zmijewski models and arrived to similar results. According to these authors "many researchers use Altman Z Score and Zmijewski methods to analyze financial distress in both manufacturing and non-manufacturing companies" and both methods "give the same result, but the difference is the level of condition and standard determining the financial condition only" (Manalu *et al* (2017, p. 681). Using the same models Viciwat (2020, p. 794) found "that the Zmijewski (X-Score) model is the model that has the highest accuracy rate in predicting bankruptcy with an accuracy rate of 90%".

Zmijewski (1984) model is represented as follows:

$$X - \text{Score} = -4.3 - 4.5X_1 + 5.72X_2 - 0.004X_3 \quad [1]$$

Where:

X-Score= bankruptcy index

X_1 = ROA (return on assets)

X_2 =leverage (debt ratio)

X_3 = liquidity (current ratio)

AlAlia *et al* (2018) used, only, Zmijewski X-score model in their study in which they "examine the likelihood of financial distress that mobile telecommunications companies might face".

Sinarti and Sembiring (2015, p. 354) used Z-Score, Springate, and Zmijewski models in their study. The results showed "a significant difference to the prediction model Z-Score with Zmijewski and Springate with Zmijewski".

The methods and procedures taken in the present study are described below.

METHODOLOGY

The main objective of the present chapter is to understand how Covid-19 has impacted interim financial statements of the entities included in the selected sample. Then it seeks to measure entities financial health using financial ratios and Zmijewski model; and, this way, compare those entities in order to try to find any relation with the disclosures about the impacts of Covid-19. Having this in mind, it was decided to use a convenient sample composed by the companies included in PSI20 on august 27th (with the exception of the financial companies due to their special characteristics). This is a bibliographic; documentary; qualitative and quantitative; and descriptive research. Primary and secondary data are used.

Requirements from related accounting standards and CMVM main decisions and rules about the present subject are reviewed. The chapter uses content and conformity analysis of financial statements.

The financial statements concern the first semester 2020 interim financial reports. Comparison between financial health and disclosures related to Covid-19 is supported by qualitative and quantitative information.

Table 1 shows the companies included in the sample and their respective areas of activity according to Euronext Lisbon.

Table 1. The sample

Entities	Areas of Activity
Altri SGPS, S.A. (Altri)	Paper pulp production; logging; electricity production from renewable energies.
Corticeira Amorim, SGPS, S.A. (C. Amorim)	“world’s largest cork and cork-derived company in the world, ... developing a vast portfolio of 100% sustainable products”.
EDP - Energias de Portugal, S.A. (EDP)	Production, sales and distribution of electricity; supply of energy services; other. “... one of the leading producers and distributors in Portugal”.
EDP Renováveis (EDPR)	Development and construction of electricity production units; electricity production from wind and hydraulic energies; operation and maintenance of electrical plants.
Galp Energia, SGPS, S.A. (Galp)	Refining and distribution; production and distribution of natural gas; exploration and production of crude oil; and other.
Ibersol, SGPS, S.A. (Ibersol)	Specializes in operating well known fast-food restaurant chains.
Jerónimo Martins SGPS S.A. (J. Martins)	“Assets in the Food area, mostly in Distribution, with market leadership positions in Poland and Portugal. operates in the areas of Dairy Products, Livestock and Aquaculture. ... in the Restaurants sector ... chain of kiosks and coffee shops.
Mota-Engil, SGPS, S.A. (Mota-Engil)	Engineering and construction (leader in Portugal); waste management; energy; multi-services; transport concessions, mining; logistics.
NOS, SGPS, S.A. (NOS)	Telecoms and entertaining group (mobile phone, television, internet, voice and data solutions).
Novabase S.G.P.S., S.A. (Novabase)	Portugal’s number one computing company.
Pharol, SGPS S.A. (Pharol)	“Specializes in owning shares in companies operating in the telecommunication field”.
REN - Redes Energéticas Nacionais, SGPS, S.A. (REN)	Electricity; gas; other. “Specializes in the operation and concession management of the Portuguese electricity transportation network”.
Semapa	Production of paper and pulp; production of cement and building materials; environmental services.
SonaeMC, SGPS, S.A. (SonaeMC)	Food retail market; retail market in the electronics, sports and fashion sectors.
Sonae Capital	Development and management of tourist resorts; hotel and health clubs management; energy service provision for industry; design, assembly and handling of commercial and industrial refrigeration systems and air-conditioning systems. “... holds non-strategic assets that are available for sale, in particular equity ownership and property assets”.
The Navigator Company (Navigator)	Production of printing paper (Navigator, Inacopia, Discovery, MultiOffice, Inaset brands, etc.); production of eucalyptus; sale of tissue papers; other. “... leading European producer of printing paper”

Source: Euronext Lisbon (2020)

Thus, from table 1 it is obvious that the PSI 20 companies (the sample) are quite diversified. However, energy (Altri; EDP; EDPR; Galp; Mota-Engil; REN; Sonae Capital); paper and pulp (Semapa; Altri; Navigator); and food (Ibersol; SonaeMC) are areas in which more than one of the companies operate. But other areas are also quite relevant due to the companies’ international exposure and their importance:

cork (C. Amorim) and construction (Mota-Engil). Computing, telecommunication and tourism are other areas of activity of some of these companies.

Table 2 shows the accounting standards that somehow are to be observed when considering the impact of Covid-19 on financial statements and the related issues.

Table 2. Related accounting standards

Accounting standard	Designation	Issue
IAS 36	Impairment of assets	Non-financial assets
IAS 28	Investments in Associates and Joint Ventures	Non-financial assets
IAS 1	Presentation of financial statements	Non-financial assets; Non-financial obligations; Going concern; Disclosures including financial risk
IAS 2	Inventories	Non-financial assets
IFRS 9	Financial instruments	Non-financial assets; Financial instruments and leases
IAS 16	Property, plant and equipment	Non-financial assets
IAS 23	Borrowing costs	Non-financial assets
IFRS 13	Fair value measurement	Financial instruments and leases
IFRS 15	Revenue from contracts with customers	Revenue recognition
IAS 37	Provisions, contingent liabilities and contingent assets	Non-financial obligations
IAS 19	Employee benefits	Non-financial obligations
IFRS 2	Share based payment	Non-financial obligations
IAS 12	Income taxes	Non-financial obligations
IAS 34	Interim financial statements	Interim financial statements
IFRS 7	Financial instruments: disclosures	Financial instruments and leases
IAS 20	Government grants	Revenue recognition
IFRS 2	Share based payment	Non-financial obligations
IAS 10	Events after the reporting period	Non-financial obligations

Source: Own source

According to table 2, these accounting standards have to be observed related to non-financial assets; non-financial obligations; financial instruments; going concern; disclosures; revenue recognition; and interim financial statements.

Considering Covid-19 impact, CMVM decided to adopt “a set of decisions and recommendations addressed to the investors and to the various entities under its supervision aimed at helping them handle the current context” (CMVM, 2020, p. 1). Table 3 shows those main decisions and rules.

Table 3. CMVM main related decisions and rules

Decisions and Recommendations on Covid-19 (20.03.2020).
European Securities and Markets Authority (ESMA) public statement on the accounting implications of the COVID-19 outbreak on the calculation of expected credit losses in accordance with IFRS 9 (25.03.2020).
ESMA on mitigating the impact of COVID-19 on the EU financial markets regarding publication deadlines under the Transparency Directive (27.03.2020).
CMVM recommends adopting principles of sustainability and transparency in information to the market and in dividend and crisis management policies (14.04.2020)
CMVM supports ESRB and ESMA recommendations on market risk containment (14.05.2020)
CMVM supports ESMA recommendations on half-yearly financial reports (22.05.2020).

Source: Own source

It may be observed from table 3, that CMVM decisions to face Covid-19 consequences specially concern the preparation of financial reports; recommendations on market risk containment; sustainability, transparency, and deadlines in information to the market; the calculation of expected credit losses; and other recommendations.

In the first document CMVM refers, specially, that it had decided a set of activities to carry on that imply that entities prepare their business plans in a required manner and, particularly, stated that disclosures about Covid-19 must be made in a timely and clarified way.

Next, the empirical study follows, step by step, the development of the present subtitle, analyzing the entities' 2020 (1st semester) interim financial accounts.

EMPIRICAL STUDY

As referred above the main objective of the present chapter is to investigate the standards and rules entities have to obey and orientations that they have to follow *vis a vis* Covid-19, and to understand how Covid-19 has impacted interim financial statements of the entities included in the selected sample. Like Liao and Mehdian (2016); Nurhayati1 *et al.* (2017); and a vast number of other authors, the present study seeks to measure entities financial health using financial ratios and, this way, to compare those entities. The intention here is just to use the final product of other studies taking their results as good. For example, taking debts to assets ratio, current ratio, and return on assets (ROA) as strong measures and Zmijewski (1984) model as accurate to measure an entity financial health. Then it compares the entities in order to try to find any relation among financial health and Covid-19 disclosures.

To attain the main objective of the present study the interim financial accounts (first semester, 2020) of the entities included in the sample were read and the outcome of this reading is presented here.

IMPACT OF COVID-19 ON INTERIM FINANCIAL ACCOUNTS

Several entities among those included in the sample follow ESMA's (2020) encouragement and use a single note to report information about the impact of Covid-19 (Altri; Ibersol; J. Martins; Mota-Engil; SonaeMC); others use an introductory text in the Notes, before note 1 (EDP; EDPR); others use a sub-

point of a note (Galp, NOS, Semapa; Navigator); while others include this information in other notes (C. Amorim; Novabase; REN); and, finally, others disclose this information, only, in the Management Report (Pharol, Sonae Capital). This means that not all the entities embraced the ESMA's encouragement.

Almost all entities in the sample report having elaborated Contingent Plans and, in their context, having adopted measures to avoid the spread of Covid-19 among their employees and in their facilities. The exceptions are SonaeMC, although this entity refers that it "will continue to implement measures to minimize the impacts of the pandemic and follow the recommendations of the authorities"; and EDP that seems to incorporate the strategy and the measures towards Covid-19 in its business continuity plans.

It is possible to mention that some entities do not, clearly, disclose information about the impacts of the pandemic on financial position, financial performance, and cash flows (Altri; C. Amorim; EDP; Galp; SonaeMC). Yet, they show to be aware of the risks deriving from the spread of the pandemic and several entities refer a significant impact of Covid-19 (C. Amorim; EDP; Ibersol; Mota Engil; NOS; Sonae Capital; Navigator), above all, because of the decreased activity due to the lockdown imposed by the conditions associated with the state of emergence; while others refer having felt the referred impact, but not so strongly or they cannot quantify it (J. Martins; Pharol). Finally, some refer not to have felt any impact or that the impact was reduced (EDPR; REN; Novabase; Semapa).

From the observation of the entities' interim financial reports, it seems that the majority of the entities did not recognize **imparities** due to the negative impact of Covid-19 (although some may have recognized imparities for other reasons). However, some (EDP; Ibersol; NOS; Semapa; SonaeMC; Navigator) do report imparities for that reason. The imparities recorded in relation to non-financial assets are, almost exclusively, related to accounts receivable, except in what concerns EDP and Semapa that had recognized imparities, also, relatively to proprietaries, plants and equipment; and Ibersol that reports, also, having recorded impairments for tangible fixed assets.

It, also, seems that there is no risk of recoverability of inventories, goodwill or other items besides those already mentioned, from any of the entities included in the sample.

Entities face several risks, which include, besides others, financial risks and risks related to the impact of Covid-19. This late exposure may be identified, as Hassan *et. al.* (2020, p. 1) argue, by counting the number of times the pandemic is mentioned, but while the authors count times "in the quarterly earning conference call that public listed firms host with financial analysts", here those times are counted in the half-year interim financial reports of the entities included in the selected sample (Table 4). As argued by Alves (2011) the option for the word as analysis unity has some advantages and limitations, however the decision should fall on the type of unity considered more adequate to the studied being carried on. The words used to identify the exposure are: Covid; pandemic; and coronavirus/virus. These words are counted considering the following **decision rules**:

- When, in the same sentence, the word exists more than once, it counts, only, one time;
- When, in the same sentence, exists more than one of the words, only one counts;
- When the previous situation occurs the word to count for is Covid;
- When, in the same sentence, the existing words are pandemic and coronavirus/virus the word to count for is pandemic;
- Titles and sub-titles count.

Table 4. Word count

Entities	Word counts			Total number of words
	Covid	Pandemic	Coronavirus/ Virus	
Altri	8	9	0	17
C. Amorim	14	10	4	28
EDP	31	14	2	47
EDPR	47	8	6	61
Galp	14	0	0	14
Ibersol	17	7	-	24
J. Martins	10	27	0	37
Mota-Engil	13	23	2	38
NOS	37	20	5	62
Novabase	16	5	-	21
Pharol	5	4	0	9
REN	4	1	0	5
Semapa	26	29	4	59
SonaeMC	13	3	3	19
Sonae Capital	6	8	0	14
Navigator	28	17	1	46

Source: Own source

From the observation of table 4 it can be underlined that the entity that has mentioned the most the selected words is NOS, nearly followed by EDPR, and the entity that has mentioned the less those words is REN. Supposedly, NOS is the entity included in the sample that is more exposed to the impacts of Covid-19 and REN the less exposed. However, the situation is not that simple because, as argued by Lin *et al.* (2007) “How to assess and quantify transparency are very real and current difficulties”.

In the context of the present study financial risks are observed in relation to the impacts of Covid-19.

Considering **credit risk** main disclosures, for each item, the observation shows which entities are in conformity with IFRS 7 (88 36–38) requests:

- Maximum amount of exposure: Ibersol; J. Martins; Semapa; SonaeMC; and Navigator;
- Description of collateral: Altri; EDPR; Ibersol; J. Martins; Semapa; Navigator;
- Information about credit quality of financial assets:

That are neither past due nor impaired. C. Amorim; EDP; Ibersol; J. Martins; Semapa; Navigator;
Whose terms have been renegotiated: C. Amorim; J. Martins;

- Analytical disclosures about financial assets that are past due or impaired: Semapa; Navigator;
- Collateral or other credit enhancements obtained or called: none.

So, no one of the entities interim financial reports is completely in conformity with the main IFRS 7 requests about this subject. Some entities do not make any relation between this type of risk and Covid-19 (EDP; Ibersol; REN); others merely state that they felt no need to change their credit risk management policy and procedures due to Covid-19 spread, being this risk reduced either because of the quality or the diversification of their customers (Altri; C. Amorim; EDPR; Galp; Pharol; Semapa; Sona Capital; Navigator); and others claim the reinforcement of this type of risk due to the impact of Covid-19, but are managing it attentively (J. Martins; NOS; SonaMC). Finally, one does not include this type of risk in the set of risks it faces but it calls for 2019 financial report (Novabase), and another does not mention the risks it faces (Mota Engil).

It deserves to be highlighted that J. Martins took an interesting action towards its partners whose businesses were affected by Covid-19, first suspending rents collection in the first months of the spread of the pandemic, and afterwards negotiating discounts on those rents; and, also, an alert made by NOS (2020, p. 34) that argues that legislation related to Covid-19 makes collections difficult having “an effect that can last into future periods”.

As previously referred entities have to disclose information regarding the reviewed ECL. Some of the entities in the sample refer having made this revision based on the evolution of Gross Domestic Product and on the unemployment rate, to be applied, specially, to amounts receivable with the aim to reflect in the referred component the impact of Covid-19 (Galp; NOS; SonaMC; Navigator); others just mention how they assess ECL (C. Amorim; EDP; EDPR; Mota-Engil; Semapa); and others do not make any reference to this subject (Altri; Ibersol; J. Martins; Novabase; Pharol, REN; Sona Capital).

In what concerns **liquidity risk** IFRS7 (8 39) main disclosures, it may be observed that all entities present a maturity analysis of financial liabilities; and only Pharol and REN do not present a description of their approach to risk management. However, they report to 2019 financial reports. The majority of the entities do not expect Covid-19 to impact their liquidity risk and/or their liquidity risk management as they have guaranteed credit lines availability and financing facilities with financial institutions; as well as ‘Cash and cash equivalents’ careful management. Only a few do not include this type of risk in the set of risks they face and they may or not call for 2019 financial reports (Novabase; Pharol; REN).

About **market risk** main disclosures, for each item, the observation reveals which entities are in conformity with IFRS 7 (88 40–42) requests:

- Sensitivity analysis of each type of market risk to which the entity is exposed: EDP; EDPR; Ibersol; J. Martins; Semapa; Navigator;
- Additional information if the sensitivity analysis is not representative of the entity’s risk exposure: none;
- Sensitivity analysis prepared for management purposes that reflects interdependencies of more than one component of market risk: none.

It may be observed that, only six entities accomplish sensitivity analysis concerning market risk. Among these entities some make it relatively to currency risk and interest rate risk (EDP; EDPR; Semapa; Navigator), while one, only, relatively to currency risk (J. Martins) and another one, only, to interest rate risk (Ibersol).

It is important to remark that NOS has opted to practice Enterprise Risk Management, which is a holistic way of developing the management activity.

Table 5. Variation of revenues and expenses

Entities	Var% Revenues 1H 20 / 1H 19	Var% Expenses 1H 20 / 1H 19
Altri	-19,5%	899,9%
C. Amorim	-5,0%	-89,8%
EDP	-13,0%	-20,3%
EDPR	-11,2%	-17,0%
Galp	1,9%	2,6%
Ibersol	-39,6%	-22,0%
J. Martins	4,6%	5,4%
Mota-Engil	-14,0%	-5,2%
NOS	-7,6%	1,6%
Novabase	13,6%	11,6%
Pharol	-	-83,9%
REN	0,4%	6,6%
Semapa	-15,9%	-22,8%
Sonae MC	-6,4%	-7,0%
Sonae Capital	49,8%	38,5%
Navigator	-18,6%	-11,4%

Source: Data extracted from entities 1st semester 2020 interim financial reports

Some entities do not expect Covid-19 to impact significantly their market risk but they will carry on a careful management (C. Amorim); others do not include this type of risk in the set of risks they face and they may or not call for the 2019 financial report (Altri; Mota Engil; Novabase; SonaeMC; Sonae Capital); others acknowledge the impact of the pandemic but made it lower through the use of hedging strategies and a thorough monitorization of this type of risk (EDPR; J. Martins; REN; Semapa; Navigator); others just mention the existence of this type of risk but explain little or nothing about it (Galp; NOS; Pharol). Finally, one entity explains its situation regarding this type of risk but makes no direct relation with Covid 10 (Ibersol).

The great majority of the entities which adopt hedging strategies report that they use derivatives to manage risk. In those cases, they often use hedge accounting. So, they have to have in mind that the impact of Covid-19 may reduce “the probability of a hedged forecast transaction occurring or affects its timing” (Gould & Arnold, 2020, p. 6); then hedge accounting can no longer be applied.

Considering all items analyzed in the **fair value** revision, several entities did not find any significant difference between fair value and book value (C. Amorim; EDP; EDPR; NOS; REN). The valorization models more frequently used by the entities are the discounted cash flow model and the options model (C. Amorim; EDPR; NOS; REN; Semapa; Sonae Capital; Navigator). Another model referred is the proprietary model used for the valuation of some complex derivatives (C. Amorim).

It may, also, be observed that the “three-level fair value hierarchy” is used by almost all the entities included in the sample, except one that only reports having recorded changes in fair values (SonaeMC). Still one explains how fair values are determined and makes no relation to Covid-19 (Ibersol), and another does not even mention the subject (Novabase).

As previously referred, the spread of Covid-19 may impact **revenues**. Table 5 shows the variation of the revenues reported by the entities included in the sample, comparing the first semester of 2020 with the same period of 2019. It, also, shows the variation of the expenses in the same period.

Table 5 above shows that almost all entities within the sample suffered a drop in their revenues. Considering no other possible variables and the present circumstances, that can be interpreted as the negative impact of Covid-19 over their revenues. The higher impact was felt by Ibersol, and the lower impact felt by C. Amorim. In the opposite sense is Sonae Capital (followed by far by Novabase, J. Martins, Galp, REN) with an increase in its returns of about 50%, which is not so strange due to its activity. Several entities managed to reduce their expenses in a higher rate than the rate of reduction in their revenues. Pharol did not show any sales or services in its 1st semester 2020 income financial statement.

Although entities have had to face unexpected expenses, those expenses, as reported by the majority of the entities in their financial reports, were, above all, related to hygiene and cleaning procedures, health and safety, and acquisition of security materials. Donations are also reported (Altri, EDP; EDPR). Some entities do not, clearly, mention the existence of expenses regarding the impact of Covid-19 (C. Amorim; Galp; Novabase; REN; Sonae Capital); others do mention such expenses but together with other items and/or do not make the identification of the amounts (J. Martins; Ibersol; Mota Engil Pharol); and, finally, others refer such expenses and the respective amounts (EDP; NOS, Semapa; SonaeMC; Navigator). Yet, harder to overcome are, certainly, the production shutdown costs (about € 7.7 million) reported by Navigator.

Ibersol reports having adhered to the simplified lay-off of circa 75% of its employees; and later joined the Extraordinary Incentive to Standardization of Business Activity program and to the cost reduction initiative, renegotiation of contracts and negotiation of payment terms.

In what concerns **government grants**, only Navigator reports, clearly, having received them for the purpose of facing the impact of Covid-19. This entity' financial reports are in conformity with IAS 20 disclosure requests.

Although having or not considered **contingent assets**, there is no mention of any relation with the pandemic among the entities object of the present study. And, although **provisions** had been recorded, for some entities (Altri; C. Amorim; EDP; EDPR; Ibersol; Novabase; Pharol; REN; Semapa; SonaeMC; Sonae Capital; Navigator), they had nothing to do with the effects of the pandemic. Also, changes in estimates had not been mentioned. Galp has recorded provisions under the caption Other risks and changes, but does not explain to what, exactly, it refers to. So, they may or may not have to do with Covid-19. Also, changes in estimates are not mentioned. And, finally, others have recorded provisions related, above all, to the probable future impact of Covid-19 (J. Martins; Mota-Engil; NOS); they mention to have reviewed estimates.

Yet, still **other issues** deserve to be mentioned:

- Only NOS and SonaeMC report having recorded **onerous contracts** due to the impact of Covid-19. Amendment to IAS 37 was not yet applied;
 - Having or not recorded **employee benefits**, entities included in the sample do not refer whatever relation with the impact of Covid-19, let alone any review of its assumptions;
 - No entity report having any change or maintenance of **share-based payments** policy related or not with the impact of Covid-19;

- None of the entities included in the sample has made any disclosure about the recoverability of their **deferred tax assets** with any link to the pandemic, but Sonae Capital mentions a reasonable expectation of recovery of deferred tax assets recorded before their date of expiry;
- In what concerns **future profits**, some entities underline a relation (difficult to estimate) with the uncertainty resulting from the spread of the pandemic and its impact (C. Amorim; EDP; Galp; Ibersol; J. Martins; NOS; SonaeMC); others refer a low or no significant impact of the pandemic (EDPR; Semapa; Sonae Capital; Navigator) regarding expectations for the future and, finally, some refer the expectation of no impact or do not make any reference to the subject (Novabase; Pharol; REN). Only Mota-Engil reports that its prospects for 2020, are “strongly conditioned by the uncertainty regarding the evolution of the pandemic”;
- The entities that had negotiated **covenants** declare being in compliance with them and make no reference to changes in terms of repayment. Among them, some had negotiated the covenants in association with credit lines (J. Martins); others associated with credit lines and commitments to maintain certain financial ratios within previously negotiated limits. and/or cross-default, *pari passu* and negative pledge clauses (C. Amorim; EDP; NOS; REN; Semapa; Navigator) and others do not identify to what the covenants are associated with (Galp; Ibersol; SonaeMC). Finally, the remaining entities do not refer the existence of negotiated covenants (Altri; EDPR; Mota-Engil; Novabase; Pharol; Sonae Capital). Only Galp has established a relation between the covenants and the uncertainty derived from Covid-19. No breach of covenants seems to have occurred in the semester in study, in the context of the sample;
- Some entities do not report any adjusting or non-adjusting **event after the reporting period** related or not to Covid-19 (Altri; Ibersol; J. Martins; Novabase; REN; Sonae Capital); others report those events but making no relation with Covid-19 (EDPR; Mota Engil; NOS; Pharol; Semapa; SonaeMC); and, finally, others report those events relating them both with Covid-19 and not with Covid-19 (C. Amorim; EDP; Galp; Navigator). Due to the pandemic some entities report having postponed the payment of dividends (C. Amorim; Novabase; Navigator).

Several entities observe the stated by IAS 1 and refer that they assessed the impact of Covid-19, considering different basis and assumptions, and they decided to prepare their financial statements on a **going concern** basis (Altri; Galp; J. Martins; Mota Engil; NOS; Semapa; Sonae Capital; Navigator). A few entities, although not mentioning the going concern basis, refer the assumption of business continuity (C. Amorim; EDP; EDPR; Novabase; SonaeMC). The referred basis and assumptions of decisions were the following:

- Relevant information, facts and circumstances, of financial, commercial or other nature (Altri; Mota Engil); or under a defined strategy (C. Amorim; EDPR; J. Martins; Semapa);
- Having regulated activity and revenues (Galp);
- Liquidity situation and capital levels (Novabase)
- Remarkable generation of free cash flow. strengthened financial position, financial and liquidity situation (Navigator);
- Regulated concession contracts; results and cash flows estimates; credit lines (REN);
- Books and accounting records of the companies (SonaeMC);

– No identification of basis of decision (Sonae Capital; Pharol).

Ibersol does not mention either the going concern basis or the business continuity assumption but, in note 2.1, it emphasizes the need to read interim financial report together with the 2019 financial report.

During the period, the majority of the entities report no changes in accounting policies, estimates and judgments (Altri; C. Amorim; EDP; EDPR; Galp, Ibersol; NOS; Novabase; Pharol; REN; Semapa; SonaeMC; Navigator). However, C. Amorim had the intention to change accounting policies because an Amendment to IFRS 3 became effective on the 1st of January 2020 and this entity considers that it allows “to overcome the difficulties that arise when an entity determines whether it has acquired a business or a set of assets; once this entity has an agreement to acquire non-controlling interests, this decision seems to be adequate”. Some entities do not report changes in accounting policies and judgments, but report changes in estimates (J. Martins - for tax litigations) or in estimates and assumptions (Mota-Engil - for impairment losses and provisions, used sensitivity analyzes). Semapa refers having made changes in accounting policies of entities whenever necessary to ensure consistency with the policies adopted by the Group.

After showing the results of the observation of the entities interim financial reports, following their selected ratios are presented in order to try to understand their relative financial health and, finally, try to find any, probable, relation between the first results and the later.

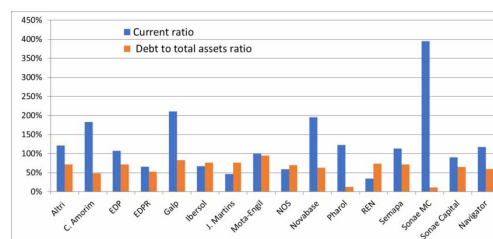
COVID-19 AND ENTITIES FINANCIAL HEALTH

Now, under this caption, some ratios and the Zmijewski model are presented and their results are read.

Figure 1 shows the outcome of two ratios obtained from some statement of financial position indicators.

Figure 1. Current and debt to total assets ratios

Source: Data extracted from entities 1st semester 2020 interim financial reports



From figure 1:

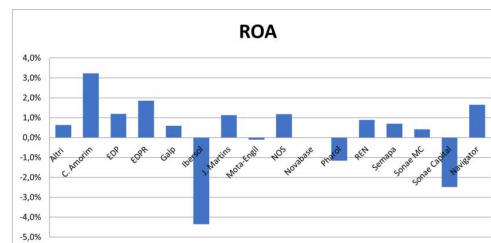
- In what concerns the current ratios the entity in the best situation, among those included in the sample, is SonaeMC, with a large distance from the remaining. The entity in the worst situation is REN. This last entity is, therefore, the one generating the less short-term liquidity. All this because the highest the value of the ratio is the more liquidity the entity is generating. This is a very important measure of liquidity as, like argued by Svabova *et al.* (2018), “if all short-term liabili-

- ties would be due, the firm would not have enough a security reserve of the short-term assets and would have to proceed to monetize part of the fixed assets to fulfill its liabilities”;
- Regarding debt to total assets ratios the entity in the best situation is SonaeMC and the entity in the worst situation is Mota Engil, which is generating the less long-term liquidity or solvency. This is because the lower the value of the ratio the best. This is, also, a very important measure as, according to Terrell, K. e Terrell, R. (2005) it indicates the financial health of an entity.

figure 2 shows the results of the calculation of ROA ratio.

Figure 2. ROA

Source: Data extracted from entities 1st semester 2020 interim financial reports



Relatively to ROA ratios (figure 2) the entity in the best situation is C. Amorim and the entity in the worst situation is Ibersol whose assets are being costly used. This is because the higher the value of the ratio the best. This equally relevant measure shows, as referred by K. Terrell, and R. Terrell (2005), the efficiency with which the entity uses its assets to produce revenues and the higher the value the best will be its efficiency.

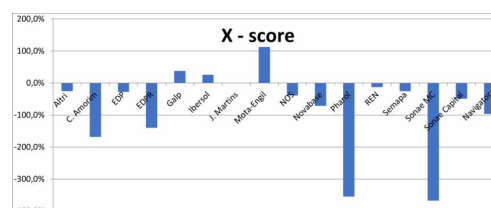
Now, to better understand the entities financial health it was used a well-known model. Like Svabova *et al.* (2018, p. 16) the model used in the present study (Zmijewski model) “is generally applicable, it is not sector-oriented, and its discriminant function consists of financial indicators, which are clearly quantifiable”.

As previously referred Zmijewski (1984) model is represented as follows:

$$X - \text{Score} = -4.3 - 4.5X_1 + 5.7X_2 - 0.004X_3 \quad [2]$$

Figure 3. Zmijewski X – score

Source: Data extracted from entities 1st semester 2020 interim financial reports



Where:

X-Score= bankruptcy index

X_1 = ROA (return on assets)

X_2 =leverage (debt ratio)

X_3 = liquidity (current ratio)

Zmijewski model cut-off point is zero, and when $X > 0$ that means the entity is experiencing financial distress and when $X < 0$ that means the entity is not experiencing financial distress. Figure 3 shows the results of the application of Zmijewski model.

As can be observed from figure 3 above, only, Galp; Ibersol; J. Martins; and Mota Engil seem that they will, probably face financial troubles. The remaining entities seem that they will, probably, be financially healthy.

The financially healthier entity seems to be SonaeMC, nearly followed by Pharol, and the entity with less financial health is Mota Engil.

SOLUTIONS AND RECOMMENDATIONS

Concerning disclosures, it is possible to remark the following:

- Only 31% of the entities follow, strictly, ESMA's (2020) encouragement to use a single note, within the Notes included in the financial reports, to disclose the information about Covid-19;
- Almost all entities have elaborated Contingent Plans regarding the spread of Covid-19;
- About 38% of the entities report having recorded imparities due to the negative impact of Covid-19;
- The majority of the entities disclose information about the impacts of the pandemic on financial position, financial performance, and cash flows;
- No one of the entities follow, strictly, the main requests of disclosure stated by IFRS 7 about financial risks. However, the main disclosures about liquidity risk were, nearly, in conformity, and the main disclosures about market risk were the less conform;
- The majority of the entities seem to have reviewed the fair values, as desirable facing the present circumstances;
- The majority of the entities suffered a negative impact of the spread of Covid-19 on their revenues, and managed to reduce their expenses;
- Only one entity (Navigator) reports having received government grants to face the impact of Covid-19;
- Only 19% of the entities report, clearly, having recorded provisions due to the probable future impact of Covid-19;
- Relatively to employee benefits, share-based payments, or recoverability of deferred taxes, nothing, clearly, relevant is referred by the majority of the entities;
- Regarding future profits, several entities refer a probable impact of the spread of Covid-19, but only one (Mota Angil) refers a "strong" conditioning;
- No breach of covenants were reported among the entities;
- Only 25% of the entities report events after the reporting period linked to Covid-19;

- The majority of the entities report having assessed the impacts of Covid-19, and prepared their financial statements considering the going concern basis;
- The majority of the entities report no changes in accounting policies, estimates, and judgments due to the impact of Covid-19;
- The majority of the entities report having incurred in unexpected expenses due to the impact of Covid-19.

From the content analysis point of view, using the “word” as unity of analysis, and as previously referred above, it was observed that the entity that has mentioned the most the selected words is NOS, nearly followed by EDPR, and the entity that has mentioned the less those words is REN. And, it was remarked that, supposedly, NOS is the entity included in the sample that is more exposed to the impacts of Covid-19 and REN the less exposed. But, may be the interpretation should be that NOS and EDPR were more transparent than the other entities. Only with the information included in the interim financial reports it is difficult to know. Being transparent is desirable to avoid agency costs as argued by agency theory, and as prescribed by EU Transparency Directive.

In what concerns the results of the calculated indicators measuring entities financial health, it deserves to be remarked that no one of the late entities do emerge either for good or bad reasons (Table 6).

Table 6: Healthier and unhealthier entities

Indicators	Best situation	Worst situation
CFO/CFE	C. Amorim, followed by Navigator	Ibersol
CFO/Total debt	Pharol	Ibersol
Current ratio (short-term liquidity)	SonaeMC	REN, followed by J. Martins
Debt/Total assets (long-term liquidity or solvency)	SonaeMC, followed by Pharol	Mota Engil
ROA	C. Amorim	Ibersol
X - score	SonaeMC, followed by Pharol	Mota Engil

Source: Data extracted from entities 1st semester 2020 interim financial reports

From table 6 above it is possible to refer that SonaeMC; Pharol; C. Amorim, and Navigator seem to be the financially healthier entities among those included in the sample; and Ibersol; Mota Engil; REN; and J. Martins seem to be the financially unhealthier entities. SonaeMC seem to be, in general, the entity in the best financial situation, considering the measures used. However, in the rank that quantifies the number of words connected to Covid-19, is badly positioned (11th position) which may demonstrate that there is no relation between financial health and that variable. But, in what concerns disclosures related to the spread of Covid-19 on the accounts, this entity seems to be quite transparent.

FUTURE RESEARCH DIRECTIONS

In future studies individual annual accounts, questionnaires, and other models to measure financial health, besides Zmijewski model, should be used in order to improve this research.

CONCLUSION

So far, Covid-19 is the pandemic of the century. Its impacts in multiple fields are, still, not yet deeply assessed.

The main objective of the present study was to investigate the standards and rules entities have to obey and orientations that they have to follow *vis a vis* Covid-19, and to understand how Covid-19 has impacted interim financial statements of the entities included in the selected sample. Then it tried to measure entities financial health using financial ratios and Zmijewski model; and, this way, to compare those entities in order to find any relation among financial health and the disclosures about Covid-19. Content and conformity analysis were used and the 1st semester 2020 interim financial accounts of the PSI20 companies were the object of analysis. A bibliographic; documentary; qualitative and quantitative; and descriptive research was carried on. Primary and secondary data were used.

Requirements from related accounting standards about the present subject were reviewed and comparison between financial health, measured by some financial ratios, and the disclosures about Covid-19.

The results provide information about the conformity of the entities, within the sample, financial statements to the accounting standards applied; show which entities among them are financially healthier and therefore better prepared to face Covid-19 crisis; and indicate that the healthier entities are quite transparent.

Among the limitations of the present study are the fact that it was used, only, consolidated interim financial information and it was not possible to prove the relation between financial health and the disclosure of words connected to Covid-19. However, it deals with a subject of undeniable relevance now a days; provides information for students about the impact of the pandemic on the financial statements; shows preparers of financial statements the main efforts they have to undertake and investors how financially healthy the entities are to face Covid-19 crisis. Therefore, at least it is justified by academic and professional reasons.

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KEY TERMS AND DEFINITIONS

Current Ratios: Show the coverage rate of current assets over current liabilities; they measure short-term liquidity.

Debt-to-Total-Assets Ratios: Show the debt coverage rate total assets; they measure long-term liquidity,

Expected Credit Loss: Corresponds to the estimated amount, in a given currency, probability-weighted, that the creditor will be deprived off in case the object of the credit does not the pay the amounts in debt in the contracted dates.

Financial Instruments: Are a wide range of contracts stated between parts, in a given currency, that may be loans, trade and other receivables, debt instruments not measured at fair value through profit or loss, contract assets, lease receivables, financial guaranties or loan commitments.

Net Realizable Value: Is the estimated amount to be obtained by selling the item, and deducting the costs related to the transaction.

Non-Financial Assets: Comprise a wide set of assets such as: goodwill; indefinite lived intangible assets; interests in joint ventures and associates under IAS 28 accounted for under the equity method; and other assets of this type.

ROA Ratios: Show the percentage of net income generated by each unity of assets.

Chapter 11

The Impact of Working Capital Management on Firm Operational Performance Through Business Cycles: Evidence From Portugal

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ABSTRACT

This chapter aims to analyze the impact of working capital management on firm's profitability, considering economic downturn and boom periods. Analyzing Portuguese firms from 2006-2019 results show that cash conversion cycle, as well as days sales outstanding, days sales inventories, and days payment outstanding decreased after 2009 due to the international financial crisis. When the length of cash conversion cycle increases, firm return on assets also increases. This situation happens especially in recession periods, when sales decrease. Results also exhibit singularities across industries. In some sectors, the impact of working capital management in firm return is positive, while in industries with greater cash conversion periods, the impact is negative. The findings also reveal the impact of financial debt and economic growth on operational profitability. Managers need to focus on short-term financing practices to increase firm profits and create value.

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INTRODUCTION

Traditional theory on corporate finance usually focuses on long-term financial decisions, especially firm's capital structure and dividend payout (Baños-Caballero, García-Teruel, and Martínez-Solano, 2014). Although, short-term financial decisions, namely working capital management has impact on firm's liquidity, risk, and performance, with greater influence on its value.

In Portugal, in 2019, accounts receivable and inventories were 11.7% and 12.4% of total assets, respectively, while accounts payable were 10.5% and financial debt 33.3% (all Portuguese firms' mean value). These percentages, except financial debt, increase to small-size firms, showing the dependence of this type of firms in working capital management to guarantee their survival. These facts suggest that the way firms manage working capital impacts their financial management and, in turn, their operational performance.

Deloof (2003) argues that to maximize their value, firms should have an optimal level of working capital. Firms need to manage credit grant to customers and stocks to avoid the increase of current assets that rises its needs for finance. If for one side, enlarging days sales outstanding may increase sales, for another side, it can contribute to increase bad debts. Large inventory also can reduce the risk of a stock-off but, add more costs to firms. Thus, managing these current assets is crucial. To finance their assets, firms specially the small-size ones, use current liabilities, specially through suppliers' credit. Small and medium enterprises (SME) have less fixed assets that can be used as collateral to long-term debt, so the main source of financing is short-term liabilities (Demigurc-Kunt and Maksimovic, 2002). Moreover, these firms have no access to financial markets to obtain funding (Petersen and Rajan, 1997). Therefore, managing working capital is crucial, especially for SMEs (Baños-Caballero, García-Teruel, and Martínez-Solano, 2010).

Working capital management is usually analyzed through cash conversion cycle (CCC) - the period of time between the collection of cash from customers and the payment to the suppliers. The longer this lag, the higher the investment in working capital, and in turn there is more need of other financial sources, which can impact the firm's performance (Deloof, 2003).

Moreover, macroeconomic factors, with special relevance to crisis periods, impact working capital. Several firms do not survive during downturn periods, leading to bad debts and to an increase of financial needs (Mielcarz, Osiichuk, and Wnuczak, 2018). Although, the difficulty to access to banks increases in these periods since more debt covenants are added. With less alternative of financing, firm are more dependent on commercial credit, but they need to manage it to pay credits on time. Thus, in crisis periods firms need to be more efficient in managing working capital since it will impact its cost of debt, operational performance, and its survival (Enqvist, Graham and Nikkinen, 2014).

This chapter aims to analyze the evolution of several financial ratios to understand the impact of business cycles on firm's characteristics, mainly with regards to working capital items. Moreover, to understand the impact of working capital management on firm's operational performance a model will be regressed. By analyzing the interrelation between working capital management and firm's profitability, this work aims to summarize the principles of financial management across economic cycles.

The sample includes means values for all Portuguese firms available in database from 2006 till 2019. Moreover, differences across sectors will be also analyzed. With these analyses, this work aims to give insights about the impact of business cycles on working capital management, giving some suggestions about how managers should deal, especially during crisis periods, to increase the firm's performance and assures its survival.

This chapter is organized into six sections. After this first introductory section, the second one presents a theoretical context about working capital and its impact in firm's profitability. The sample and methodology are present in section three. Section four presents and discuss the main results. The main conclusion of the study is presented in section five, and in the last section future lines of research are addressed.

LITERATURE REVIEW

Working Capital

Firm's financial decisions can be divided in long and short-term, being this last type of decisions the ones that are related with the day-to-day of a company. Short-term decisions are related with working capital and treasury management (Ross, Westerfield & Jordan, 2008).

There are different ways to present working capital. To Tăgăduan and Nicolaescu (2011) working capital is the financial needs of a firm to develop its operational activity, it means, is the set of cyclical needs to finance the firm's cyclical resources (the differences between current assets and current liabilities). To Aravindan and Ramanathan (2013) it is the cash invested in the firm's day-to-day operations.

For most industries, net working capital is positive since the operational cycle starts before sales receivable, it means, the credit given to suppliers and the amount in inventories is higher than the debt to suppliers (Mendonça, 2018). In this situation, the firm uses equity and non-current liabilities to finance short-term assets, while the contrary increases the firm's bankruptcy since if current liabilities are not renewal the firm may have treasury problems (Robles, 2016). Although, increasing working capital can increase the firm's cost of debt. Therefore, firms must manage working capital, since it impacts its risk, return and, in turn its value (Smith, 1980). Moreover, when taking it into account firm's increase their decision-making quality (Aravindan and Ramanathan, 2013), and can quickly react to unanticipated changes in market variables (Abuzayed, 2012).

Managing working capital means controlling and planning short-term items. For it, firms need to balance accounts receivables, inventories, and payables, it means, need to understand how they should balance the costs and benefits of working capital (Baños-Caballero et al., 2010). Kieschnick, Laplante and Moussawi (2006) found that working capital management practices depend on the industry.

Moreover, managing working capital is more relevant to small-size firms since these firms have more difficulties do access to capital markets (Enqvist et al, 2014). In fact, Baños-Caballero, García-Teruel and Martínez-Solano (2013) show that the amount of the firm's working capital depends on the firm's access to external market and their negotiation power.

Firms can follow two policies of working capital. In the conservative policy firms invest more in working capital accounts. This means that firms have more inventories in stock, give more credit to customers and intend to have more cash and equivalents that can be used if the firm decide to pay to suppliers sooner to have high discounts. For another side, firms that follow an aggressive policy want less investment in working capital, and therefore, limit the credit given to customers and lower the level of inventories to reduce the investment in current assets (Mendonça, 2018). Although, if for one side firms that follow this policy have greater profitability, for another side also have more risk since in this case the firm needs that debts are renewed periodically (Tăgăduan & Nicolaescu, 2011). Hill, Kelly and

Highfield (2009) found that firms with more uncertainty and highest probability of bankruptcy usually adopt more aggressive policies when managing working capital.

Usually working capital is measured through the cash conversion cycle (CCC), calculated as follows (Deloof, 2003, Caballero et al., 2010):

$$CCC = DSO + DSI - DPO \quad [1]$$

With:

DSO – days sales outstanding

$$DSO = \frac{\text{Accounts receivables}}{\text{Sales with VAT}} \times 365 \quad [2]$$

DSI – days sales inventories

$$DSI = \frac{\text{Inventories}}{\text{Purchases}} \times 365 \quad [3]$$

DPO – days payment outstanding

$$DPO = \frac{\text{Accounts payable}}{\text{Purchases with VAT}} \times 365 \quad [4]$$

Managing Inventories

Production or commercial companies need to have some inventories in stock. It includes raw material, goods, semi-finished goods, and final goods, and it can be the item with highest weight in the firm's current assets.

Usually, the level of inventories is adapted to the business volume (Robles, 2016). For one side, more inventories in stock can prevent interruptions in the production (the level of inventories in stock should be enough to continue the firm's production), can minimize potential losses within a situation of stock-out (customers will have final products available in the moment they need/want), and can reduce fluctuations in supplier cost and prices fluctuations, minimizing the firm's risk (García-Teruel, & Martínez-Solano, 2007, Baños-Caballero et al., 2010).

Although, for another side, higher investment in stocks will reduce the firm's profitability since the cash flow is invested in inventories and is not available to invest in other business opportunities. Thus, to achieve excellence, inventories should be reduced to a level of security. The just-in-time (JIT) proposed by Hall (1983) suggests that firms must look for excellence and for it should have stock zero or a small level of inventories. Inventories are called a non-profitable investment since it can become obsolete or lose quality, which implies a loss of its value; the product rotation can be less fluid, besides less money will be available to the firm to invest in others' opportunities (Caballero et al., 2013). Therefore, firms

must manage inventories in the way to achieve a trade-off between the maximization of the firm's return and the minimization of its risk.

Managing Credit to Customers

In most sectors, firms give credit to customers, it means give the opportunity to customers to pay latter their sales and services. Usually, this practice is a survival question and not a choice since it is followed by all firms of the same industry. Increasing the trade credit can increase the firm's sales since customers can check the quality of the product or service before paying it (Petersen & Rajan, 1997). Granting credit is special relevant in moments of low demand since it assures the firm to have more sales as customers are attract by the opportunity to pay latter their purchases (García-Teruel, & Martínez-Solano, 2007).

Although, the greater the credit given to customers, the highest the probability of bad debts, which can reduce the firm's liquidity and profitability (Mendonça, 2018). Thus, firms must give credit till the moment the increasing of bad debts exceeds the maximization of profits due to highest sales (Ross et al., 2008).

Managing Accounts Payable

Suppliers also give credit to firms, being a short-term funding source alternative to financial debt. The firm can use first the goods and pay it latter. Using this alternative of credit has benefits since it requires less information about the firm than financial debt. Moreover, suppliers have close relations with customers and can easily understand their financial situation by given discount to anticipate payments and analyzing customers reaction. This allows great flexibility in terms of commercial credit (Lau & Schaede, 2020), being an alternative of funding especially relevant in moments of economic downturns since, in that moments, firms have more difficult to access to banks and, when accessing to it, the cost of financial debt is usually higher (Love, Preve & Sarria-Allende, 2007). Moreover, Cuñat (2007) argues that new firms are more dependent of this type of funding due to the difficulty to access to financial debt because of the lack of guarantees.

Although, if a firm pays in advance to suppliers, it can get discounts and reduce the amount in debt (Baños-Caballero et al., 2010). Moreover, the firm have more free cash flows and thus, managers can engage in opportunistic behaviors.

Working Capital Management and the Impact in Profitability

Working capital management impacts the firm profitability. Diverse studies found that firm's profitability increases when cash conversion cycle decreases (Shin & Soenen, 1998, Kieschnick et al., 2006, Enqvist et al., 2014, Pais & Gama, 2015), or when days sales outstanding and days sales inventories decrease (Deloof, 2003, Padachi, 2006, García-Teruel, & Martínez-Solano, 2007). Therefore, firms may benefit from being more efficient in managing working capital.

Efficient working capital management practices intend to decrease CCC. Firms should try to quickly receive from customers, but at a level to assure the level of sales; and inventory turnover should increase, reducing the investment in current assets items and avoiding obsolete inventories, without meaning stock-outs.

Pais and Gama (2015) found that SME that adopt a more aggressive working capital management policy (less investment in working capital) are more profitable. This situation is enhanced to financial constrained firms that need cash flows (Mielcarz et al, 2018).

Moreover, researchers found that macroeconomic factors impact working capital amounts (Robles, 2016). In moments of economic downturns, working capital is more pronounced than in periods of economic recovery, suggesting that firm's must take it into account when doing its financial planning (Deloof, 2003, Enqvist et al., 2014). In fact, in recession periods consumer's demand decreases, and the access to financial market is more difficult, enhancing the need of liquidity, and pressuring working capital accounts (Abuzayed, 2012).

SAMPLE AND METHODOLOGY

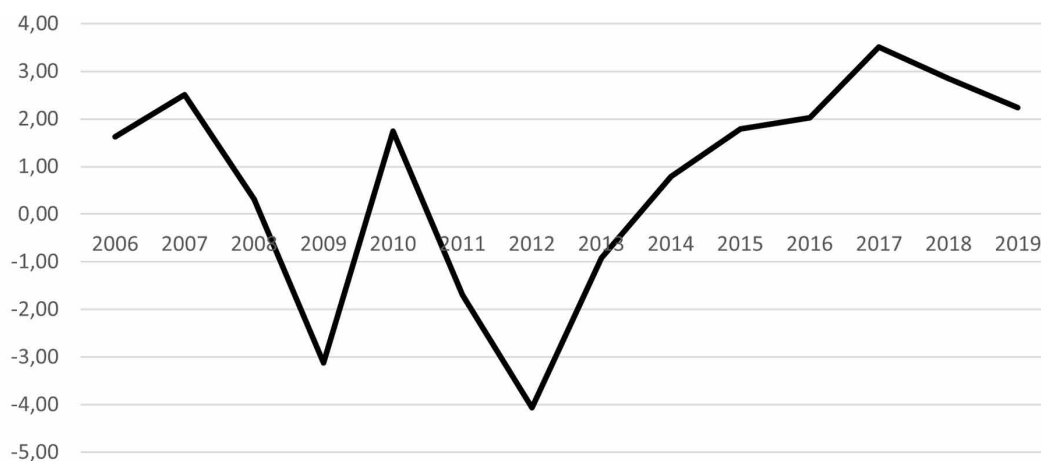
This work analyses Portuguese firms. Portugal is a small-size country, almost unexplored. Moreover, the weight of working capital over total assets was, in 2019, 12.6% (in mean), while financial debt was 34% (Banco de Portugal, 2020), which shows the relevance of managing working capital.

Since working capital amounts depend on the industry, this work aims to understand which industries are more dependent on it. Therefore, the sample includes the mean values of Portuguese firms, per year, and per industry, to get an overall picture of the country.

The period analyzed covers the years 2006 till 2019. These years are the ones with available data on Banco de Portugal (2020), the database where the data was collected. This period covers a recession period (due to the international financial crisis of 2007/2008) and a recovery period. Analyzing the gross domestic product (GDP) growth it is clear the downturn and the recover periods (figure 1).

Figure 1. Real GDP growth rate

Source: Pordata (2020)



The Portuguese GDP started to decrease after 2007, achieving a negative growth in the year of 2008. In 2010 it increased again, but it was only in that year. The decrease of the GDP continued till the year

of 2012, when the minimum was achieved (-4.06%). In 2013, the GDP growth was still negative but showed some signs of the economy recovery.

The 2007/2008 international financial crisis impacted all countries, and Portugal was not an exception. The public deficit increased so much that in 2011, and till 2014, Portugal had economic and financial assistance with several austerity measures applied by Troika. These facts justify the evolution of GDP showed in figure 1.

Regarding the methodology, in a first moment we analyze the evolution of some ratios to understand the relevance of working capital, and to characterize Portuguese firms. After it, and to analyze the impact of working capital management over firm's profitability, the following model will be regressed:

$$\text{Profitability}_t = \pm_1 + \pm_2 \times \text{WC}_t + \pm_3 \times \text{Sales}_t + \pm_4 \times \text{CR}_t + \pm_5 \times \text{D}_t + \pm_6 \times \text{GDP}_t + \mu_t \quad [5]$$

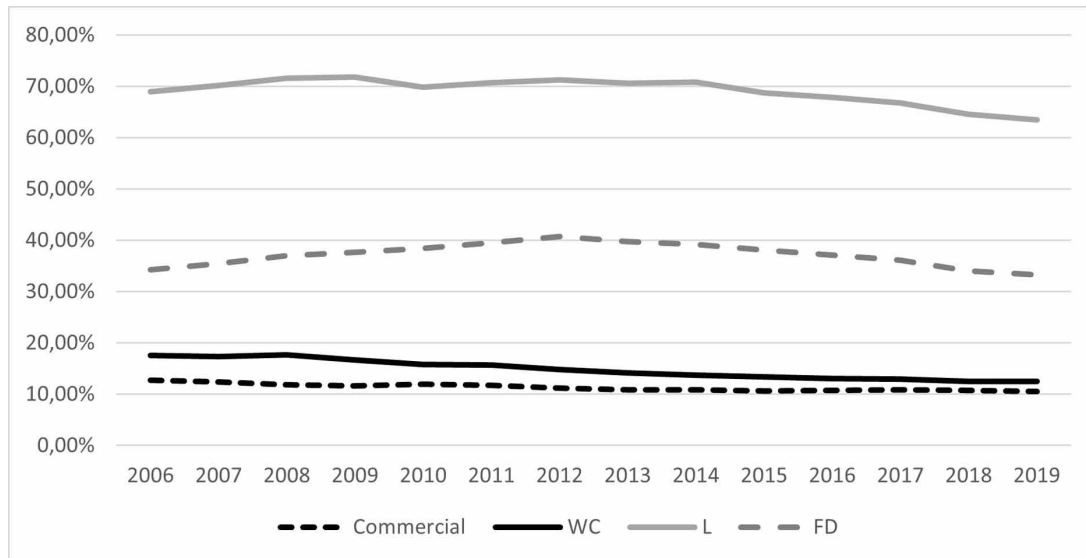
Profitability will be measured using return on assets (ROA) as in Caballero et al. (2010), Enqvist et al. (2014), and others. WC (working capital) will be measured using CCC (cash conversion cycle), and alternatively with DSO (days sales outstanding), DSI (days sales inventories) and DPO (days payment outstanding) to understand the impact of each item of working capital management on the firm's profitability (Deloof, 2003, Padachi, 2006, García-Teruel, & Martínez-Solano, 2007).

Finally, some control variables are also added, following Deloof (2003), Enqvist et al. (2014), and others. Sales is the natural logarithm of sales and it is included to control the firm's size. Baños-Caballero et al. (2013) found that working capital management depends on the firm's size. Therefore, its return and profitability can also be influenced by this variable. The percentage of sales export is also included since days sales outstanding can be different, depending on whether sales are for the domestic or for external markets. Usually, firms ask payments in advance to external sales since it is more difficult to recover bad debts in that cases. CR - Current ratio, the ratio between current assets and current liabilities, shows the ability of a firm to pay short-term financial obligations. It controls the level of liquidity of a firm. D - debt ratio is the ratio of debt (current and non-current) by total assets; it shows the firm's indebtedness. Some researchers use as alternative financial debt as percentage of total debt, which measures the firm's dependence of financial debt. Finally, GDP is the annual growth of GDP and control for macroeconomic effects on return on assets. This variable aims to understand if firms' profitability is impacted by the economy's downturn/ boom.

RESULTS

To understand the relevance of working capital on firm's total assets, the next graph shows the evolutions of this ratio as well as the evolution of firm's financial sources, namely: liabilities, financial debt, and commercial credit as percentage of total assets.

Figure 2. Weight of liabilities, financial debt, commercial credit and working capital over total assets
 Source: Data collected from Banco de Portugal (2020)



The firm's debt is mostly composed by financial debt, while commercial credit finances a small percentage of total assets. Moreover, equity covers around 30% of total assets till 2014, but it increased after it (debt ratio decreased) suggesting that in moments of economic downturn firms are more indebted. In fact, the recession period in Portugal was greater from 2011 till 2014 which explains these numbers.

The graph also shows that after 2008 the weight of commercial credit and working capital over total assets started to decrease. After 2016, commercial credit and working capital over total assets seems to present similar values. This fact suggests that the financial crisis impact the amounts of credit given and received, as well as inventories weight over total assets.

Moreover, suppliers credit only finance around 11.3% (in mean) the firm's total investment, while financial debt finances around 37.2%. With the decrease in commercial credit and working capital, the amount of financial debt, as well as total leverage, increased.

The next graph shows the evolution of trade receivables, inventories, commercial credit and working capital over total assets.

Figure 3. Weight of customers, inventories, commercial credit and working capital over total assets
 Source: Data collected from Banco de Portugal (2020)

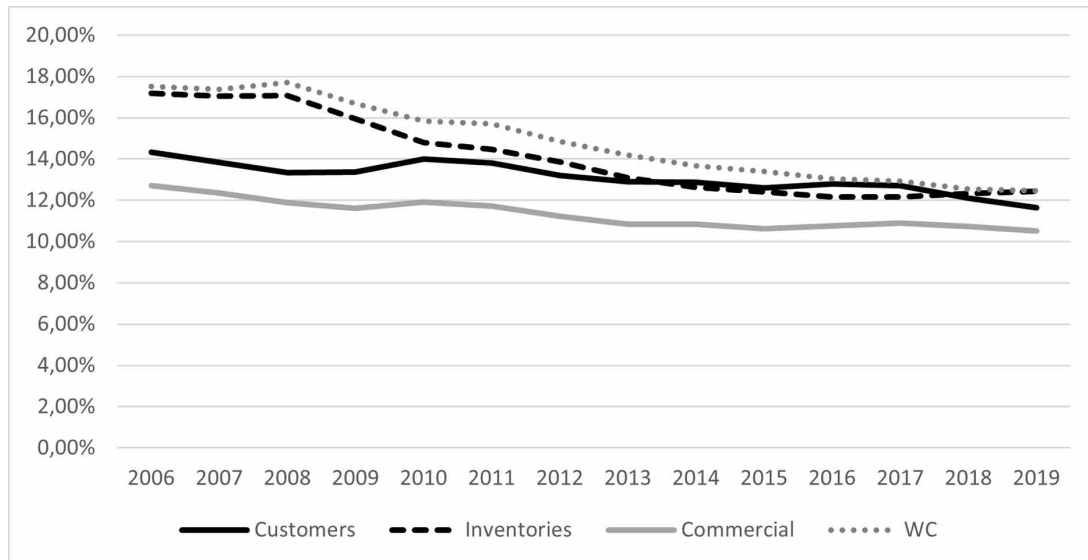


Figure 3 shows the impact of downturn periods on working capital management, as argued by Deloof (2003), Abuzayed (2012), Enqvist et al. (2014), Robles (2016), among others.

Figure 4. Evolution of days sales outstanding, days sales inventories, days payment outstanding and cash converting cycle
 Source: Data collected from Banco de Portugal (2020)

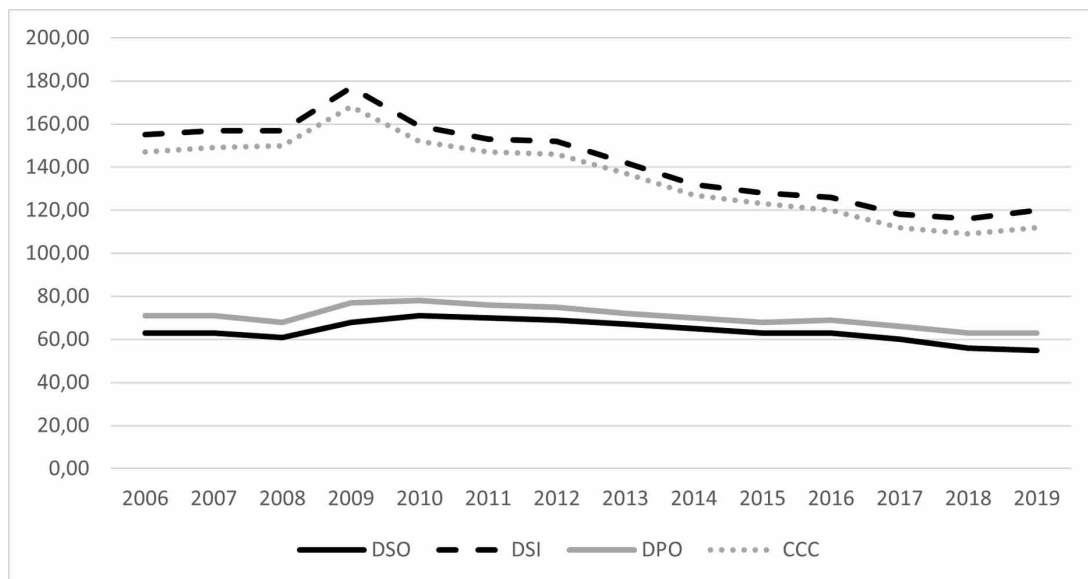


Table 1. DSO, DSI, DPO and CCC per industry

Industry	Weight	DSO	DSI	DPO	CCC
A -Agriculture, animal production, hunting, forestry and fishing	3.32%	79.07	193.14	104.21	168.00
B - Extractive Industries	0.24%	103.79	368.14	105.71	366.21
C - Manufacturing Industries	10.63%	71.57	98.21	71.00	98.79
D - Electricity, gas, steam, hot and cold water and cold air	0.20%	35.79	6.71	37.93	4.57
E - Water collection, treatment and distribution; sanitation waste management and depollution	0.25%	110.79	63.29	88.50	85.57
F - Construction	12.05%	119.86	1062.86	135.64	1047.07
G - Wholesale and retail trade; repair of motor vehicles and motorcycles	26.40%	52.14	64.29	62.64	53.79
H - Transport and storage	4.99%	60.14	94.29	66.86	87.57
I - Accommodation, catering and similar	9.28%	17.93	120.50	57.36	81.07
J - Information and communication activities	2.45%	80.14	99.21	89.43	89.93
L - Real Estate Activities	7.30%	26.50	365.43	81.14	310.79
M - Consulting, scientific, technical and similar activities	9.49%	101.93	277.00	79.29	299.64
N - Administrative and support service activities	3.42%	75.57	90.64	64.50	101.71
P - Education	1.34%	33.57	137.07	44.21	126.43
Q - Human health and social support activities	4.92%	56.36	67.43	54.14	69.64
R - Artistic, entertainment, sports and recreational activities	1.42%	69.07	142.07	106.57	104.57
S - Other service activities	2.43%	48.50	186.14	79.14	155.50

Weight is the ratio of firms from this industry divided by total Portuguese firms; DSO – days sales outstanding; DSI – days sales inventories; DPO – days payment outstanding; CCC – cash conversion cycle.

Source: Data collected from Banco de Portugal (2020)

After 2008, the weight of inventories over total assets as well as working capital decreased, suggesting that, with the international financial crisis of 2007/2008, firms' free cash flow decreased, which call the need to reduce inventories in stock to avoid losses. The working capital followed this tendency suggesting that inventories is the item with greater impact in working capital.

Regarding customers and suppliers (commercial credit) weight over total assets have both increased from 2008 till 2011, but then both ratios decreased. With the beginning of the international financial crisis of 2007/2008, firms gave more credit to customers to attract more customers and increase sales, and it was followed by more credit from suppliers. Although, as the Portuguese public deficit increased, this tendency invert. The credit given to customers decreased to avoid bad debts and increase the firm's cash flows. Moreover, the commercial credit also decreased since suppliers had less opportunity to give credit, also due cash flows problems.

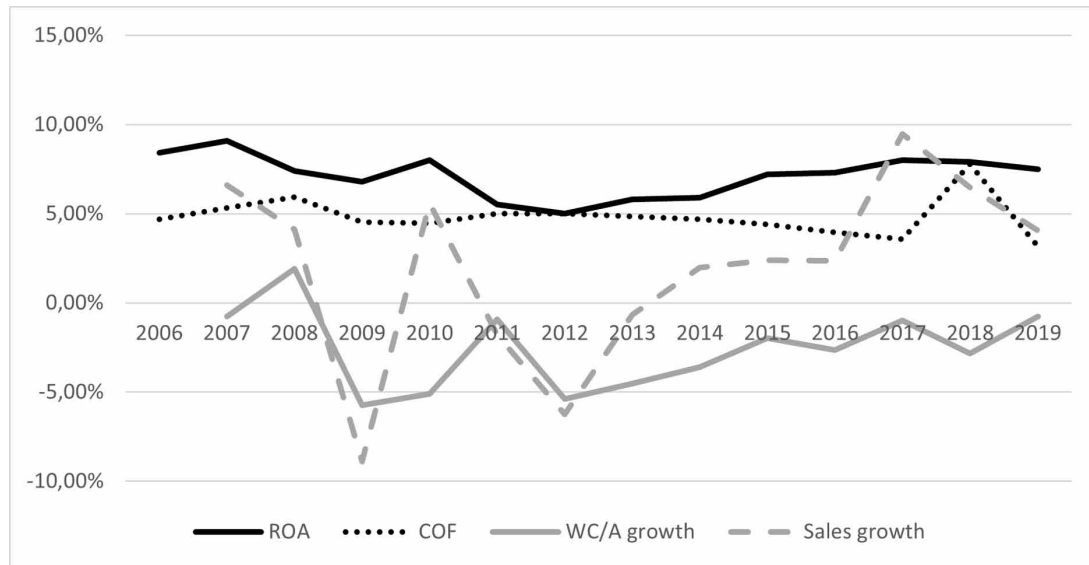
To confirm this situation, the next graph shows the evolution of days sales outstanding (DSO), days sales inventories (DSI), days payment outstanding (DPO) and cash conversion cycle (CCC).

Analyzing figure 4 the following facts emerge: 1) days sales of inventories is the higher period of all cash conversion cycle, which confirms the high weight of inventories over total assets; 2) 2009 was the year when DSI, DSO and DPO present the higher values, after it the ratios have decreased; 3) firms

usually receive from customers before paying to suppliers (DPO is always higher than DSO); 4) DPO and DSO follow always the same evolution.

Figure 5. Evolution of return on assets, working capital as percentage of total assets, cost of obtained funding and sales growth

Source: Data collected from Banco de Portugal (2020)



CCC is, in mean, 136 days, which is higher than the value found to Belgian firms (45 days), to Mauritian Small Manufacturing Firms (105 days), to Spanish SME (76 days), and to listed Finish firms (109 days) (see Deloof 2003, Padachi, 2006, Garcia-Teruel and Martinez-Solano, 2007, Enqvist et al., 2014). Although, it is also smaller than the CCC found by Pais and Gama (2015) (177 days in mean), who analyzed Portuguese SMEs, in a previous period (2002-2009). This fact suggests that 2007/2008 crisis impact the Portuguese firms' working capital.

Although not all firms have the same practices regarding cash conversion cycles. Next table presents the mean values of DSO; DSI, DPO and CCC per industry.

Table 1 shows huge differences between industries. While the construction sector has a cash conversion period of 1047 days, due to the period of inventories in stock; electricity industry has less than 5 days. Although, all industries have a positive CCC suggesting that normally firms need other sources of finance rather than credit from suppliers.

Wholesale and retail trade; repair of motor vehicles, and motorcycles is the industry with more firms in the total sample, followed by the construction sector. Electricity industry is the one less represented in Portugal.

Padachi (2006), Garcia-Teruel and Martinez-Solano (2007), and Baños-Caballero et al. (2010), also found differences across industries, but the maximum number of days of cash conversion cycle is inferior than those found (in mean) for Portuguese firms.

To understand the relation between firm's profitability and working capital, debt and sales, the next graph shows the evolution of return on assets (ROA), working capital as percentage of total assets, cost

of obtained funding (is related with financial debt) and sales growth. Therefore, the impact of the international financial crisis can be also addressed.

On average firms' return on assets (ROA) was positive (7.1%), but it decreased from 2010 to 2013. After 2013 firm's performance increased again (5.8%), but to levels smaller than those of 2010 and before. Pais and Gama (2015) found a smaller ROA in mean (5%), analyzing Portuguese firms from 2002 till 2009. This fact hints that firm's return is too volatile.

Working capital as a percentage of total sales followed the same tendency, but with a huge variation, suggesting that both ratios are related. Regarding cost of obtained funding (COF) and sales growth, these ratios did not followed return on assets' tendency. Sales growth was negative in 2009 and 2012 and, only after 2016, it showed a high increase. Regarding cost of obtained funding, it was always smaller than ROA except in 2012 and 2018, when both values were similar. These facts suggest a leverage effect since return on assets was always equal or higher than the cost of looking for financial debt.

Moreover, return on assets depends on the industry analyzed. Therefore, the next tables show the average values per industry of ROA and CCC.

Table 2. CCC and ROA per industry

Industry	CCC	ROA
A -Agriculture, animal production, hunting, forestry and fishing	168.00	5.41%
B - Extractive Industries	366.21	10.58%
C - Manufacturing Industries	98.79	8.76%
D - Electricity, gas, steam, hot and cold water and cold air	4.57	8.85%
E - Water collection, treatment and distribution; sanitation waste management and depollution	85.57	7.61%
F – Construction	1047.07	3.81%
G - Wholesale and retail trade; repair of motor vehicles and motorcycles	53.79	6.46%
H - Transport and storage	87.57	9.21%
I - Accommodation, catering and similar	81.07	4.37%
J - Information and communication activities	89.93	11.44%
L - Real Estate Activities	310.79	3.19%
M - Consulting, scientific, technical and similar activities	299.64	8.07%
N - Administrative and support service activities	101.71	9.76%
P – Education	126.43	6.74%
Q - Human health and social support activities	69.64	12.82%
R - Artistic, entertainment, sports and recreational activities	104.57	7.19%
S - Other service activities	155.50	5.08%

CCC – cash conversion cycle; ROA – return on assets.

Source: Data collected from Banco de Portugal (2020)

Analyzing table 2 results are mixed. In a first instance, it seems that the greater cash conversion cycle, the smaller firm's profitability, since the two industries with greater CCC are the ones with smaller returns, and the ones with small CCC present greater ROA. This fact suggests that more investment in inventories and accounts receivable – conservative policy, had a negative impact in firm's profits and

The Impact of Working Capital Management on Firm Operational Performance Through Business Cycles

returns (Tăgăduan & Nicolaescu, 2011). This relation was also found by Shin and Soenen (1998), Kieschnick et al. (2006), Enqvist et al. (2014), and Pais and Gama (2015). Although, there are exceptions as B - Extractive Industries, which has the second highest CCC also has one of the highest return on asset in mean.

Table 3. Correlation Matrix

	ROA	CCC	DPO	DSI	DSO	Sales	SExp	CR	D	FD	GDP
ROA	1										
CCC	-0.130	1									
DPO	-0.370	0.842 ***	1								
DSI	-0.090	0.998 ***	0.822 ***	1							
DSO	-0.505 *	0.722 ***	0.965 ***	0.688 ***	1						
Sales	0.462 *	-0.566 **	-0.699 ***	-0.526 **	-0.776 ***	1					
SExp	-0.401	-0.822 ***	-0.505 *	-0.847 ***	-0.306	0.138	1				
CR	0.263	-0.894 ***	-0.838 ***	-0.871 ***	-0.809 ***	0.729 ***	0.639 **	1			
D	-0.419	0.825 ***	0.784 ***	0.793 ***	0.803 ***	-0.812 ***	-0.466 *	-0.934 ***	1		
FD	-0.793 ***	0.394	0.678 ***	0.342	0.825 ***	-0.725 ***	0.148	-0.594 **	0.738 ***	1	
GDP	0.783 ***	-0.641 **	-0.674 ***	-0.621 **	-0.667 ***	0.571 **	0.174	0.615 **	-0.675 ***	-0.693 ***	1

With: ROA – return on assets, CCC – cash conversion cycle, DPO – days payment outstanding; DSI – days sales inventories; DSO – days sales outstanding; Sales – ln (sales); SExp – percentage of sales export over total sales; CR – current ratio; D – debt ratio (liabilities divided by total assets); FD – financial debt ratio (financial debt divided by total assets); GDP – Gross Domestic Product growth

***, **, * level of significance of 1%; 5%; 10%, respectively.

Table 4. Results of the model estimation

	Model with CCC	Model with DSO	Model with DSI	Model with DPO
C	0.1548	0.4645	0.1702	0.437390
WC	0.0004 ***	0.0014 ***	0.0004 ***	0.0013 ***
Sales	-0.0028	-0.0154	-0.0039	-0.0160
FD	-0.2265 ***	-0.4924 ***	-0.2069 ***	-0.3931 ***
GDP	0.4474 ***	0.2937 ***	0.4551 ***	0.3456 ***
R ² adjusted	91.36%	79.86%	91.68%	83.35%
F-statistic	76.3808 ***	51.8674 ***	79.3015 ***	77.8837 ***

Regression of ROA – return on assets against WC – working capital, measured by CCC – cash conversion cycle, DPO – days payment outstanding; DSI – days sales inventories; DSO – days sales outstanding; Sales – ln (sales); FD – financial debt ratio (financial debt divided by total assets); GDP – Gross Domestic Product growth

***, **, * level of significance of 1%; 5%; 10%, respectively.

To prove the relationship between working capital and profitability, the proposed model is tested. Before it, the correlation matrix between the variables is presented in the next table.

Cash conversion cycle (CCC), days sales outstanding (DSO), day payment outstanding (DPO) and days sales inventories (DSI) are highly correlated, but these are alternative variables of working capital management, so these correlations are not relevant. Moreover, sales export is highly correlated with CCC and DSI, so this variable will not be used in the model. Current ratio and debt ratio present also high correlations with other independent variables, so both variables will also be excluded from the model.

Return on assets presents a statistically significant correlation only with DSO, sales, financial debt ratio, and GDP growth. Results suggests that, as sales and GDP growth increase, firm's profitability also increases, since in these cases firms are more able to generate profits. When DSO and financial debt increase, firm's profitability decreases as the firm has more accounts receivable, which can lead to bad debts, and more debt to pay which will consume some profits.

The following model will be test:

$$ROA_t = \alpha_1 + \alpha_2 \times WC_t + \alpha_3 \times Sales_t + \alpha_4 \times FD_t + \alpha_6 \times GDP_t + \varepsilon_t \quad [6]$$

Results are present in the next table.

The estimated models are accurate since F-statistic is significant and explain 79.86% to 91.68% return on assets, depending on the working capital variable used.

Working capital items positively impact return on assets. In the correlation matrix results suggest a negative relation between ROA and CCC, DSO, DSI or DPO, as found by previous researchers (see Shin & Soenen, 1998, Kieschnick et al., 2006, Enqvist et al., 2014, Pais & Gama, 2015). Thus, this finding suggests that this relation is impacted by another variable. Results also suggest that macroeconomic factors impact the relation of working capital and profitability. In moments of recession, firms can increase returns if have large inventory and a generous trade credit policy since it leads to higher sales and thus, an increase in profitability. Similar conclusions were found by Abuzayed (2012) and Ng, Ye, Ong and the (2017) to listed firms in less developed countries.

Moreover, results show that firms with more financial debt have less return, since have more financial costs to pay which will consume part of the firm's return. Finally, an increase in GDP growth contributes to increase ROA. In economic boom period, firms can increase profitability due to an increase in sales, while in moments of downturn firms' return decreases. Similar conclusions were found by previous researchers (see Deloof, 2003, Enqvist et al., 2014, Pais & Gama, 2015, among others).

The results found can depend on the industry analyzed. In the next table the results of the model estimation by sector are shown.

Table 5 prove that the impact of working capital on return on assets depend on the industry. The impact is statistically significant to more a less half of the Portuguese industries, but while to some the impact is positive, as the one found to the total sample (G - Wholesale and retail trade; repair of motor vehicles and motorcycles; H - Transport and storage; J - Information and communication activities; P - Education), to others the impact is negative (F - Construction; I - Accommodation, catering and similar; M - Consulting, scientific, technical and similar activities; N - Administrative and support service activities). Comparing results with table 1 it can be implied that firms with large cash conversion cycle increase operational profitability whenever working capital is efficiently managed, it means, cash conversion cycle decrease, since more free cash flow is available, and the firm can decrease debt.

Table 5. Results of the model estimation per industry

	A	B	C	D	E	F	G	H	I	J	L	M	N	P	Q	R	S
C	0.0612	-0.2655	-0.2269	1.6150 ***	-0.1543 *	-0.0919 *	0.1605	-1.9997 ***	-0.1489	-1.1587	-0.4912 ***	6.3545 *	0.3359	0.1612	0.8505 ***	-0.0643	-0.5639
WC	-0.0000	0.0002	0.0005	0.0003	0.0000	-0.0000 ***	0.0024 **	0.0009 **	-0.0005 *	0.0027 **	0.0000	-0.0002 **	-0.0005 ***	0.0006 ***	0.0004	-0.0000	0.0001
Sales	-0.0001	0.0280 *	0.0194	-0.0924 ***	0.0157 **	0.0069 *	-0.0023	0.1147 ***	0.0219 **	0.0707	0.0335 ***	-0.3870 *	-0.0009	-0.0167	-0.0440 **	0.0189	0.0392
FD	-0.0105	-0.4238 **	-0.2976 ***	0.0327	-0.0302	0.1747 **	-0.7201 **	0.1731 **	-0.2745 ***	-0.3666 *	0.0031	0.2044	-0.3873 ***	0.1932	-0.2195 ***	-0.3079 *	0.2361
GDP	0.3653 ***	-0.0785	0.3595 ***	-0.0546	0.0429	0.1328	0.1874 *	0.7534 ***	0.3113	0.5872	0.1093 **	1.3077 *	0.1354	0.3956 ***	0.1754 *	0.1586	0.4070 **
R2 adjusted	54.31%	48.20%	74.56%	52.48%	39.94%	74.48%	81.27%	83.15%	89.62%	28.10%	87.13%	31.80%	72.06%	58.56%	66.36%	75.11%	35.01%
F-statistic	7.5335 ***	10.2064 ***	33.2202 ***	5.6761 **	7.4915 ***	36.1760 ***	36.7817 ***	37.3136 ***	254.3115 ***	3.3411 *	75.3358 ***	6.7073 ***	40.5983 ***	47.8634 ***	14.3830 ***	4.6360 **	46.4008 **

Regression of ROA – return on assets against WC – working capital measured by CCC – cash conversion cycle; Sales – ln (sales); FD – financial debt ratio (financial debt divided by total assets); GDP – Gross Domestic Product growth

A - Agriculture, animal production, hunting, forestry and fishing; B - Extractive Industries; C - Manufacturing Industries; D - Electricity, gas, steam, hot and cold water and cold air; E - Water collection, treatment and distribution; sanitation waste management and depollution; F - Construction; G - Wholesale and retail trade; repair of motor vehicles and motorcycles; H - Transport and storage; I - Accommodation, catering and similar; J - Information and communication activities; L - Real Estate Activities; M - Consulting, scientific, technical and similar activities; N - Administrative and support service activities; P - Education; Q - Human health and social support activities; R - Artistic, entertainment, sports and recreational activities; S - Other service activities

***, **, * level of significance of 1%; 5%; 10%, respectively

ROA, showing that in moments of recessions, firms are more financially constraint.

The impact of sales is statistically significant to some sectors, but the sign is either positive, suggesting that when sales increase, firm's ROA also increase, but sometimes is negative. The impact of financial debt is mainly negative, as it was found to the total sample, but in some exceptions (F – Construction; H - Transport and storage) is positive, which can be due to free-rider problems between agents and principals.

Finally, GDP growth, whenever is statistically significant cause a positive impact in CONCLUSION

This study aims to analyze the impact of working capital management on firm's operational profitability, taking into account macroeconomic fluctuations.

A sample of Portuguese listed firms is analyzed through the period of 2006-2019. Differences across sectors are also analyzed.

Results show a decrease of cash conversion cycle, days sales inventories, days sales outstanding and days payment outstanding after 2009, suggesting that firms tried to manage in a more efficient way working capital to deal with the international financial crisis of 2007/2008. Moreover, results show that, especially in downturn periods, firms with a more conservative strategy of working capital, it means with higher CCC have greater return on assets. Although, this relation is not followed to all industries. To some sectors, especially the ones with larger CCC, the impact is negative, it means, firms need to reduce the cash conversion cycle to increase profitability. Results are similar if working capital is measured by trade receivables, inventories in stock or trade payables.

These results are especially relevant to managers who can understand how to deal with working capital in moments of downturn or boom to increase firm's operational profitability. Main findings suggest that to every industry there is an optimal level of working capital that can deal with more liquidity and return and less risk.

FUTURE RESEARCH DIRECTIONS

This work uses mean values to Portuguese firms, and due to it, firm's characteristics as age, sales export, or even ownership characteristics are not taken into account. For future it would be interesting to analyze all firms of a specific sector to confirm results. Moreover, the firm's size can also impact results since micro and small-size firms have more difficulties to access to financial debt and are more dependent on commercial credit. Therefore, working capital management in these firms can be singular. A non-monotonic (concave) relationship between firm's operational profitability and working capital can also be considered. Finally, manager's perspective about the benefits of working capital management can also be analyzed since if managers misestimate the risk involved of its working capital practices, the impact in the firm's profitability can be the contrary of the expected one.

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KEY TERMS AND DEFINITIONS

Cash Conversion Cycle (CCC): Period of time between the collection of cash from customers and the payment to the suppliers.

Days Payment Outstanding (DPO): Number of days per year (in mean) a company has credit from suppliers.

Days Sales Inventories (DSI): Number of days per year (in mean) a company has inventories in stock.

Days Sales Outstanding (DSO): Number of days per year (in mean) a company gives credit to customers.

Working Capital (WC): Is the difference between current assets and current liabilities.

Chapter 12

Idle Costs in the Pandemic

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ABSTRACT

This chapter focuses on a crucial crisis issue with consequences that have affected many companies worldwide, the spread of the COVID-19 pandemic. Deliveries were cancelled, and many companies closed their facilities completely around the world. Taking into account the capacity and structural nature of fixed costs, activity-based cost estimation may be more appropriate than traditional cost estimation to create the capacity to manage production cost structures to eliminate possibilities for idle costs, as these are a function of using the capacity offered to the installation. This chapter theoretically presents the relationship between the main costs of idleness, crisis, and profitability as a measure of the company's value. This is important, as the company's value can be delayed by the occurrence of a crisis, and the health pandemic has created a field emerging from research with advances in strategic cost management.

INTRODUCTION

The pandemic that is observed due to Covid-19 and, as a consequence, the removal of workers caused the lockdown, social distancing and the huge impact in the economy and the one of the consequences was the failure of thousands around the world. Companies have been trying to fight to survive and maintain their working capital in order to pay the minimum bills that are required to avoid bankruptcy.

It is not known, until now, how the economy will recover, nor how most will react, in all sectors. As it is known, the company's operational continuity in times of economic uncertainty is determined

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by its ability to manage costs and expenses in a way that maintains the financial flow to maintain the company's value.

As the main source of financial information, accounting is fundamental to give the manager the necessary direction in situation of crisis, so that the manager can evaluate his financial decisions, monitor, and redirect his activity. The correct management of costs and expenses takes on an important discussion for the decision-making process, in order to generate competitive advantage (Porter, 1989; Souza et al., 2020).

Besides the importance of the information, it is important to discuss the correct concept of the costs and expenses. The correct allocation of costs and expenses may be a huge difference in times of important financial decisions. However, many structural factors may be considered when the company classifies their costs and pay attention to the "hidden costs" that are not considered in the decision-making process.

Hidden costs, or intangible costs, arise from activities that are difficult to identify, often fully performed, such as machine maintenance, unnecessary movement, set-up, or preparation of machines with inefficient use of time, and consequently interfere, impairing the functioning of the process and productive (Gama et al., 2009).

The purpose of this chapter is theoretically presenting the relationship between the main costs of idleness, crisis and maintaining the company's value. The chapter discusses, in an essay form, an overview of the management of idle costs given by the literature.

In this sense, in order to face this crisis, which has altered the productive structures of different countries in the world and profoundly changed the social and economic dynamics in the most different areas, this chapter presents itself as a contribution to its confrontation and to provide an update to the academic fields. Thus, this chapter is justified by the importance of addressing themes related to emerging issues for discussion in the accounting-management academic community to face crises and provides insights to achieve practical results, in the process of (re) stabilizing society during and after of the pandemic.

In addition, this chapter provides a discussion with information that illustrates the issues, problems, and trends related to the book's theme. The section on conclusions presents a constructive and analytical assessment and lists arguments for suggestions for improvement with measures that can be taken by countries to avoid the negative impacts of the pandemic in order to establish measures to help "level the economic curve", limiting the economic loss, as well as so that companies can establish more accurate decision making, prioritizing the best decisions for their operational structures with an emphasis that can improve the area of the subject studied.

Methodology

In addition to the theoretical framework synthesized in a bibliographic survey, the methodology aims to support the study and provide a preponderant role to the research objective and contribute to the advancement of science (Larocca et al., 2005), in addition to allowing future research also deepen the theme (Bruyne et al., 1991; Conforto et al., 2011), with a critical analysis of scientific production in accounting (G. A. . Martins & Theóphilo, 2007) .

The research adopted the method of Conforto et al. (2011), and thus data were collected, based on bibliographic review, costing in times of crisis with repercussions on the economy, and the creation of a database with chain of evidence for analysis of collected results.

The methodology by Conforto et al. (2011) which constitutes a roadmap for conducting a systematic bibliographic review (SBR) presents a roadmap entitled RBS roadmap, created from the best practices recommended in pioneering areas in this type of review, combined with an action research in several

surveys. The authors suggest a systematic approach as a way of allowing the repeatability and greater reliability of the research generated. Within its systematic bibliographic review (SBR) model, the “SBR Roadmap”, a separate analysis of journals and databases is recommended in the processing stage.

The SBR Roadmap is organized in phases and stages. It has 15 stages distributed in 3 phases (Input, Processing and Output). In the case in question, the idle costs identified, involved analysis of articles in databases in the areas of Management and Financial Accounting, doing the search with the keywords: cost of idleness and profitability.

The present study is characterized as exploratory-descriptive with a qualitative character, which provides greater familiarity with the theme, using the bibliometric technique of data collection and treatment to identify and understand the phenomenon studied, through critical reflection of personal interpretation without the need for statistical treatment of variables (Minayo, 1998).

SYSTEMATIC BIBLIOGRAPHIC REVIEW ABOUT IDLE COSTS

Aranoff (2014) reported, in his study, about the overhead cost savings and the convenience of factories to operate at their normal capacity with the lowest production costs per unit. In this study, he explains the main problems of the production cycle are a dominant cost that are incurred regardless of production rates.

Before proceeding, capacity is defined, which in the words of Horngren et al. (2006) such term can be defined as limitation or upper limit, and they report that two categories of denominators can be considered, that is, one related to the installed capacity (or nominal) and, still considered as theoretical capacity, and another related to the use of this capacity (practical capacity at a certain level of efficiency), what means that the nominal capacity reduced by normal measures caused by unavoidable and necessary interruptions to the operational process.

In this concept, costs play a paradoxical role, as they make regular operation peculiarly desirable and peculiarly profitable, so that the business feels a definite loss whenever production falls below normal capacity, largely since fixed capital that the business depends independently on rules and other issues. The ideal is to keep the operation constant and avoid idle overload. The contributing causes of this problem are mostly of a varied, technical, financial, commercial and psychological nature and the underlying fact that capital plays is the inelasticity of costs, sunk costs, and the change and conversion of general costs.

Aranoff (2014) prominently presents arguments about costs of idle manufacturing capacity. For example, it argues that the irregularity of demand and the inelasticity of supply produce idle capacity as a normal and desirable situation most of the time, with cost counters isolating the cost of the idle capacity from the cost of normal production.

In this threshold of great transformations and demand for new decision-making models, in view of the high retraction of the world economy, accountants in a multidisciplinary group with administrators and auditors and other professionals from different business areas, should also be concerned with processes of going concern assessment, explanatory note disclosures, earnings release.

As well as, in other managerial processes, such as the lack of investment in equipment and new installations and construction in general, which, if not renewed, cause loss of productivity and quality and increase in the cost of goods and services, the question of interruption of global supply chains due to imposed restrictions, which cause idleness of fixed structural costs, due to the lack of raw materials and other supplies and, with the increase in the costs of importing inputs, which increases production costs and impacts on systems establishment of prices, due to fluctuations in exchange rates.

Aranoff (2014) also reports that the probable total economic cost can clearly be a significant cost factor and must be carefully planned and controlled and that it depends, according to Clark's guidelines in 1923, who provided a detailed illustration that today can be proper way to do your calculation.

Herath and Kusy (2014) proposes a new refinement to consider activity capacity restrictions to separate the cost of idleness into excessive cost of capacity and cost of idle capacity. He reports that the excess capacity of an activity is the limit placed on the use of available capacity due to the restriction imposed by another activity in a production process. Thus, the idle capacity, then, is the misused of the capacity of each activity in comparison with the restriction activity. It emphasizes that it is important to consider the cost of idle capacity when determining the economic cost for pricing and efficient management of operations.

In this scenario, for each type of product there must be strict assumptions so that management is quite realistic, since currently a large part of the manufacturing industry that operates without economies of scale, with fluctuations in linear demand, production works with capacity limits and with the durable and specific assets. In this case, according to Aranoff (2014), the novelty is the choice that companies have, and the assumption is that companies will choose to produce the minimum necessary throughout their cycle to produce with an excessive demand above the minimum required.

Jorgensen et al. (2009) note that returns to scale are recognized in profit margins based on accounting. If a manufacturer can produce additional quantities without adding costs to the plant, that is, if the plant has idle capacity, the average cost per unit will tend to decrease with an increase in production and thus, the accounting profit margins, which reflect the total cost, will increase. In this case, sales growth for a company with idle capacity will result in higher profit margins. But if the company is operating at full capacity, an increase in production must be preceded by an increase in capacity, for example, as an expansion of the factory. Thus, for a company operating close to or at full capacity, sales growth without an expansion may result in lower profit margins, reflected by the increase in fixed structural costs.

In this regard, Roychowdhury (2006) and also Gunny (2009) provided evidence to suggest that companies produce more to increase short-term profits and meet profit benchmarks. However, Gunny (2009) examined the consequences of manipulating real activities. One of these manipulations is related to overproduction to reduce costs of overdue products (COGS). The results indicate that the manipulation of real production activities is positively associated with the fact that companies meet these profit benchmarks, among other factors. This examination shows an opportunistic situation of influencing the result of the accounting system to allow a positive association, is consistent with managers who use operational discretion to obtain benefits that allow them to improve future performance or to signal the future value of the company.

Jorgensen et al. (2009) provide evidence that companies with idle capacity, increase profit margins due to increased production, that profit margins increase with capacity utilization, and companies that approach full capacity, margins profit margins decrease and suggest that profit margins would decrease in production as companies choose to increase their capacity.

Aranoff (2014) presents a model so that during periods of recessions investors can choose to invest in plants, with the objective of profiting from the return of peak demand times, through political recommendations and realistic and critical assumptions in periods of recession, situation that faced the manufacturing industries in the United States, which had been occurring for about 6 or 7 years.

Theoretical studies and accounting practices, more precisely, started in the 1990s, became concerned with cost management of idle production capacity due to unused productive potential (Guerreiro & Christians, 1992). One of the most traditional measures for managing these costs is to systematically

understand and make possible the identification and measurement of a company's idleness. Obviously, the company must focus on eliminating losses and minimizing additional work, maximizing the effective work, which needs to be done as efficiently as possible, in order to add value to its activities.

In this scenario, the business environment requires excellent decision-making systems. According to Johnson and Kaplan (1996) "*the contemporary economic environment demands excellence from corporate management accounting systems*". With the change in this environment, an organization's management accounting system needs to provide timely and accurate information to its internal public and its stakeholders.

When considering the public users of financial information, the cost information of idle capacity is relevant for managers and investors. Such information has related predictive power and the significance of the costs of idle capacity related to its materiality is of high value for internal purposes of various orders and for market analysts to make their analysis for investors and other users (Bettinghaus et al., 2012).

The planning, control and information processes for decision making require knowledge of cost behaviour, association with activities, a broad view of the events and their time horizon. All of this associated with the level of practical activity (effective production level), within a normal or relevant operational range.

It must be recognized that financial integration exists as an inseparable part of economic integration and with operating systems, and deficiencies in the scope of operations management affect capital movement and economic development and may not be beneficial for the economy. However, during periods of crisis, this integration can be delayed (Jednak & Jednak, 2018).

Jednak and Jednak (2018), report that in the last 10 years, several crises have been underway and have affected both economic development and financial integration, which as we are experiencing the Covid-19 pandemic, slows down the countries' economic development, due to the imposed global crisis.

The profitability of companies favours the economy, followed by the financial result, obtained when consumer markets have the potential to produce in the face of demand, even with potential costs of concentration and possible misallocation of capital flows, volatility and propensity of capital flows, compromising macroeconomic stability and the risks of entry by competitors, since better resource allocation and risk diversification, for example, can provide more opportunities for companies to achieve economic growth and achieve financial and economic development (Jednak & Jednak, 2018).

In normal periods, companies face different challenges of different natures, such as capacity, competition, quality, price, costs, and contingencies to maintain operational continuity. The Covid-19 pandemic is causing the closure of several companies due to the difficulty of overcoming operational and financial difficulties. Those that are surviving but operating below installed capacity are having their profitability negatively impacted by the costs of idleness (Zatta et al., 2003).

When the production capacity is below the capacity for which the factory was designed to produce, committed fixed expenses, that is, those that were acquired before the real demand occurred, are transformed into idle costs (Zatta et al., 2003). In this case in an undesired way (Leamer, 2009). Since the first half of the 20th century, accounting has been used to account for cost management (Vollmers, 1996).

In Brazil, it is common to find information on productivity in different sectors of the economy, with emphasis on indicators of idle capacity of companies and sectors of the economy, as well as the main factors that led companies to experience this type of problem. However, in the presentation of the financial statements, the impact of this idle capacity and the due accounting record is not always so clear. CPC 16 (R1) - inventories, in Correlation to International Accounting Standards - IAS 2 (IASB) determines

the form of accounting and disclosure of accounting practices related to costs attributed to inventories, and regarding the recognition of the cost of idle capacity.

Idle cost is known internationally, and thus calls attention to management control and the evaluation of competitive companies in view of the adequacy of technological, material and human resources, associated with the level of activity or production, constituting one of the most important one's activities to establish the balance with the practical capacity or efficient level of execution of the activities.

Hansen and Mowen (2001) point out that many resources are acquired before the real demand for the resources, constituting committed fixed expenses that provide long-term activity capacity. Such information is necessary to conduct the management process of the idle productive system that does not contribute to the manufacture of the products, that is, the fixed structural costs or expenses committed to the project, linked to the nominal, or installed capacity can result in business continuity problems. due to the imbalance between nominal capacity and practical capacity.

Fixed costs or expenses are defined by their cyclical behaviour. They are developed, contracted, or acquired for specific periods and represent expenditure, regardless of their use without the possibility of reimbursement, such as rent and mandatory fixed labour in Brazil (Martins, 2010).

Usually, for several reasons, companies do not operate at their maximum production level. Zatta et al. (2003) explained that the reduction in the level of activity, caused by abnormal factors, turns the costs related to the installed capacity, of a fixed nature, into costs of idleness, that requires the elimination or reduction of unnecessary fixed expenses that negatively impact the result organization. And this is what has been seen all over the world, due to the Covid-19 pandemic, the development of activities with reduced operational capacity causing an increase in cost, due to the company operating below its practical production capacity.

Gantt (1994) points out that during periods of depression, like the one we are currently experiencing, companies must take advantage of opportunities to prosper in the return after the depression period and compensate for losses suffered, in relation to their more conservative competitors who adopted different strategies, so to gain competitiveness again (Santos et al., 2006).

In this context, the costs of inefficiencies, idleness, in the sectors of responsibility generate some discomfort and impels the managers of the areas to improve their results, as these expenses become evident and attitudes become necessary so that these costs no longer occur, which it also requires cultural changes with effects on organizational structures.

This is justified, from the perspective of the consumer, because items that undergo transformation, that is, the transformation activities that create and / or physically modify the product that do not add value, or additional work, comprise activities that do not increase the value of the product, and together with the drop in consumption with the pandemic, it further contributes to the fall in prices, which becomes irrecoverable.

This is a worrying situation, because the loss of profitability can lead to the bankruptcy of a company and, as has been observed, impact a whole chain of sellers (suppliers) and customers (buyers). And in all cases, regardless of whether they are large companies, which generate many jobs, incomes and taxes, or small and medium-sized companies. It must also be considered that many of these companies have a strong impact on political and social control in the countries of origin and in the countries where they are installed.

In the event of loss of profitability, companies start to demand new and appropriate cost management systems to accompany the manufacturing process, identifying waste, reducing costs by improving the quality of the product and processes, to identify how to maintain this profitability and maintain its

continuity. Therefore, the company's strategic position is strengthened by managing aspects of cost reduction, eliminating waste, minimizing bottlenecks, among other important factors for improving operational and financial performance (Zatta et al., 2003).

Long-term profitability is determined by the company's position in relation to its rivals, which determines the competitive advantage in companies that work proactively in the use of manufacturing excellence, which consequently results in maintaining its continuity. In this specific case, the company's liquidity position is strengthened by managing aspects of cost reduction, elimination of waste, minimizing bottlenecks, among other hidden costs, before competitors do so. And in this way, the use of installed capacities efficiently allows less impact on the result, increases profitability, and consequently results in a reduction in the final price of the product or service, which in turn, makes it more attractive to the consumer. As a result, the organization has more power to be more competitive in tougher markets (Zatta et al., 2003) and of high rivalry, both in terms of the domestic market and in terms of the foreign market.

In this regard, Wernke and Junges (2017) report that idle production costs should be allocated as period costs not attributable to the totality of the respective production, and therefore, idleness should not be passed on to the cost of products. The results show that idle capacity shows benefits when strategic management tools for cost optimization are invested (Cortés, 2019).

According to International Accounting Standards - IAS 2 (IASB), it is determined that the allocation of fixed overhead costs to the units produced must be based on normal capacity of production.

Normal capacity is the average production that is expected to be achieved over several periods under normal circumstances, and for the determination of this normal capacity, the share of total unused capacity due to preventive maintenance, collective vacations is considered. and other similar events considered normal for the organization.

The actual level of production can be used if it approaches normal capacity and therefore, the value of the fixed cost allocated to each unit produced cannot be increased because of a low volume of production or idleness. In this case, fixed costs not allocated to products must be recognized directly as an expense in the period in which they are incurred. In periods of abnormally high volume of production, the amount of fixed cost allocated to each unit produced must be reduced, so that inventories are not measured above cost. Variable indirect production costs must be allocated to each unit produced based on the actual use of the variable production inputs, that is, the actual capacity used (IAS 2, 2019).

It appears from CPC 16 that idle capacity should not be included in the cost of production and cannot be allocated to inventories. As fixed costs related to unused capacity resulting from production volume below normal capacity must be recognized as expenses in the period in which they are incurred. This form of recording directly in the results anticipates recognition and impacts profitability, since an important part of the production cost ends up losing its function and can result in problems of continuity of business due to the imbalance between nominal capacity and practical capacity. In this case, the more capacity is fully utilized, the greater the production and the lower the fixed cost per unit identified with each product. Defining a strategy that is fully consistent with market nuances is a task that imposes difficulty for managers, since such a decision may not mean meeting a demand during the life cycle of certain products or even an organization (Horngren et al., 2006).

To remain highly competitive and heterogeneous, organizations need margin and profitability, important dimensions for the long-term success of the business, which depend on prioritizing the main structural costs to obtain greater results (Gantt, 1915), which requires a more accurate management for generating business value including the management of idleness and monetarily measuring its impact on the generation and optimization of the company's overall result.

It is possible to verify that the nature of the resources defines the temporality, whether short or long term and the combination with the capacity factor to develop a balanced production plan and provide competence to use the existing capacity (Atkinson, 2000).

The production cost is one of the most relevant information for industrial, commercial, and service activities, as it is a market activity that is close to perfect competition, and because the price is not likely to be dictated by the offering and demanding agents, leaving to cost management to seek the best alternative of business profitability (Zatta et al., 2003).

The costs that negatively impact profit and profitability of the business are those of a fixed nature included in indirect costs of manufacturing, marketing, and service activities, which associated with the level of production below practical capacity, generate costs of idleness that are caused by factors not extemporaneous routines or other economic reasons, internal or external.

The behaviour of costs is often conditioned by environmental, technological, and economic issues that alter their behaviour (Horngren et al., 2006). For example, if a company operates in a leveraged manner (Brigham et al., 2001), any change in the level of production caused by abnormal factors will cause the costs related to installed capacity, of a fixed nature, such as depreciation, rents, supervision and others included in indirect manufacturing expenses, become idle costs. That is, the reduction in the level of activity - production idleness - makes these costs related to this unused capacity to be considered as extraordinary items, and consequently should not be included in inventories (taken directly to the expense), thus avoiding the risk an overvaluation of these and a probable future non-recovery, with an immediate negative impact on profitability.

In this sense, a treatment that allows the identification and quantification of a company's idleness in a systematic way is undoubtedly useful to assist the process of analysis and improvement of business efficiency. Therefore, special attention should be given to the treatment of idleness in the sense that it can only be considered as such, if it is caused by abnormal factors, such as those derived from sectoral economic recession, strikes and other factors considered non-recurring or routine according to Ludícibus et al. (2018) and by the legislation of the Brazilian Securities Commission (CVM).

At this threshold, every type of business involves planning that must be meticulous, involving mainly the financial issues of the industry, and one of the main points of productive planning is the knowledge and understanding of a company's capacity. Thus, it is possible to divide this capacity into two types: productive and idle and therefore to act more adequately in solving problems. It is argued that due to the recent crises and other factors surrounding cultural issues, Brazil tends to work with a production capacity much lower than that seen in other countries. In general, in developed countries, the machines are programmed to operate 24 hours a day, while in Brazil, they follow the 44-hour week rule (Febratex Group, 2020).

The financial relationships most used to calculate the probability of bankruptcy in the literature are liquidity, solidity or solvency, sufficiency of cash flow and profitability (Lukason & Laitinen, 2018). The main concepts that should be addressed are:

- Depreciation: this cost, which is often remembered and highlighted by management experts from different sectors but is often left out for various reasons. This is a cost associated with the future generation of economic benefit from an investment in operating assets, which is often ignored because it is not an effective cash outflow, which however, reduces the company's profitability;

- **Cost of Capacity:** Operational assets are acquired to generate value according to capacity, the facility offered which is underutilized generates a burden for the business and decreases the profitability of the business;
- **Cost of Idleness:** Just like depreciation, other underutilized costs, even without an effective cash outflow, must be controlled to increase the profitability of the business;
- **Interest from Suppliers:** A large part of the interest-bearing financing comes from agents within the supply chain that impact the profitability of the business;
- **Buyer Interest:** In addition to possible credit risks associated with payment defaults, it is important to highlight that there is an implicit cost of financing to buyers that can reduce the company's profitability;
- **Inventory loading:** This cost alone represents standing capital within the operating and financial cycle, representing a direct cost that can reduce business profitability.

Managing non-recoverable costs is important for controlling operational and financial leverage, as decisions taken without considering hidden costs at the present time, but which are consumers of strategic resources in the future, have a negative impact on business profitability.

About this strategy, the flexibility can be a good alternative to minimize capacity change costs, because change the employment period policy by extending the minimum employment period or expand the fixed capacity periods. The flexibility too can be a good alternative to minimize idle capacity, because change the employment period policy by reducing the minimum employment period or reduce the fixed capacity periods (Carvalho et al., 2017).

INSIGHTS TO ACHIEVE PRACTICAL RESULTS

The aim is to provide useful theoretical guidance for advancing practice on five relevant issues: (i) the selection and prioritization of costs; (ii) the representation of the capacity of production and process with flexibility; (iii) the managerial costing system adopted; (iv) the profitability decision and (v) the scope of action of the decision model. Similarly to the Carvalho et al. (2017) research, these issues are discussed in the next subsections.

Besides that, this chapter provides current and historical information and includes an analysis of the thoughts of the authors who contribute to the area of the manuscript, that is, it contemplates theoretical constructs with relevant themes linked to the area of study.

The Selection and Prioritization of Costs

An important part of the development of the planning model is the determination and prioritization of the cost objectives to be achieved, to result in a minimum total production cost. In addition to the concern with changes in physical production capacity. As well as, translating this into policies to enable objectives to be met.

The Representation of the Capacity of Production and Process with Flexibility

The productive capacity planning process must be accompanied by technical adjustments for the processing of operations. To this end, management must rely on acid data to estimate the impact of idle capacities and the resulting costs, accompanied by studies of negative impacts on the organization's profitability.

The Managerial Costing System Adopted

The proposed model does not exhaust the role of a standard costing system, although its objective function is related to costs. In this case, only fixed costs are considered, when planning on how much and this structure for the periods in which they are incurred.

In the data collection process to identify and segregate all costs in fixed and variable costs, when referring to general manufacturing costs, especially since in the long run all costs are variable. On the other hand, all direct costs are variable costs. However, some of the indirect manufacturing costs can be partially fixed and partially variable after an average period (Carvalho et al., 2017).

The Profitability Decision

The proposed model should allow an iterative and interactive decision process, to allow interventions in the preparation of production plans with economic and financial management decisions, generating alternative scenarios and the evaluation of these plans in terms of a set of performance measures (Carvalho et al., 2017). Management decisions must be used to generate new simultaneous analyses within the operational and financial tactical planning process, as well as to serve to adjust parameters including time scales and the severity with which economic and financial information can be impacted, positively or negatively.

The model provides information for decisions on how to use capabilities for market demands in times of crisis and recession. According to Carvalho et al. (2017), decisions can refer to actions related to demand, supply (availability of materials), the use of capacity, the exploration of flexibility and the production flow.

The scope of action of the decision model

The person committed to the original investment that established a determined level of nominal installed capacity, in times of crisis, will convert it into practical production, or effective production according to demand, with a loss of efficiency below normal efficiency, for example, considering machines stopped for maintenance. This compromises necessary capital expenditures that before certain low demand was certain, since the production resources are in these underutilized periods, when considering the capacity of the physical installation, which represents the lack of potential use of all infrastructure, machinery and technology available processes (Carvalho et al, 2017).

The main characteristics and assumptions can present a solution as a capacity planning and resource utilization model that can be used as a decision support tool in periods leading up to crises of different orders, balancing demand with available capacity and providing information for a more rational decision-making process. It is a formulation of cost minimization of an idle production system, which is supplied and provides a production plan and ideal costs, subject to various restrictions related to different causes

and of varying character, technical, financial, commercial and psychological. The committed work capacity, on the other hand, is attributed both to periods of idle time, as well as to the incurred resources, originally planned and disbursed, and which, therefore, must be recovered.

As reported by Eklin and Shtub (2010), the allocation of indirect costs to products must consider practical capacity, with correct estimates. The literature provides a series of cost estimation models based on unlimited capacity, that is, it does not consider the available capacity on the factory floor, and deals with finite capacity and dynamic workloads, which can change over time. According to Eklin et al. (2010), models that use information about products, materials and production processes and make up a more common approach are those of parametric cost estimation based on regression analysis, fuzzy logic, minimizing the Euclidean distance between estimated cost and real value; group technology, hybrid cost estimation, among others.

CONCLUSION

This chapter focused on the crucial issue arising from the COVID-19 pandemic that is causing a crisis across the world ecosystem with consequences that have been affecting companies and people around the world. As a result, issues related to environmental, social and governance demands, which define the Environmental, Social and Governance (ESG) movement, can be a way of redesigning the global business ecosystem, as an economic initiative to measure the value of organizations.

In addition to the search for the recompositing of social dynamics in the most diverse areas, whose global scenario for the coming years should be totally different from what humanity has already experienced, and for which changes are envisaged that will occur at a much faster speed and will require new knowledge and competences (Benchimol, 2021). To avoid idleness and to remunerate workers and to avoid the liquidation of businesses, by recovering production and Gross Domestic Product that can be comparable to a recession of high severity, before an acute recession, even if it is of short duration, turns into a lasting depression (Saez & Zucman, 2020). And so, the business activity that is currently paralyzed and with cash flow paralyzed, can be kept alive until the health crisis and the containment of the pandemic pass and the economy restores (Gourinchas & Olivier, 2020).

It is noteworthy that in this context, the reduction of idle capacity may be the main objective of managers seeking to establish an alignment between the demand for production and the occupation of resources such as facilities, and equipment and labour as a business strategy. This is to seek a return to the baseline, which can be considered a break-even point, instead of an increase in the level of productive activity, even if a post-recession increase in expenditure on postponed purchases of durable goods is expected. In a modern economy scenario, everything is considered as a complex network of interconnected parts, involving employees, companies, suppliers, consumers, banks and financial intermediaries, and a sudden stop like that of the Covid-19 pandemic, triggered a cascading chain. collectively catastrophic events (Gourinchas & Olivier, 2020).

Thus, measures need to be taken by countries to avoid the negative impacts of the pandemic in order to establish measures to help “level the economic curve”, limiting the economic loss, as well as so that companies can establish more accurate decision making, prioritizing the best decisions for your operational structures.

In this perspective, according to Gourinchas and Olivier (2020), the priority must be: (a) to ensure that workers can remain employed; (b) ensuring that companies can weather the storm without going

bankrupt; (c) supporting the financial system as non-performing loans increase, to ensure that the crisis does not turn into a financial crisis. Such measures serve to significantly reduce the economic slowdown, and the adoption of fiscal policy to expand the capacity of the health system and the adoption of political initiatives to contain the recession.

Still in addition to the above arguments, Souza (2020) refers to other strategies: (i) determining priority in the economic sphere to avoid obstacles to free trade, whether national or internationally to avoid stricter measures of social exclusion; (ii) maintaining stronger health systems for successful surveillance; (iii) Global articulation of capitalism to inject part of the public fund into emergency aid to maintain the subsistence income of population segments to maintain employment; (iv) avoiding the globalization of capital, the individualistic ethos that is expressed in competitiveness beyond market functions, such as education and culture; (v) the need for a structure to combat social problems and generate income that allows the adoption of preventive measures.

Limitations

Specific weaknesses that may have contributed to ineffective aspects of the chapter can be pointed out as limitations of the study. In spite of the fact that the analyses were made using qualitative data, and the limitations imposed by the Coronavirus pandemic, the present study brought a very different reality because it presented new difficulties, physical, budgetary and structural limitations, for which the researchers needed reinvent itself, understanding that this is a new reality applied to scientific production. Even with the limitations that arose with the development of the study, either due to the absence of quantitative data or for which there were no answers, it is believed that the data shown is reliable, which may be useful as an opportunity to describe the needs of future research, during and post-pandemic and as an apprenticeship on what to do to avoid other crises.

Regardless of the approach used, the study was concerned with the results as one of the possible “truths” about the phenomenon studied. For this, fundamental requirements were considered when choosing the method adopted. To this end, the researchers understood that the method adopted was feasible and appropriate to the object of the investigation, keeping epistemological coherence from the choice of the reference, the collection techniques to the way in which the data were analysed. The academy says that there is no ideal method that allows to arrive at an absolute truth, because the reality is complex. This to reduce the subjectivities associated with the analysis of the opinion of the researched authors.

The findings of the present study show that periods of crisis affect the functioning of the market as a whole; the results provide evidence of the adaptive behaviour of economies, which work differently given market conditions, according to Souza and Silva (2020). As well as the efficiency of the markets is not constant, and cultural, social, financial, and public health aspects affect the markets, companies, people. The strong point of the chapter lies in the way the proposed target audience of the book will discover and monitor their immediate and spontaneous reactions to the situations they face in their daily lives, which can contribute to the performance of necessary activities and in a way adequate.

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Chapter 13

Cost Managerial Analysis to Prevent Arbitrary Cost Reductions in Times of Significant Crisis

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ABSTRACT

This chapter presents an innovative cost categorization model that can help understand costs in terms of their causes. The model incorporates categories that are now scattered in the literature, develops the categories more broadly, and connects with management control tools to monitor these costs. The model was applied in a Brazilian dairy company and made it possible for managers to discuss strategic aspects, hitherto not addressed in routine discussions. The model contributes to the literature by filling a gap in textbooks and contributes to practice by providing a cost categorization model, enabling the controller and finance professional to avoid arbitrary cost reductions, so common in times of crisis. However, they hinder the long-term performance of companies.

INTRODUCTION

Cost management controls are routinely used for monitoring the operations, including activities, expenses, resources, product margins, and customer profitability, and are useful tools to monitor the drivers of

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organizational performance (Cadez and Guilding, 2008; Fish, Miller & Pernsteiner, 2017; Kasanen et al., 1993).

In times of severe crisis, controlling and finance professionals are highly demanded for timely implementation of strategies aiming at cost efficiency, which is the most proficuous strategy at such times (Schoenberg, Collier & Bowman, 2013). Such strategies include various actions aiming to obtain “fast gains” to stabilize the short-run financial position so that more complex strategies can be prepared.

However, as in any strategy, the search for cost efficiency involves risks (Schoenberg et al., 2013). One of them is that cost-cutting actions may reduce the employees’ commitment, and such a strategy cannot last much time. Otherwise, it can jeopardize the assets or resources necessary to sustain the core focus of the company. R&D, for instance, is one of the first areas to be cut down; however, such action can undermine the sustainability of the company for the future (Schoenberg et al., 2013). Headcount reduction is an easy and obvious way to cut costs in hard times, but it can erode both employee and eventually customer loyalty in the long run (Tikici, Omay, Derin, Seçkind, & Cüreoglu, 2011). Such alerts can also be seen in the business literature, such as the situation that happened in 2015 in BRF, a Brazilian multinational food company. More than 80 senior executives and managers were dismissed, and many were hired by the main competitor so that “all business intelligence was, all of a sudden, in the competitor’s hands” (Samor, 2018).

The traditional definitions and classifications used in cost management are the common expressions such as direct and indirect, fixed or variable and period or product costs. Atkinson, Banker, Kaplan and Young (2000) also explain the classification of costs based on function: manufacturing costs (direct and indirect), distribution costs, selling costs and so on which are commonly used in the financial statements. Horngren, Sundem and Stratton (2002), on the other hand, start his book with the introduction to cost behavior explaining how the cost drivers affect the cost behavior. They highlighted the importance of the cost drivers, which is defined as any output measure that causes costs, that is, causes the use of costly resources (Horngren et al., 2002). However, they also use the tradition categories of the costs as usually applied in general cost accounting.

Although Strategic Management Accounting SMA (Cadez & Guilding, 2008; Nixon & Burns, 2012) focuses on the costs under competitive strategies elaboration, a consolidated model of different cost perspectives is not known, mainly about what factors cause costs. SMA emphasizes the different tools used to measure the costs of products, customers, and activities.

Shank and Govindarajan (1997) presented two cost drivers, the structural and the transactional drivers, which allow identifying the causes of the costs. However, no framework was found comprising such costs with other aspects such as the strategic costs (Kaplan & Norton, 2008) and the so-called “discretionary costs.” Our framework classifies the costs into four categories: structural, transactional, strategic, and discretionary costs. We also recommend the management control tools that can be used to monitor and influence the causes of the costs. Therefore, our framework focus is on identifying the causes and analyzing the performance impacts in the short and long run.

By presenting such a framework, our main objective is to contribute to the practitioners involved in the challenging task of searching for operational efficiency, trying to have information that can support more assertive decisions and preserve the company sustainability in the short and long horizons. Thus we expect to answer the call from Davila and Oyon (2008) so that the research can have a relevant impact on practice and contribute to the dissemination of the concepts of Strategic Cost Management so that they can be incorporated in the textbooks (Seal, 2010).

Thus our paper contributes to the practice by showing a typology to categorize the different types of costs, which can be useful for diagnosis and decision-making, and to prevent arbitrary cost reductions. The recommended management control tools allow the due analysis of the events and transactions based on the main drivers of costs.

In the following sections, we present the main theoretical references and an application of the framework in a producer of milk and dairy products.

COST CATEGORIES

In this section, the cost categories used in our framework are presented in detail, so as the management control techniques that can be used to monitor and carry out interventions.

Structural Costs

According to Shank and Govindarajan (1997), the drivers for the structural costs are related to the company's strategic choices in terms of economic structure such as scale, product line complexity, operations scope (vertical integration) experience. In practical terms, investment decisions are affected by choice of position within a value chain, such as buying or manufacturing, the decision to choose the production system (make to order or make to stock), or even the choice of construction architecture and expansion of the industrial park, for example, if the growth can be modular.

These costs are also influenced by choices based on the value chain positioning and the types of competitive strategies, such as cost leadership, differentiation, or approach, that determine the company's investments. The choice for a certain level of operation volume defines the investment size in types of equipment and installations, which is accounted for as depreciation afterwards. Other structural costs associated with those choices are maintenance, property insurance, utilities, engineering team, cleaning, and surveillance.

Therefore, these structural costs are difficult to be reduced since they are related to investment decisions, and new investment or disinvestment are needed to get them reduced.

Strategic Costs

Kaplan and Norton (2008) defined the strategic expenses (stratex) as those aimed to enhance the intangible assets which supply the organizational resources such as training and customer database. In their view, strategic costs are necessary resources to the implementation of initiatives that generate benefits for the long run.

Examples of strategic costs are R&D projects, expenditures of human capital training and development, as well as the customer and supplier networks. These costs harm short-term performance (cash and profit), but they are necessary for the company to have new products and capable people for the medium and long-term horizons.

Strategic costs are the result of strategic priorities that management defines in its strategic planning and are also the resources consumed in critical success factors, such as innovation, the attractiveness of people, conquests of new markets, and the launch of new products. To monitor if the strategic priorities have been executed, it is necessary measure the performance indicators. This process is called strategic

alignment; in other words, performance drivers are needed to measure if those strategic priorities are being achieved (Verbeeten & Boons, 2009).

Transactional Costs

Transactional costs are caused by the volume of activities developed in the industrial processes, such as the merchandise receipt, material handling, production, quality inspections, and commercial activities such as pre-sale and after-sale services, customer acquisition, customer relationship, communication, delivery to the customer. They also comprise administrative processes such as collecting, payment, receiving, and purchasing processes. Different aspects affect transactions, for example:

- Quantity of production steps such as assembly, mixing, finishing, quality control, among others
- Quantity of production steps but which do not add value such as set-ups, handling materials in production, movement of finished products, reprocesses, among others
- Service level agreements with customers, such as visits, deliveries, after-sales, with suppliers about delivery times and quality control
- Administrative policies such as providing information to managers, directors, shareholders, auditors, and regulators
- Number of transactions resulting from employee management, such as hiring, training, and dismissal

Discretionary Costs

According to Garrison et al. (2013), part of the fixed costs can be classified as discretionary in the planning phase, and they are dependent on annual or shorter period decisions (short-run). Our definition of discretionary costs is slightly different since we conceptualize them as expenditures on which the managers can reduce or save temporarily or definitively since they do not impact the firm performance in the long run. They are associated with value differences according to the perception level of quality or comfort, such as trips, accommodations, and food, which can be relatively changed without missing the final goal of the expenditure.

Two management tools, which are ZBB (Zero-Based Budgeting) (Dean & Cowen, 1979; Phyr, 1981; Burns & Lee Jr, 2004; Kreuzberg, Beck & Lavarda, 2016; Ferreira & Caliman, 2018; Ibrahim, 2019) and Matrix Expense Management (Oliveira, Ramos, Silva & Prado, 2015; Silva & Bezerra, 2014), can be used rationally and cost-effectively to support the decision making on discretionary costs.

Cost Managerial Analysis to Prevent Arbitrary Cost Reductions in Times of Significant Crisis

Table 1. Information on cost categories and related bibliographic references.

Cost category	Definition	Some examples	Main Reference
Strategic Costs	Costs arising from strategic priorities, critical success factors and customer value proposal	Research and development, brand marketing expenses, employee attraction and retention, etc.	Kaplan & Norton. (2008)
Structural Costs	They are impacted by investment decisions and production process, plant size, technology, complexity	Depreciation, maintainance, power, facilities	Shank & Govindarajan (1997)
Transactional Costs	They are impacted by the volume of transactions with internal process such as manufacturing, machines preparation, customer services, delivery, administrative process, etc.	Pre-sales, after-sales, delivery, machine set-up, credit collection, legal contracts, etc.	Cooper & Kaplan (1991)
Discretionary Costs	Resulted from the choices made by managers, whose monetary values can be changed by the increase or decrease in quality and service levels required.	Travel, hospitality, graphic materials, Consulting and legal services, etc.	Garrison et al. (2013)

Source: Prepared by the authors

Management Control Techniques and the Cost Framework

In this session, we present some management control techniques which can be useful to diagnose and make decisions that affect these costs.

Net Present Value and Investment Analysis ® Structural Costs

An investment corresponds to the use of resources in the present to obtain future benefits and their feasibility analysis consists of an analysis of future cash flows. In the industrial sector, most investments are made to expand production capacity or replace or renew obsolete or worn-out assets (Gitman & Zutter, 2019).

To make an investment feasibility analysis, first, it is necessary to identify and estimate the relevant cash flows. In an expansion case it is enough to estimate the cash outflows and inflows after income tax related to the investment under analysis. In a case of replacement, it is more complicated since it is necessary to identify the incremental cash outflows and inflows that would result from the proposed replacement (Gitman and Zutter, 2019).

Decisions about types of equipment, size of the industrial plant, and choices of the production system, which are included in the cash flow analysis, will affect the structural costs that will be recognized and incurred over time in the income statement.

Zero-Based Budget ® Discretionary Costs

Observing the methodology proposed by Phyr (1981), Zero-Based Budget is an approach that has several planning attributes, breaking with the historical basis to guide the preparation of the budget and starting from “zero” to forecast the organization’s expenses. The expenses are related to the decision packages that include objectives, goals, and activities in the quest to rationalize the consumption of resources.

These packages are prioritized, providing opportunities to reduce and eliminate expenses, and their configuration also allows for the monitoring of actions.

Reinforcing the planning attributes of ZBB, McNally (2017) summarizes the advantages and disadvantages of ZBB. According to the author, the potential advantages are: it allows greater clarity of the organization's mission, improves communication, reduces the effect of inflation on the projection of the budget of expenses and ultimately eliminates non-essential and redundant activities. However, the author also remembers the disadvantages of using ZBB, as follows: it takes more time for managers to prepare it, requires more training to be implemented, it can increase bureaucracy in the company, subject to "organizational games" by senior managers, it may not be practical (cost reduction benefit less than the effort to implement ZBB), it can reduce the agility of the budget process and can also influence the morale of the employees since it deals with the reduction and elimination of expenses. It is suggested that ZBB be seen as an approach far beyond the emphasis on cost reduction, but as an instrument for optimizing economic and financial results (Costa, Moritz & Machado, 2007).

Matrix Expense Management ® Discretionary Costs

This tool is designed to monitor mainly expenses. In practical terms, every group of expenses has an employee responsible for monitoring this expense group in the company (Oliveira et al., 2015; Silva & Bezerra, 2014). On the other side, another employee is responsible for controlling the expenses in the department or cost center. To compare if a department is wasting resources or if it could be more efficient, the responsible for the expense package usually he or she uses an average travel unit cost per employee or cleaning per squared meter, for example.

Activity Based Techniques ® Transactional Costs

The conceptual basis is the activity-based costing (ABC). Cooper and Kaplan (1991) explain that this method reveals the links between executing certain activities and the demands that these activities make on the organization resources. The fundamental idea of ABC is that the activities consume the resources (Oyadomari, Mendonça Neto, Dutra-de-Lima, Nisiyama & Aguiar, 2018) so that the ABC can provide a detailed view of the most representative and most efficient resources and the product and customer profitability. However, the main emphasis is on activity management by identifying the cost drivers, which explain the behavior of the activity costs (Martins & Rocha, 2010), and mainly to know which factors stimulate the cost drivers to act on the causes. Cost drivers, which are linked to the internal processes, may result from, for instance, the layout design problems which cause the material handling or service level issues with customers such as shorter delivery time tending to generate more deliveries and consequently consuming more resources.

Kaplan and Anderson (2005) also emphasize that ABC concepts can be applied based on the processing time. They called the tool "Time-driven ABC," that is, ABC based on time. In this case, the cost driver is the time of execution of the activity whose cost is measured in monetary units per time. The authors emphasize that this cost can be obtained by estimating the costs of the resources used and the time available to carry out the activity based on their practical capacity.

Activity-based costing is a recognized useful technique for companies with high complexity level processes. They need to control the costs of these processes and to make decisions about processes, particularly in improving processes or activities, and eliminating or charging their customers. Roberts

(2017) has an interesting understanding of cost drivers and cost allocation criteria. For him, they “can have a double role in assisting both management accounting and knowledge management” (Roberts, 2017). In some cases, activity-based costing can eliminate the errors of fixed cost allocation criteria (Smith, 2005), mainly when these processes are not oriented to volume.

The customer profitability analysis is considered as a technique from strategic management accounting (Cadez & Guilding, 2004) and also taught in textbooks such as Smith (2005) and Horngren, Sundem, Stratton, Burgstahler and Schatzberg (1999). According to Fish, Miller, Becker and Persntainer (2017), this analysis may be used to turn unprofitable customers into profitable customers by improving processes to lower service costs through activity-based management and also substantiate the need for customized pricing policies. Furthermore, this issue remains descriptive or normative research. This subject is also studied in the marketing field, for instance (Helgesen, 2006).

Customer Value Analysis ® Strategic Costs

According to Kumar and Reinard (2006), the challenge is to dynamically align resources spent on customers and products in order to generate value both to and from customers simultaneously. They understood that resource allocation remains an important research and practical question that needs careful and comprehensive attention.

Understanding which aspects the customer recognizes as more essential and influence their decision to buy products/services can supply useful information to the decision-makers to allocate resources. Some of these aspects influence the strategic costs.

Strategic Planning and Balanced Scorecard® Strategic Costs

Strategic planning encompasses the following aspects: vision, the mission, the strategies and long-term goals, the scenarios, and the long-term operating plan (Frezatti, Aguiar, Guerreiro & Gouvea, 2011). This technique uses scenario analysis techniques, such as SWOT analysis (Anthony & Govindarajan, 2006). After the strategic planning, the company prepares the budget, which the literature suggests that it performs at least four roles such as operational planning, performance evaluation, communication of goals, and strategy formation (Hansen & Van der Stede, 2004). The budget usually begins with the definition of the premises and ends with the financial statements’ projection (Frezatti et al., 2011).

The balanced scorecard is used as a strategic management system because it organizes strategies in different dimensions, translating vision and mission into measurable goals, providing a visual map of the causal link between initiatives and achievement of objectives (Norreklit & Mitchell, 2007). Companies use it more as a planning control because it connects strategic planning with the budget process, but with a broader view of the dimensions beyond the financial. Despite several criticisms about the lack of a conceptual rigor of the artifact, BSC is one of the most widespread managerial tools in organizations and could and should be recognized as an appropriate form of framing for strategic decisions (Harris, 2014).

Based on this process, other qualitative objectives are essential such as obtaining an excellent corporate reputation, organizational efficiency, employee motivation and morale, organizational growth, or providing public (Anthony & Govindarajan, 2006). Another long-term objective is to enter new markets. Crossan, Fry, Killing, and Rouse (2009) described the matrix product/market scope developed by Igor Ansoff in 1987. This matrix indicates that companies can choose to sell new products to new markets or new geographic territories (Harlez & Malagueño, 2016), or on the extreme side, the existing products to

existing markets. In turbulent times for surviving, several companies include in their goals innovation. Innovation is a critical enabler for firms to create value (Chen & Huang, 2007). Notably, Bisbe & Otley (2004, p.711) state that product innovation refers to product development and launching, which is, in some respect, unique or distinctive from existing products.

Cost Categories and Management Controls Techniques

Table 2 shows the connections between the primary meanings of the cost categories and their relationships with management control techniques.

Table 2. Costs categories and relationship with management control techniques

Cost category	Capacity to be changed in the short term	Management control tools used to control these cost categories
Strategic Costs	Low, there are risks to jeopardize the performance in the medium term	Strategic Planning and Balanced Scorecard
Structural Costs	Almost zero, it could be changed with new investments and disinvestments	Net Present Value and Investment Project Analysis
Transactional Costs	Medium, but it affects service level agreement with customers, but it is possible modifying processes	Activity Based Costing Customer Profitability Analysis
Discretionary Costs	High, it could be reduced without critical effects on performance	Zero Based Budgeting (ZBB) and Expenses Matrix Management

Source: Prepared by the authors

CASE STUDY

Our framework and methodology were applied in a producer of milk and dairy products. It is a family business located in the state of São Paulo with its own-brand dairy products, cattle, chicken, and citrus production. Gama (fictitious name) was founded in 1945 and is one of the largest producers of type A milk in Brazil.

The traditional managerial cost analysis previously prepared by the managers indicated the need to preserve cash with cost and expense reductions in a pandemic scenario which has just started. It was the perfect scenario for an applied research.

As for the data collection plan, we used the Gama management and accounting data of the first quarter of 2020 from the summary of the general ledger with all expenditures of the company. We obtained some additional information during a meeting with the board and another with the managing directors. We used Microsoft Excel® and Microsoft SQL Services® software to structure and analyze the data.

Cost Managerial Analysis to Prevent Arbitrary Cost Reductions in Times of Significant Crisis

Table 3. Fixed costs by items

Items	Quarter 1 - 2020 (R\$)*
commercial	XXX
primary freight	XXX
projecte	XXX
labor	XXX
maintenance	XXX
energy	XXX
quality	XXX
GLP	XXX
assets	XXX
marketing	XXX
chemical	XXX
others	XXX

*numbers omitted for confidentiality

Source: Prepared by the authors

Gama Dairy and Its Data

Gama's target is to add value to raw milk sustainably and responsibly. Based on this objective, the dairy farm was built in 2007, which currently processes about 25% of the farm's milk. The dairy farm processes only type A milk produced in the company, and it is located less than 30 meters from milking and receives its primary input without having any human contact in this process. This procedure, among other process controls, guarantees the quality control and origin of the entire product that is filled by this facility.

The dairy industry was recently joined by the third generation of the family and in a partnership with a professional executive not linked to the family. This combination generated a level of investment never experienced by the company with relevant sales growth results in its first year. In 2020, however, like most other companies globally, they face a significant challenge of preserving cash.

The dairy farm's productive capacity, with the current structure of employees, can process 640,000 kg of products in a single shift of production. The monthly average for the first quarter of 2020 was 545,500 kg. The items produced include milk in bottles, sachets, and bags, fermented milk in bottles and sachets, yogurts in 180gr and 600gr bottles, curdled in 600gr bottles and 130g pots, sour cream in 10l, 1l packages, ad 500gr and, finally, fresh cheese.

In addition to the labor force in the production process, there is also a high cost with the quality team due to the operating requirements in Brazil for type A milk. The company has five different filling lines to fill these products: cheese, pot, 600 and liter bottles, 180 bottles, and sachets/bags. Each of these lines has a different production capacity calculated in liters of products packaged per hour.

The commercial structure has both salespeople linked to the company and exclusive and shared sales representatives. There is also a team of tasters and promoters in the field covering the São Paulo state.

Application of the Framework of Cost Categories

We obtained the accounting data with all the figures referring to the costs and expenses of the dairy, and then we separated all the fixed cost. Fixed costs represent 35% of total costs and, theoretically, would be the costs in which there would be a more significant potential for reduction in the short and medium-term. We grouped these costs by the items described in Table 3 with the respective quarterly absolute values.

We then applied the classification according to our framework as shown in the Table 4 based on the same source previously presented in the Table 2.

Table 4. Classification of items and representativeness of costs

Group	items	% total	% group
Transactional	commercial	7,85%	45,02%
Transactional	primary freight	5,71%	32,71%
Strategic	project	4,04%	90,33%
Transactional	labor	4,00%	11,05%
Structural	maintenance	3,71%	44,84%
Structural	quality	1,68%	20,38%
Structural	energy	1,57%	18,96%
Structural	LPG	1,13%	13,67%
Strategic	assets	0,48%	5,08%
Discretionary	marketing	0,42%	79,55%
Structural	chemicals	0,23%	1,29%
Discretionary	others	0,11%	10,44%

Source: Prepared by the authors based on the data collected (2020)

The cost categories groups with the representativeness of the fixed cost of the items in relation to the total cost of the dairy farm are shown in the Table 5.

Table 5. % of costs by category

Cost Categories	Representativeness %	Average R\$/kg
Transactional	57%	0,42
Structural	27%	0,20
Strategic	15%	0,11
Discretionary	2%	0,01

Source: Prepared by the authors

After mapping the relevance of fixed costs and their cost categories, we outlined a medium-term action plan to improve existing assets' profitability.

The dairy farm is in a phase of high visibility in the market, and it is managed to take advantage of such a context and has been invited to supply large retail companies. A plan to serve these large customers was structured to guarantee quality service and operational profitability. This plan will be implemented in the next months, comprehending a structure that starts from order fulfillment by the store in an automated way to automated control of the logistics operation to the customer. All investments are aimed at reducing the risk of human error and reducing costs throughout the process.

With the volume that these large customers will bring to the dairy, it is expected to achieve the plant's filling capacity in the current model. This would bring a saving corresponding to what was expected at the investment decision.

During this case study, we noticed that Gama's dairy costs were under control, with no opportunity to reduce costs in the short term without affecting the current quality of dairy deliveries.

However, the management was surprised when they realized that the past decisions reflected on the actual structural costs and the pipeline of R&D projects were not congruent. New product lines were launched, but they were not focused on the most idle capacity with higher potential for fixed cost dilution. They concluded that a better distribution of efforts in terms of transactions could be contemplated considering the market or branding need. Besides, the fixed cost dilution could mean more profitability and financial sustainability for the firm.

The Cost Managerial Analysis based on our framework contributed to identifying the source of the costs, which allowed critical reflections by the managers on the decisions that involve costs. The cost framework allows extrapolating from the simple sources of the costs to the scenarios and assumptions that were chosen in a specific investment or service and the returns expected by the company. In a routine evaluation of the Income Statement such details may be between the lines or less evident than in the cost analysis which was used in this case study.

FUTURE RESEARCH DIRECTIONS

Future studies could investigate the application of this model using interventionist research and case studies. Relationships among these control techniques and cost categories could be analyzed using survey research and structural equation modeling.

CONCLUSION

Our understanding is that these cost categories have interactions with each other – for instance, spending on hotel stays reflects transactional aspects, such as a number of trips, combined with discretionary aspects, such as the hotel's quality that affects the price. When choosing the industrial plant layout, for example, it can affect the number of transactions and transaction costs, such as material handling. When choosing production equipment, this may also affect the quantities of machine set-up and maintenance transactions.

Some management control techniques could be used to diagnose and make decisions about these costs. Discretionary costs can be monitored using Zero-Based Budgeting and Expenses Matrix Management. Transactional Costs was the object of Activity Based Costing and Activity-Based Management and also Activity-Based Budgeting.

We argue that at least two skills are necessary and essential for controllership professionals to perform their activities at a high level: the first is to make adequate diagnoses of where the opportunities for performance improvement are, both in the short and long term, the second is having the ability to make appropriate interventions, preferably in a collaborative manner with the managers of the operational areas and senior management to solve the most routine problems and also those of greater complexity. Our paper provides a tool that helps in the first task, that is, a framework that allows grouping the costs by category (except variable costs, such as raw material in a product). Having done this categorization, we recommend that the controllership professionals be trained in leading change processes, and for that, the interventionist research approach (Suomala, Lyly-Yrjänäinen, & Lukka, 2014; Oyadomari, Silva, Mendonça Neto & Diehl, 2017) has been recommended as an interaction between practitioners and academics to produce innovation and new knowledge.

The limitations of the case study are related to the application of the framework in a single company, which obviously prevents generalizations. However, we believe that it can still inspire its adoption by other companies with the necessary adaptations.

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KEY TERMS AND DEFINITIONS

Cost Managerial Analysis: A range of techniques to analyze costs, products, activities, and customers.

Discretionary Costs: Resources consumed by managers' choices can be affected by the increase or decrease in quality and the service levels required.

Strategic Costs: Costs arising from strategic priorities, critical success factors, and customer value proposal.

Structural Costs: Costs that are affected by investment decisions.

Transactional Costs: Costs are affected by the volume of transactions like production orders, deliveries, set-ups, customer visits, etc.

Chapter 14

The Uncertainty of the Organizational Environment as Cause of Unfavorable Budget Deviations in the Projects of Portuguese Construction Companies

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ABSTRACT

Construction companies are increasingly concerned with new strategic guidelines and ways of managing project budgets to improve their competitiveness and sustainability. Thus, with this work, the authors analyse the relationship of the uncertainty of the organizational environment with other constructs, as causes of unfavorable budgetary deviations in the projects of Portuguese construction companies. For its development, quantitative research methods and techniques were adopted. The results presented in the study show a high correlation between the five first-order constructs (internal environment, external environment, time/delay, project process/monitoring, and project financing) justified by the literature review and justify the perception regarding the uncertainty in the organizational environment and other constructs as factors that determine the causes of unfavorable budgetary deviations in construction companies' projects. It should be noted that the objectives outlined for this study were achieved by providing complementary knowledge in this area of research.

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INTRODUCTION

Currently, the covid19 pandemic has spread uncertainty to various business sectors and has forced managers to be more demanding with regard to their ability to manage budgets, particularly in construction companies' projects. It is common to assume that the main risks affecting the budget of construction companies' projects are uncertainties (Abramov, 2020).

However, the uncertainty of the organizational environment has aroused the interest of researchers, due to its transformations, which somehow determine the factors that cause unfavorable budget deviations (Drucker, 2009).

The budget has thus become an issue that has deserved the attention of academics and researchers, since the pioneering studies of Welsch (1957) portraying the "Profit Planning and Control" theories on profit planning and control. This study contributes to the dissemination of the budget at the level of entrepreneurial projects, namely in the projects of construction companies.

The construction companies' projects have enormous acuity in the national economy, particularly in the labour market. They are also known for their diverse activities and business areas, such as construction, civil engineering and other specialized activities.

However, when comparing the projects of Portuguese construction companies with their European counterparts, there is a gap in terms of competitiveness, due to the lack of recognition of problems, such as unfavorable budgetary deviations, non-compliance with deadlines, insufficient quality of service. final product, and also deficiencies with regard to ensuring safety at work (Couto, 2007).

The prevention of uncertainties in the organizational environment in terms of competitiveness, reveals that the budget is a strategic planning tool, which provides company managers, particularly in the construction sector, with useful information, whether for monitoring the current management developed by the company, or for project management of construction companies (Coulmas & Law, 2010). Although the budget provides added value in project management, particularly in the projects of construction companies, it is the target of frequent criticism.

For Hansen *et al.* (2003), the budget is far from the idea that it can constitute an optimal management control system. Libby & Lindsay (2007) point out that criticisms about dissatisfaction with budgets have increased recently. These criticisms of dissatisfaction with the budget reveal that companies that operate under conditions of rapid market change are unable to take the right measures for the budget, due to the uncertainty of the assumptions to be used, as well as the slowness in their elaboration process. Despite these criticisms of dissatisfaction, budgets have developed various techniques* in terms of execution, and are still used by most companies worldwide (Ekholm & Wallin, 2000; Libby & Lindsay, 2007).

The forecasts included in the budgets, in the short, medium and long term, are very often affected by unfavorable budgetary deviations due to the uncertainties of the organizational environment, namely the conditions of the construction market (Barki, Rivard, & Talbot, 1993; Nidumolu, 1995). Unfavorable budgetary deviations are undoubtedly responsible for the failure of many construction companies' projects (Mendes, 2019).

It is therefore important to make an in-depth study of the uncertainty of the organizational environment as one of the causes of unfavorable budgetary deviations. To this end, we will take advantage of the data from the doctoral thesis entitled "Determinants of Budgetary Deviations and their Impact on the Performance of Portuguese Construction Companies" by Caropul C. Mendes.

Reflecting on this work and with the uncertainties hovering in the air due to the covid-19 pandemic, it appears that the more scientific knowledge on this theme is systematized and the more possible it is

to introduce new approaches with innovative characteristics, the more simplified it becomes. project management for construction companies. Therefore, it is justified to develop a work that seeks to perceive the departure from the forecasted budget with the real, considering the time of uncertainty conditioned by covid19.

The present work aims to analyse the relation of the uncertainty of the organizational environment motivated by covid19, with determinants of the causes of the unfavorable budgetary deviations in the projects of the Portuguese construction companies. To achieve the intended objective, an investigation model was initially proposed with the respective constructs namely, internal and external organizational environment, time/delay, project process/ monitoring and project financing.

In methodological terms, techniques and methods of quantitative research are adopted. The need to evaluate the proposed model and test the formulated hypotheses, considers the use of structural equation modelling (SEM). The structural equation approach has been explored in many studies to examine causal relationships and test hypotheses in several areas, from economics, management, psychology, etc. (Xiong, Skitmore, & Xia, 2015).

However, this study aims to develop the following points: in the second section (ii), the explanatory variables of the causes of unfavorable budgetary deviations are conceptually illustrated in the light of the related literature, and the hypotheses of the research model are developed. In the third section (iii), the sample, data collection and investigation method are discussed. In the fourth section (iv), the results of the analyses are presented and neglected, and in the last section (v), we sought to discuss the conclusions as well as the contributions, aspects that limit the study and suggestions for future investigations.

LITERATURE REVIEW

The literature review comprises a task of compiling the knowledge developed by different authors, taking into account the identification of the subjects investigated and their results, being also a keyway in building a foundation for the dissemination of knowledge.

In this perspective, it is intended, initially, to contextualize the measures of budgetary performance, the construct of the determinants of the unfavorable budgetary deviation, as well as to establish the foundations of the theoretical relations between the variables of the study and of the analysis, to be carried out later.

Budget Performance Measure

For Neely et al. (1995) performance measurement can be understood as a technique adopted to quantify the efficiency and effectiveness of the organization's activities. In this way, the measurement of budgetary performance becomes a powerful tool in helping and improving the management of organizations.

At the beginning of the 20th century, the Return on Investment (ROI) indicator was created, which, together with other financial indicators, makes it possible to measure budgetary performance associated with medium and long-term investment operations. It should be noted that these indicators were so successful that many companies at the time started using them as being unique for assessing their performance (Johnson & Kaplan, 1987).

Subsequently, companies began to be increasingly concerned with the quality of information, using non-financial indicators directed to other functional areas of the company, in order to reflect the quality

of their management. As such, the so-called non-financial indicators emerged, and their use caused a decrease in the use of traditional indicators (Bititci, Mendibil, Martinez, & Albores, 2005), it is currently common and frequent to use financial and non-financial indicators to assess companies' budgetary performance.

In the opinion of Callado et al. (2011) the performance indicators are basic elements to measure the company's activity, allowing also to position the company in relation to the sector where it carries out its activity. Thus, for each sector, different groups of performance indicators can be elaborated, according to their specific performance characteristics. In this way it will be possible to make comparisons and introduce correction measures by the professionals responsible for them. Table 1 shows some of the most used financial indicators in the practice of assessing budgetary performance.

Table 1. Budget performance indicators and measures

Indicator Description	Equation
Budget Execution Indicator	$BE = \frac{RR}{RE}$
Net Present Value Indicator	$NPV = -I_0 \sum_{t=1}^{t=n} \frac{CF^t}{(1+k)^t}$
Additional Credit Indicator	$AC = \frac{ACP}{IB}$
Internal Rate of Return Indicator	$I_0 = \sum_{j=1}^n \frac{CF_j}{(1+k)^j}$
Payback indicator	$Po = \sum_{j=1}^{\Delta} CF \Delta$
Budget Revenue Realization Indicator	$BRR = \frac{RR}{BR}$

- Budget Execution Indicator (BE) focuses on highlighting the company's management capacity, ensuring that expenses do not exceed the respective revenues in the period of execution of activities. BE means budget execution, RR - realized revenue and RE - realized expenditure, that is, if the realized revenue is greater than the realized expenditure, the greater the indicator of budgetary execution.
- Indicator of Net Present Value (NVP) of an investment at time zero and calculated at time k (V (k, 0)) is the sum of the present values of net cash flows that occurred after zero, taking into account the values already verified in the moment k. The zero moment is called the reference moment, k being the calculation moment. When the calculation moment is irrelevant for the calculation of the net present value, only V0 will be used. Assuming that the calculation moment is prior to the reference moment, that is, all net cash flows are ex ante quantities so:

$$V_o(i) = \sum_{j=0}^n c_j (1+i)^{-j}$$

where i is the discount rate that reflects the cost of capital used to finance the project. The difficulty of this criterion is precisely in determining this rate. An investment is said to be admissible for rate i if $V_0(i) \geq 0$; an investment will be all the more attractive the higher its net present value.

- Additional Credit Indicator (AC) seeks to identify the added values in the budget execution process. However, changes made to the budget are understood through calculations made in a given period in which the amounts of the additional credits are considered in relation to the company's initial budget. Thus, AC is the representation of additional credits, ACP - additional credits per period, IB - initial budget.
- Internal Rate of Return Indicator (IRR) indicates the capitalization rate that makes the updated value of net cash flows equal to zero, that is, the rate that satisfies the following condition:

$$\sum_{j=0}^n c_j (1+i_r)^{-j} = 0$$

In other words, it is the rate that makes the current investment value equal to zero, that is, $V_0(i) = 0$.

- Payback Indicator (P) reveals the period of time necessary to recover the investment, that is, the number of years necessary for the accumulated future cash flows to equal the initial investment amount (I_0).
- Budget Revenue Realization Indicator (BRR) reveals the degree of correctness of the estimated revenue value with the total realized revenue value. RR represents realized revenue and BR represents budgeted revenue. If the coefficient is greater than 1 it will be favorable, being unfavorable on the reverse.

These indicators are those that are most frequently used in budgetary practice; however, it is important to note that the measurement of budgetary performance should be carried out not only for budget planning and control, but also for analyzing budgetary procedures at the time of their elaboration. They must also have a dynamic character in order to accompany the execution of the planned plan and make improvements for its correction.

However, it is common to verify the non-compliance with the plan foreseen in the construction companies' projects, hence the present study analyzes the factors that determine the unfavorable budgetary deviations in an environment of uncertainty conditioned by covid19.

Factors that Determine the Causes of Unfavorable Budgetary Deviations in Construction Companies' Projects

The volatility of the business context in which companies in the construction sector compete with their projects, triggers the need to identify the factors that determine the causes of unfavorable budgetary deviations motivated by covid19.

The manager is undoubtedly an essential element in identifying the causes of unfavorable budgetary deviations and proposing measures to correct them.

The capacity of managers is assumed to be an essential factor for achieving the objectives planned and foreseen in the budget (Flyvbjerg, Skamris Holm, & Buhl, 2004; Posner, 1986; Turner, 1993; Wateridge, 1997).

In this context Peters (1992) stressed that the lack of competence of many managers contributes to the deviations found in some activities. These deviations and conflicts may arise in several fundamental areas, such as in the organizational environment in the priority of activities to be developed, in administrative procedures, in the complexity of projects, in technical opinions, in short and long term financing, in human resources, in estimates of costs and times / delay, in the work schedule and in the conflict of personalities (Calisir & Gumussoy, 2005).

However, it appears that if managers are aware of the various alternatives they can use to avoid deviations, there will always be concrete ways to prevent these situations, which are often unknown (Thamhain & Wilemon, 1975).

For Flyvbjerg *et al.* (2004) the excesses of costs, which generally lead to unfavorable budgetary deviations, are caused by several factors, among them, the political aspects and the long duration in the implementation of the construction project.

In fact, the managers who frequently carry out the analysis of budget deviations, normally obtain accurate information about the performance of the budget, in order to enable control and ensure the level of activity of the company in accordance with its strategic plan, namely in what regarding the fulfillment of the objectives set (Drury, 2007). After analyzing budget deviations, managers collect relevant information, but they need to identify the factors that determine the causes of unfavorable budget deviations.

According Hirsch (2000), the causes that determine unfavorable budgetary deviations can be classified into several distinct groups:

- Absence of an organizational environment capable of developing team spirit;
- Resulting from data incorrectly entered in the budget (calculation errors);
- Use of excess credit;
- Changes in production costs (raw materials, wages, general production costs, etc.), changes in the project, poorly calculated standard prices, or changes in production processes;
- Inability to innovate;
- Interdependence of objectives, causing conflicts between them;
- Changes in the market structure where the company operates;
- Low efficiency and productivity resulting from inefficient communication.

Listed these causes, the determinants of unfavorable budgetary deviations can be classified into five categories (Mendes, 2019).

The Uncertainty of the Organizational Environment as Cause of Unfavorable Budget Deviations

1. Deviations due to uncertainty in the internal and external organizational environment;
2. Deviations due to the time factor (delays in achieving objectives);
3. Deviations due to failures in the process / monitoring;
4. Deviations due to changes / difficulties in obtaining financing.

Since these categories are conducive to unfavorable budgetary deviations in organizations in the construction sector, it is up to the manager to identify and analyze them, so that he can correct them and adapt them to the objectives set for the new context of the general and operating environment., which condition the organization (Horngren et al., 2010).

In the context of the general environment, the internal and external organizational environment is included. The operating environment presents the factors time / delay, processes / monitoring and financing. In the following section, each of the categories of the determinants of the unfavorable budgetary deviations mentioned above will be analyzed in more detail, with the main constructs / variables of the study being the main ones.

Internal and External Factor of the Uncertainty of the Organizational Environment as the Cause of Unfavorable Budgetary Deviations

Generally, the uncertainty of the organizational environment, conditions the internal and external factors of the organization. The uncertainty of the organizational environment is decisive in the behavior of managers, as well as in decision making (Duncan, 1972).

The organizational environment has become interesting in the field of scientific research, given its changes that understand the main causes of difficult management by objectives (Drucker, 2009).

The organizational environment is considered as the totality of physical and social factors that are directly recognized in the organization's decision making (Duncan, 1972).

The responsiveness of budgets in a dynamic environment is now questioned, as is shown in the study of Lorain (2010) concerning the dynamic organizational environment in Spanish companies. The same study revealed that more than 60% of respondents considered changes in the environment as a difficult factor in establishing the estimated budget. The author also points out that, with the cycle of economic crisis, and taking into account the current situation¹, the establishment of reliable financial forecasts comprises an enormous effort.

To understand the effort of forecasting the reliable budget and the causes of unfavorable budgetary deviations, it is essential to involve the constructs of the variables that define the internal and external factors of the uncertainty of the environment of that construction project (Mendes, 2019).

The factors of the internal environment that determine unfavorable budgetary deviations in construction companies are measured within the organization's limits, through team spirit, conflict between units, frequent changes in the management system and weak work team leadership (Duncan, 1972; Mao, Zhu, & Wang, 2013; Milliken, 1987; Worthington & Britton, 2009).

In the same line of thought, the external environment factor is measured, according to the measures that are outside the limits of the organization, namely weather conditions, changes in the market structure, unpredictable changes in social, political and cultural aspects in the environment where the company operates (Duncan, 1972; Hartmann, 2006; Mao et al., 2013; Worthington & Britton, 2009).

The Uncertainty of the Organizational Environment as Cause of Unfavorable Budget Deviations

However, it seeks to understand the causes of unfavorable budgetary deviations, through the internal and external environment of the organization and its relationship with the time / delay factor, the project complexity factor and the project financing factor of Portuguese construction companies.

Time / Delay Factor as a Cause of Unfavorable Budgetary Deviations

With the dynamics of the market, it is increasingly perceived the existence of factors that contribute to delays in construction companies' projects (Zidane & Andersen, 2018).

The time factor in carrying out the activities of a construction project is undoubtedly one of the factors that affects the cause of unfavorable budgetary deviations. The variable "time to complete a construction project", still has no precise solution, due to its enormous complexity and interdependence with other variables that cause unfavorable budgetary deviations (Couto, 2007).

Delays occur in most construction projects and the magnitude of these delays varies considerably from project to project (Zidane & Andersen, 2018). However, it is important to define the real time / delay factors that explain the time variable, to minimize, mitigate and avoid delays in any construction project.

The factors that determine delays are crucial within a construction project and it is relevant that all organizations have knowledge about this subject in order for the project to be completed within the established deadlines (Wong & Vimonsatit, 2012). These authors also point out that the delays cause unfavorable budgetary deviations, which may jeopardize the economic viability of the project.

However, it is important to define the metrics of the time / delay construct in order to enable its measurement through changes in projects, planning, non-compliance with contract details, material shortages, etc. (Arditi, Akan, & Gurdamar, 1985; Cantarelli, van Wee, Molin, & Flyvbjerg, 2012; Couto, 2007; Flyvbjerg et al., 2004; Kaming, Olomolaiye, Holt, & Harris, 1997).

It should be noted that, in addition to the organizational environment and the delay time, it is also important to examine another factor that causes unfavorable budgetary deviations in the construction companies' projects namely project processing / delay and the method of financing construction projects.

Process/Monitoring Factor as a Cause of Unfavorable Budgetary Deviations

Usually, all work performed in the organization is part of a process, that is, there is no recognized product or service in an organization exempt from a process. Likewise, it does not make sense to have an organizational process that does not offer a product or service (Graham & LeBaron, 1994).

Factors related to processes / monitoring may also have a significant effect on unfavorable budgetary deviations in Portuguese construction companies due to people's attitudes namely, incorrectly entering data into the budgeting process as covert and dishonest tactics (Collins, Holzmann, & Mendoza, 1996).

For Harrington (1991), processes are activities or sets of activities carried out by the organization, providing input of information or products in order to provide a specific output with added value.

According Fanning (1998), the budget process was conceived as a mechanism for controlling revenues and expenses, rather than a means to identify and monitor the factors that drive the organization's success. The author also points out that currently the budget process reflects not only revenue and expenditure control activities, but also allows problems to be identified, monitored and that the instructions for procedures are more coherent, specific and focused on the proper functioning of the activities of the companies.

It should be noted that, even presenting an excellent budget with a well-defined execution process, it may not produce the expected results, due to the countless circumstances that may arise and cause unfavorable budget deviations (Wijewardena & De Zoysa, 2001). It is in this perspective that budget execution processes must always be monitored.

The measurement of the budgetary process should be carried out through corrective measures on the factors that determine unfavorable budgetary deviations, in order to maximize the expected results during the budgetary execution process (Koontz & Weihrich, 1988).

However, it appears that the budget process, presumably, will have an adverse impact on the performance of the construction company's project if it is not managed effectively. In addition, the impact of the budget process on the construction company's project performance may vary from company to company, depending on the extent of the type of construction project.

Financing Factor as a Cause of Unfavorable Budgetary Deviations

With competitiveness, organizations seek in some way to find the best financing instruments for their construction projects. As is well known, there are currently several banking products that allow the financing of construction projects, even in the project preparation and approval phase (Chirkunova, Kireeva, Kornilova, & Pschenichnikova, 2016).

The banking sector and the securities market have sufficient financial assets that can be used to finance construction projects through various instruments, such as bank loans, bond loans, issue of new shares, among others. In the process of implementing any project, one of the main components of success is the correct choice of the financing instrument (Chirkunova et al., 2016).

According to Brealey et al. (2018) financing is the realization of a loan to creditors with the promise to pay the debt plus interest. The authors stressed that the financing can be made with the shareholders, in this case through the increase of the own capital.

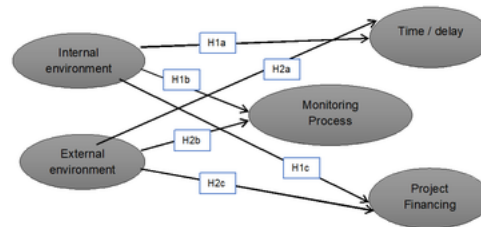
However, it is intended to present some financing indicators that provide the measurement of the causes that determine the unfavorable budgetary deviations, considering the ways used to obtain the financing, namely equity, interest rates, credits to suppliers, factoring loan, etc. (Brealey et al., 2018; Brigham & Ehrhardt, 2013; Chirkunova et al., 2016; Gitman, Juchau, & Flanagan, 2010; Hackethal & Schmidt, 2004). It should be noted that domestic financing has a huge cost advantage over external financing, with regard to the cost of capital. Next, the adopted study model will be presented.

RESEARCH METHODOLOGY

Conceptual Study Model

From the methodological point of view, the technique of exploratory and confirmatory factor analysis was used, in order to allow the researcher to explore the main dimensions to generate a theory or model, from a relatively large set of latent variables that are often represented by a set of items (Williams, Onsmann, & Brown, 2010). However, it is considered the analysis of the relationship of the uncertainty of the organizational environment motivated by covid19, with the determinants of the causes of the unfavorable budgetary deviations in the projects of Portuguese construction companies and then confirm the viability of the model proposed in figure 1.

Figure 1. Study model



The measurements of the constructs presented in the model were structured in studies previously carried out by several authors, namely (Mendes, 2019).

The main theoretical statements that relate these constructs to the causes of unfavorable budgetary deviations in the construction companies' projects are described in table 2.

In table 3 presents the study's hypotheses in order to facilitate a better understanding of the results previously determined.

Sample and Data Collection

For Zikmund, Babin, Carr & Griffin (2002), sample is a process that the researcher uses to select a certain number of population or target that allows drawing the conclusions of the investigation.

In the universe of 925 construction companies, 218 responses were obtained from the questionnaires applied. The data were collected through production directors, managers, financial directors and CEO / Administrators of Portuguese construction companies. The data were collected between June 2016 and December 2017, through production directors, managers, financial directors and CEO / Administrators of Portuguese construction companies. The scale used in the questionnaire is of the Likert type from 1 to 7 (I totally disagree and I absolutely agree). The questionnaires were mostly collected through the web platform "LimeSurvey". Next, an approach on the structural equation model adopted in this study is presented.

Structural Equation Model

Bearing in mind the need to confirm the study model and test the hypotheses, it was used the statistical technique through the Structural Equations Model (SEM), a methodological tool well known in the field of research. The SEM, also called Linear Structural Relationships (LISREL), is a multi-varied technique that establishes the relationships between variables, whether observed or latent, according to the objective of the study (Marôco, 2010).

For Hair et al. (2014), the SEM is a multi-varied technique that deals with dependency relationships with multiple variables, estimating a series of interrelated relationships simultaneously.

SEM seeks to establish the relationship between latent variables and observable constructs, using a combination of confirmatory factor analysis and path analysis. SEM can be understood through two components: 1) measurement model and 2) structural model (Sethi & King, 1994).

The Uncertainty of the Organizational Environment as Cause of Unfavorable Budget Deviations

Table 2. Causes of unfavorable budgetary deviations

Constructs/Variables	Cod.	Description
Internal Environmental Factor	FAI1	Lack of an organizational environment capable of developing team spirit
	FAI2	Frequent changes in the management system that condition the company's activity
	FAI3	Lack of leaders with the ability to lead work teams
	FAI4	Conflict between functional units in the organization of the work team
External Environmental Factor	FAE5	Weather conditions
	FAE6	Fluctuation in demand for services provided by construction companies
	FAE7	Changes in the market structure where the company operates
	FAE8	Change in the attitude of customers towards the company
	FAE9	Unpredictable changes in social, political and cultural aspects in the environment where the company operates
Time / Delay Factor	FT/A1	Non-compliance with the details of the service provision contract
	FT/A2	Shortage of necessary material
	FT/A3	Weak monitoring and control of materials on site
	FT/A4	Low efficiency and productivity as a result of inefficient communication
	FT/A5	Shortage of qualified labor
	FT/A6	Shortage of technical professionals in the organization and preparation of the work
	FT/A7	Strikes during the work
	FT/A8	Inadequate technical study during the tender phase
	FT/A9	Difficulty in communication between stakeholders
	FT/A10	Absenteeism
	FT/A11	Inexperience of the teams assigned to the work
Process Factor Business Monitoring	FPA1	Not having administrative processes based on information systems capable of monitoring and managing the budget
	FPA2	Lack of ability to develop processes leading to cost savings in the materials purchasing sector or with employees
	FPA3	Not being able to apply the knowledge that allows them to innovate the construction process
	FPA4	Inability to use databases, manuals, regulations, and other sources of knowledge, with a view to using best practices in the project execution process
	FPA5	There are no measures to make the work of its workers more flexible
	FPA6	Equipment failure during the project execution process
	FPA7	Lack of cooperation and communication between work teams in the project execution process
	FPA8	Insufficient and ambiguous security rules and regulations within the organization
Financing Factor	Medium and long term financing instruments	
	FFLP1	Retention of results or injection of fresh capital
	FFLP2	Using bank loans in the context of rising interest rates
	FFLP3	Have not used community incentives
	FFLP4	Misusing financial resources
	Short-term financing instruments	
	FFCP5	Have used excess bank financing
	FFCP6	Using excess supplier credits
	FFCP7	Overusing promissory notes
	FFCP8	Overusing letters discount
	FFCP9	Problems and delays with requested financing
	FFCP10	Lack of contract factoring
	FFCP11	Have resorted to financing to cover changes in material prices

The Uncertainty of the Organizational Environment as Cause of Unfavorable Budget Deviations

Table 3. Study hypotheses

H1a	The causes of unfavorable budgetary deviations due to the project's internal environment positively influence the time / delay factor;
H1b	The causes of unfavorable budgetary deviations due to the project's internal environment positively affect the project's process / monitoring factor;
H1c	The causes of unfavorable budgetary deviations due to the project's internal environment positively influence the financing of the project;
H2a	The causes of unfavorable budgetary deviations due to the external environment of the project positively affect the project's time / delay factor;
H2b	The causes of unfavorable budgetary deviations due to the external environment of the project positively influence the process / follow-up factor of the project;
H2c	The causes of unfavorable budgetary deviations due to the external environment of the project positively affect the financing of the project;

The measurement model seeks to assess the accuracy of the proposed measures, estimating the relationships between the latent variables and the respective indicators. However, the structural model presupposes the assessment of hypothetical relationships between latent variables, allowing to test the statistical hypotheses for the study.

In this context, it is intended to list some advantages of SEM:

- Enable the incorporation of measurement errors in the estimation of the model;
- Allow the simultaneous estimation of several interdependence relationships between variables;

Regarding the disadvantages, the following points could be indicated:

- Covariance and correlations are less stable when estimated in small samples;
- Models with a large number of indicators require larger samples.

For a better understanding of the analysis of the model, table 4 presents the references of some indexes of adjustment measures of the model.

ANALYSIS AND DISCUSSION OF RESULTS

The characterization of the sample in relation to the position that the respondent occupies in the company, shows that the response rate of the managers is around 28.4%, followed by the production director with 26.6%, the lowest value being related to the Financial Director which owns 12.4%. These results are shown in table 5.

The Uncertainty of the Organizational Environment as Cause of Unfavorable Budget Deviations

Table 4. Model fit measurement indices

Índex	Description	Reference values
Goodness-of-Fit Index (GFI)	$GFI = 1 - \frac{\text{tr}(\widehat{O}^{-1}S - 1)^2}{\text{tr}(\widehat{O}^{-1}S)^2}$	Values greater than 0.90 good adjustment (Hooper <i>et al.</i> , 2008; Schumacker e Lomax, 2010) Values greater than 0.95 very good adjustment (Shevlin & Miles, 1998)
Adjusted Goodness-of-Fit Index (AGFI)	$AGFI = 1 - \frac{K(K+1)}{2gl}(1 - GFI)$	Values greater than 0.90 good adjustment (Lomax & Schumacker, 2010)
Root Mean Square Error of Approximation (RMSEA)	$RMSEA = \sqrt{\frac{x^2 - gl}{gl(N-1)}}$	Values included between 0.05 and 0.08 (Schumacker e Lomax, 2010) Values less than 0.06 (Hu & Bentler, 1999) Values less than 0.07 (Steiger, 2007) P-value (PCLOSE) greater than 0.5 (Kline, 2011)
Normed Fit Index (NFI)	$NFI = 1 - \frac{x^2}{x^2_{null}}$ x^2_{null} representa o modelo básico ou nulo	Values greater than 0.90 good adjustment (Byrne, 2010; Lomax & Schumacker, 2010) Values greater than 0.95 very good adjustment (Hooper <i>et al.</i> , 2008)
Tucker-Lewis Index (TLI)	$TLI = \frac{\frac{x^2_{null}}{gl_{null}} - \frac{x^2}{gl}}{\frac{x^2_{null}}{gl_{null}} - 1}$	Values greater than 0.90 good adjustment (Schumacker e Lomax, 2010) Values greater than 0.95 very good adjustment (Hooper <i>et al.</i> , 2008; Hu e Bentler, 1999)
Comparative Fit Index (CFI)	$CFI = \frac{x^2 - gl}{x^2_{null} - gl_{null}}$	Value greater than 0.90 good adjustment (Byrne, 2010) Value greater than 0.95 very good adjustment (Hu e Bentler, 1999)
Parcimony Normed Fit Index (PNFI)	$PNFI = NFI - \frac{gl}{gl_{null}}$	Value greater than 0.6 good adjustment (Blunch, 2008).
Parcimony Goodness-of-Fit Index (PGFI)	$PGFI = GFI - \frac{gl}{gl_{null}}$	Value greater than 0.6 good adjustment (Blunch, 2008)

Table 5. Positions that respondent occupy in the company

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Manager	62	28,4	34,1	34,1
	CFO	27	12,4	14,8	48,9
	Production director	58	26,6	31,9	80,8
	CEO / Administrator	35	16,1	19,2	100,0
	Total	182	83,5	100,0	
Missing	They didn't answer	36	16,5		
Total		218	100,0		

To determine the adequacy of the exploratory factor analysis, we sought to assess the quality of the correlations between the variables using the Kaiser.Meyer.Olkin (KMO)² measurement and Bartlett's sphericity test as shown in Table 6.

However, the exploratory factor analysis used to assess the factor structure of the variables points to five factors "internal environment, external environment, time / delay, project process / monitoring and project financing" showing a good correlation between the same variables. The five factors explain 70.75% of the total variance above the lower acceptable limit 0,60 (Nakip, 2003).

The Kaiser.Meyer.Olkin test and Bartlett's sphericity test were considered significant with the significance levels of 0.924 and 0.000. It should be noted that the results presented in the Kaiser.Meyer.Olkin and Bartlett's sphericity tests show that both tests present data adequacy in order to allow the continuation of exploratory factor analysis (Hair et al., 2014). The five constructs were performed through exploratory factor analysis using the principal component method with varimax rotation as shown in table 6. Also, when checking Cronbach's alpha, it is noticed that the values are higher than 0.72, revealing that the constructs have a good internal consistency.

However, the main results of the confirmatory factor analysis are presented and discussed in the following section. In this context, we try to evaluate in figure 2 the quality of the relationship between observed variables and the respective constructs. In reference to table 6, it can be seen that the results of the first figure of the measurement model show a weak adjustment³ of the model to the sample data, as shown in the results of the adjustment quality indexes: $\chi^2 = 2128,925$; $gl = 692$; $p\text{-value} = 0,000$; $\chi^2/gl = 3,064$; $RMSA = 0,098$; $PCLOSE = 0,000$; $TLI = 0,786$; $CFI = 0,801$; $PCFI = 0,746$; $NFI = 0,732$.

Taking into account the results presented in table 2 and figure 2, it appears that the results of the analyses show the poor quality of the model's adjustment, so that it is essential to use the modification indices analysis and the standardized residues for enable improvement in data adjustment (Hair et al., 2014; Lomax & Schumacker, 2010).

In this context, the indicators FFLP1, FFCP6 and FFLP1 were selected and excluded because they presented the modification index between their error term of 90.636; 92,582 and 42,980 and the error term of the indicators FFLP2, FFCP7 and FFLP3.

It should be noted that the indicators FAI2, FPA1, FTA7, FTA4, FPA2, FFPLA, FTA5 and FTA5 were removed due to the high rates of change between their error term of 38.306; 31,915; 31,341; 26,787; 21,850; 26,909 and 25,355 with the error term of indicators FAI1, FPA2, FTA10, FTA3, FPA6, FTA6 and FFCP6. In the same line of analysis, the indicators FFCP5, FPA6, FTA9 and FPA5 were excluded due to the high rates of change between their error term of 25.017; 23,600 and 16,974 with the error term of the indications FFCP6, FPA3, FPA5 and FFCP9.

However, changes in the terms of correlated errors were avoided by excluding one of the indicators in each pair presented in the previous paragraph (Hair et al. 2014).

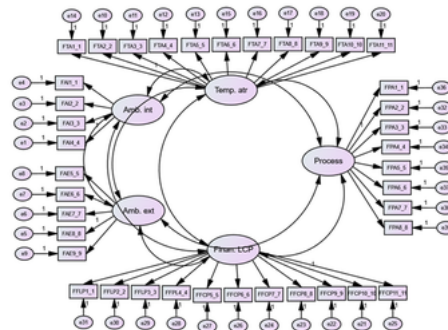
Regarding the re-specification of the initial model⁴ and although the statistical tests revealed the removal of the indicators with a high level of errors, it appears that in the 39 items presented in Table 2, only 25 items remain after adjusting the measurement model according to the Table 3, showing that it was more than half than those initially considered in Table 2. However, it was found that none of the factors remained unclassified, which means that each of them occurs, even though it may not be serious and, therefore, correctable, thus, the set of factors considered in the study was validated (Couto, 2007).

The Uncertainty of the Organizational Environment as Cause of Unfavorable Budget Deviations

Table 6. Result of exploratory factor analysis

Constructs/Variables	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
<i>Time / delay factor - (KaiserMeyer-Olkin KMO: 0,899 ; Cronbach α: 0,917)</i>					
FTA1_1	0,712				
FTA2_2	0,660				
FTA3_3	0,839				
FTA4_4	0,854				
FTA5_5	0,758				
FTA6_6	0,817				
FTA7_7	0,528				
FTA8_8	0,623				
FTA9_9	0,824				
FTA10_10	0,664				
FTA11_11	0,809				
<i>Financing factor - (KaiserMeyer-Olkin KMO: 0,924 ; Cronbach α: 0,956)</i>					
FFLP1_1		0,825			
FFLP2_2		0,830			
FFLP3_3		0,680			
FFPL4_4		0,812			
FFCP5_5		0,881			
FFCP6_6		0,887			
FFCP7_7		0,916			
FFCP8_8		0,890			
FFCP9_9		0,823			
FFCP10_10		0,803			
FFCP11_11		0,840			
<i>Process/Monitoring - (KaiserMeyer-Olkin KMO: 0,928 ; Cronbach α: 0,947)</i>					
FPA1_1			0,847		
FPA2_2			0,884		
FPA3_3			0,921		
FPA4_4			0,892		
FPA5_5			0,818		
FPA6_6			0,755		
FPA7_7			0,865		
FPA8_8			0,846		
<i>External environment factor - (KaiserMeyer-Olkin KMO: 0,753 ; Cronbach α: 0,733)</i>					
FAE5_5				0,549	
FAE6_6				0,795	
FAE7_7				0,825	
FAE8_8				0,571	
FAE9_9				0,728	
<i>Internal environment factor - (KaiserMeyer-Olkin KMO: 0,806 ; Cronbach α: 0,922)</i>					
FAI1_1					0,920
FAI2_2					0,867
FAI3_3					0,914
FAI4_4					0,901

Figure 2. Measurement model: Causes of unfavorable budgetary deviations



The adjustment of the current model has progressed a lot compared to the initial model, which can be proved through the results of the following indices: $\chi^2 = 539,241$; $gl = 265$; $p\text{-value} = 0,000$; $\chi^2/gl = 2,034$; $RMSA = 0,069$; $PCLOSE = 0,000$; $IFI = 0,927$; $TLI = 0,917$; $CFI = 0,927$; $PCFI = 0,818$; $NFI = 0,866$. With the results presented, the internal consistency of the model is verified. However, it follows the model adjusted in figure 3.

Therefore, it is essential to analyse the convergent validity of the model and the reliability of the constructs through the composite reliability (CR), the extracted average variance (AVE) and Cronbach's alpha (α) (Fornell & Larcker, 1981).

In this context, it appears that the results presented in table 7 in which it is verified that the Cronbach's alpha (α) indicates the reliability of the construct with values above 0.729. The composite reliability (CR) was represented with values greater than 0.876, confirming the internal consistency. Finally, the extracted average variance (AVE) appears with values above 0.500 recommending the appropriate convergent validity (Hair *et al.*, 2014).

Upon checking Table 7, it appears that the adjusted model does not present any discriminating validity problems, that is, the constructs presented in the study are different from each other and the AVE

Figure 3. Adjusted measurement model: Causes of unfavorable budgetary deviations

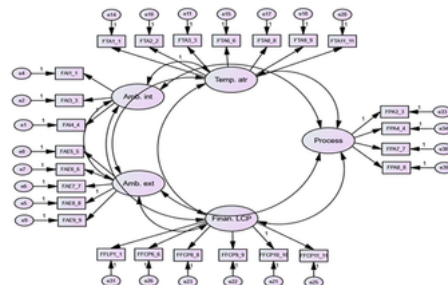


Table 7. Results of the confirmatory factor analysis of the adjusted measurement model

Constructs/Variables	Factor loading	α	CR	AVE
Internal environment factor		0,909	0,950	0,772
FAI4	0,891			
FAI3	0,897			
FAI1	0,846			
External environment factor		0,733	0,896	0,504
FAE8	0,509			
FAE7	0,768			
FAE5	0,419			
FAE6	0,717			
FAE9	0,631			
Time / delay factor		0,889	0,955	0,632
FTA1	0,693			
FTA3	0,833			
FTA2	0,605			
FTA8	0,56			
FTA6	0,764			
FTA9	0,808			
FTA11	0,792			
Process/Monitoring factor		0,921	0,956	0,745
FPA3	0,925			
FPA4	0,868			
FPA7	0,851			
FPA8	0,805			
Financing factor		0,930	0,961	0,694
FFCP6	0,850			
FFCP8	0,903			
FFCP9	0,827			
FFCP10	0,821			
FFCP11	0,869			
FFLP1	0,718			

is greater than the square of the correlation between the same constructs (Fornell & Larcker, 1981). However, the construct correlation matrix follows.

However, the validation of the measurement model followed for the structural model in order to allow the confirmation of the hypotheses through the tests performed, given the relationships of the constructs. Next, figure 4 follows to better understand the relationships of the constructs presented in the study.

According to the results presented in Table 9, as well as in Figure 4, it appears that of the 6 hypotheses tested, all of them are supported empirically with the study. However, the information found in the study

The Uncertainty of the Organizational Environment as Cause of Unfavorable Budget Deviations

reveals that the six constructs are the main causes that determine unfavorable budgetary deviations in the projects of Portuguese construction companies.

When considering the internal environment of the project as the cause of unfavorable budgetary deviations, it appears that they positively affect the time / delay factor, as well as the process / moni-

Table 8. Matrix of the correlations of the constructs

	Finan_LCP	Proc_Mon	Time_del	Enviro_Ext	Enviro_Int	α	CR	AVE
Finan_LCP	0,694					0,930	0,961	0,694
Proc_Mon	0,275	0,745				0,921	0,956	0,745
Time_delay	0,388	0,542	0,632			0,883	0,929	0,632
Enviro_Ext	0,132	0,070	0,226	0,504		0,733	0,826	0,504
Enviro_Int	0,255	0,587	0,624	0,068	0,771	0,909	0,950	0,771

Note: the diagonal values are the AVE. The values below the diagonal are the square of the correlations between the constructs.

Figure 4. Structural model: Causes of unfavorable budgetary deviations



Table 9. Result of the structural model

Hypotheses	Structural Relationship	Factor Loading	P	R ²	Result
H1a	Enveri_int $\Rightarrow$ Time_del	0,479	***	0,229	Corroborated
H1b	Enveri_int $\Rightarrow$ Process_monit	0,721	***	0,520	Corroborated
H1c	Enveri_int $\Rightarrow$ Finan_LCP	0,411	***	0,169	Corroborated
H2a	Enveri_ext $\Rightarrow$ Time_del	0,422	***	0,178	Corroborated
H2b	Enveri_ext $\Rightarrow$ Process_monit	0,245	0,022	0,060	Corroborated
H2c	Enveri_ext $\Rightarrow$ Finan_LCP	0,494	***	0,244	Corroborated

Note: *** p<0.001; ** p<0.01; * p<0.05; n.s. – not sig

toring factor of the project and the financing factor of the project, corroborating the hypotheses H1a, H1b and H1c. However, these hypotheses are corroborated with the hypotheses of the study by Mendes (2019); Zhao et al. (2019); Zidane & Andersen (2018); Okpala & Aniekwu (1988); who observed the slow / weak decision-making process; internal administrative procedures and bureaucracy in project organizations; scarcity of resources (human resources, machines, equipment); poor communication and coordination between the parties; design changes during construction; financial difficulties, etc., as the factors that enable the perception of the causes that determine the unfavorable budgetary deviations in the construction companies' projects in an environment of organizational uncertainty taking into account the pandemic of the covid19

For the external environment of the project, the causes of unfavorable budgetary deviations positively affect the time / delay factor as well as the project's process / monitoring factor and the project's financing factor, corroborating hypotheses H2a, H2b and H2c. These hypotheses were supported in the studies by Mendes (2019); Zhao et al. (2019); Zidane & Andersen (2018) who had pointed out the market conditions where the company operates, as factors that contributed to explain the causes of unfavorable budgetary deviations. The conclusions presented were confirmed in the study "Determinants of Budgetary Deviations and their impact on the performance of Portuguese construction companies" (Mendes, 2019).

When analyzing the current context of the covid pandemic19 and after analyzing the data collected before the pandemic, it appears that the market volatility and the uncertainties caused by the covid19 pandemic may affect the unfavorable budgetary deviations of the projects of Portuguese construction companies. However, it remains to be seen which are the most important uncertainty measures to explain these deviations.

In this line of thought, it appears that there are several measures of uncertainty to explain unfavorable budgetary deviations, namely the five constructs presented throughout the work. In order to explain economic development during and after the covid pandemic19, it appears that uncertainty measures will be useful, considering the capture of different aspects of economic uncertainty (Altig et al., 2020).

In agreement with the authors' statement, it appears that the results found in this work somehow make it possible to understand the different aspects of economic uncertainty, taking into account the relationship between the uncertainty of the organizational environment and the other constructs presented as causes of unfavorable budgetary deviations. in Portuguese construction companies.

Paraphrasing the previous statements, it is clear that the potential of this work consists of systematizing the measures presented throughout the work in order to enable an efficient and effective management of the construction companies' projects. However, the main measures and techniques for responding to unfavorable budgetary deviations and the stability of construction companies' projects must consist of implementing a set of measures that align their production practices (Abramov, 2020). It should be noted that, the weakness perceived during the work has to do with few works related to determinants of unfavorable budgetary deviations.

In the next section, the final considerations and conclusions will be made, also presenting the contributions and limitations of the study, as well as suggestions on future investigations.

FUTURE RESEARCH DIRECTIONS

The uncertainty of the organizational environment, particularly in this time of covid-19, clearly shows its negative impact on the world economy, which has repercussions on different levels of sensitivity and

The Uncertainty of the Organizational Environment as Cause of Unfavorable Budget Deviations

macroeconomic vulnerability of countries and microeconomic of global production and consumption chains (Senhoras, 2020).

It should be noted that the vast majority of countries have shown that they are not prepared for this type of health crisis, taking into account the slowdown in consumer production reflected in the world economy.

Today, it is also clear that the economic impact of this crisis varies according to sectors and companies and according to several factors, which include the possibility of adapting to supply chain disruptions and the implications and uncertainties generated and which influence efficient management and safe workplaces.

In view of this new general context, it appears that the construction companies, too, were not left out of these scenarios, particularly considering that it is a sector whose activity is based on the work of multidisciplinary teams that are necessary to produce direct relationship between the different players in the activity, from field operatives, to engineering professionals, and their presence in situ of these multidisciplinary teams whose activities, for the most part, are not compatible with teleworking or isolation, which implies the adoption of new approaches, work methodologies, etc. which consequently generate uncertainty and impact factors that have not yet been properly assessed.

This new reality thus highlights a set of challenges and uncertainties that will characterize the new organizational context and environment of companies in the construction industry, which are more than ever on the agenda, and will be decisive in the adaptation and recovery of this sector, namely with regard to the introduction of a reinforcement of technology in all aspects of the sector's activity, the commitment to training and qualifying the stakeholders, and a very significant effort to guarantee working conditions and safety and health.

For Junior & Santa Rita (2020), one of the lessons that can be learned from this covid19 pandemic crisis is the State's investment in assisting the population in general. However, it can be added that this task should not be imputed only to the State, but companies must also invest in the health and training of their employees.

That said, the realization of studies that aim to better understand the influence of the covid-19 pandemic on the activity and performance of construction companies will constitute important contributions for the sector and for the companies allowing to face in a more competitive and efficient way the new challenges and difficulties that are expected within a framework of high uncertainty regarding the organizational environment.

It should be noted that the factors presented in the present study are not the only ones that can affect the determinants of the causes of unfavorable budgetary deviations, such as the uncertainty of the organizational environment at the time of the covid-19 pandemic.

Thus, it appears that it is necessary to carry out future investigations to make the uncertainty and influence of the new organizational environment understandable considering the determinants of the causes of unfavorable budgetary deviations in the projects of Portuguese construction companies.

From another but broad perspective, a study on unfavorable budgetary deviations is suggested, focusing on the various health crises observed worldwide, making it possible to predict future causes and their impact on construction companies and the economy in general

CONCLUSION

This study sought to understand the relationship between the uncertainty of the organizational environment motivated by covid19, with determinants of the causes of unfavorable budgetary deviations in the projects of Portuguese construction companies.

However, there are several studies in the literature that have enabled the alignment of the objective, using theories about non-compliance with deadlines, financial uncontrolled, budget overruns in construction companies' projects, among others (Couto, 2007; Odeck, 2004; Remington, Zolin, & Turner, 2009; Shehu, Endut, & Akintoye, 2014; Sridarran, Keraminiyage, & Herszon, 2017).

Meanwhile, the management of surveys on the Web platform "LimeSurvey", obtained a sample of 218 observations. The analyses were performed using SPSS (Statistical Package for Social Sciences) software, version 25 and AMOS Graphics 25.

The results achieved in the study show the high correlations between the five first order constructs (internal environment, external environment, time / delay, project process / monitoring and project financing), justified by the literature review, justify the perception related to uncertainty of the organizational environment and other constructs as factors that determine the causes of unfavorable budgetary deviations in construction companies' projects (Couto, 2007; Horngren et al., 2010; Kaming et al., 1997; Odeck, 2004; Zhao et al., 2019; Zidane & Andersen, 2018).

It should be noted that these results corroborate the studies by Mendes (2019), which considered climatic conditions, changes in the market structure, changes in projects, the scarcity of materials, the existence of risks and uncertainties in the project, interdependence of project objectives, excess credit to suppliers, as the causes of unfavorable budgetary deviations.

The results found in the present study reveal and would contribute to the identification of the factors that determine the causes of unfavorable budgetary deviations, in order to provide the users of the budgetary system with an increased knowledge, allowing them to derive the greatest benefit and add value to the organization, seeking to implement corrections aimed at mitigating or eliminating possible unfavorable budgetary deviations.

The limitations of the study arise from the limits established for the analysis of the proposed theoretical model, taking into account the comparisons of the results with other studies that were not possible in this one.

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ENDNOTES

- * Zero-based budgeting, program budgeting, Beyond budgeting among others
- ¹ Refers to the covid19 pandemic
- ² It should be noted that the higher the KMO value, the better the result of the exploratory factor analysis.
- ³ Model adjustment presupposes assessing the potential of the theoretical model according to the correlations established between the observed variables (Marôco, 2010).
- ⁴ When the models do not have a good fit to the data, it is essential to gradually use the modification index “Modification Indices” in order to re-specify the model to improve the results, seeking to obtain consistency with the theory (Byrne, 2010; Marôco, 2010).

Section 3

Financial Institutions

Chapter 15

Economic Policy Uncertainty in Banking: A Literature Review

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ABSTRACT

This chapter is a survey of the most important research in the economic policy uncertainty literature. Economic policy uncertainty, although still under-researched relative to mainstream topics in economics and finance, has recently received increased scholarly attention. Through synthesizing common themes in the literature, the chapter highlights the progress made so far and suggests some avenues for future research that allow future researchers to position their research and differentiate themselves from other studies in the literature. The chapter finds that economic policy uncertainty affects banks through a reduction in credit supply and loan re-pricing. High economic policy uncertainty compels bank managers to discretionary distortion of bank financial reporting in ways that help them to mitigate the depressing effect of economic policy uncertainty on banks' financial statements.

INTRODUCTION

The purpose of this chapter is to review the existing literature on economic policy uncertainty (EPU) and synthesize the insights it provides. I begin by defining the term “economic policy uncertainty”. After this, I present a summary of what we know in the literature, then I discuss how it relates to banking. I end the chapter with a summary of what we do not know about economic policy uncertainty. Hopefully, this will help to set the agenda for future research. The articles selected for this concise review were chosen after applying a high research quality threshold which allows us to focus only on the relevant, recent and high-quality research articles in the literature.

Economic policy uncertainty is defined as uncertainty regarding economic policies such monetary policy, fiscal policy, and regulatory policies, and it derives mainly from whether existing policies will change in the future (Baker et al. 2016; Danisman et al., 2021). EPU describes the unknown impact of

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new policies on the economy and the private sector (Ng et al. 2020). On the other hand, policy uncertainty is defined as uncertainty about government policies. Economic policy uncertainty is a hot topic in the finance literature, even though ‘policy uncertainty’ is not a new topic. Economic policy uncertainty has been discussed in the past few decades. For example, Hassett and Metcalf (1999) examine the effect of uncertain tax policy on investment decisions and find that uncertain tax policies that follow a jump process have detrimental effects on investments. Hermes and Lensink (2001) show that policy uncertainty, measured by the uncertainty of budget deficits, tax payments, government consumption and inflation rate, leads to higher capital flight. Chen and Funke (2003) analyse the impact of policy uncertainty on foreign direct investment strategies, and show that political uncertainty is detrimental to foreign direct investment decisions. These studies suggest that policy uncertainty has detrimental economic consequences.

Economic policy uncertainty derives from whether existing economic policy will change in the future or what impact a newly introduced economic policy will have on the private sector. Precisely, economic policy uncertainty refers to uncertainty regarding fiscal, monetary, or regulatory policy. One important aspect of economic policy uncertainty is economic policy uncertainty. Understanding the implication of economic policy uncertainty for the financial and economic system is important because it can give an idea of how uncertainty about government’s economic policies affect firms, households, and individuals. The major sources of economic policy uncertainty, according to Baker et al (2016), are: (i) newspaper-based reports on the economy, (ii) tax code expirations, (iii) disagreement over CPI forecasts, and (iv) disagreement over government purchases forecasts. Many recent studies have used these sources as reliable indicators of economic policy uncertainty (see., Bhagat and Obreja, 2013; Brogaard and Detzel, 2015; Gulen and Ion, 2016; Kim and Kung, 2017; Nguyen and Phan, 2017). Other sources of economic policy uncertainty, which are less commonly used in the literature, are increased political polarization, change in governments following elections, budget deficits, trade wars, etc.

Few studies conduct a survey on economic policy uncertainty. For example, Hassett and Sullivan (2016), in their survey, show that new empirical measures of uncertainty have emerged which allows economists to assess the impact of uncertainty in various aspects of the economy. Also, Castelnovo et al. (2017), in a survey, show the interaction between uncertainty and financial frictions. Al-Thaqeb and Algharabali (2019) conduct a review of studies that use the economic policy uncertainty index (EPU) of Baker et al (2016) as a key factor in measuring uncertainty. They also reviewed the impact of EPU on financial markets, macro and micro level, stock markets, corporate behavior, and risk management. But the study did not focus on banks. Dai and Zhang (2019) conduct a survey on the impact of political uncertainty on financial markets from the perspective of asset prices, corporate policies, households and the economy. Taken together, these review studies did not focus on the banking sector. The current study is different from prior review studies in that it focuses on EPU in the banking sector. This study reviews the literature that examine the impact of EPU on the banking sector and offer some suggestions for future research.

Also, this study contributes to the recent literature on economic policy uncertainty. Economic policy uncertainty is an increasingly common macroeconomic phenomenon, and earlier studies have focused more on its economic implications while recent studies examine how economic policy uncertainty affects corporate decisions (e.g. Baker et al., 2014; Baker et al, 2016; Kim and Kung, 2017, Nguyen and Phan, 2017). This chapter complements the recent literature by providing a concise review of the recent literature in order to set the agenda for future research. A review of the recent literature has not emerged in the recent literature with particular focus on economic policy uncertainty in banking. To the best of my knowledge, this chapter is the first to review the recent literature on economic policy uncertainty.

The rest of the chapter is organized as follows. In Section 2, literature review is presented, namely it is discussed the theory, EPU measurement, the effect of economic policy uncertainty on firms, the effect of economic policy uncertainty on the financial sector, and the effect of economic policy uncertainty on banks. Section 3 summarizes the effect of EPU on the economic and financial system. Section 4 is devoted to identifying what we do not know in the literature and other research gaps. This section also identifies possible areas for future research. Section 5 concludes.

WHAT WE KNOW IN THE LITERATURE

Theory

The theoretical literature on uncertainty dates back to four decades ago. For instance, Bernanke (1983) points out that high uncertainty gives firms an incentive to delay investment and hiring when investment projects are costly to undo, or workers are costly to hire and fire. But when uncertainty reduces, firms increase hiring and investment to meet demand. Bernanke (1983) studied the optimal timing of real investment under the assumptions that investment is irreversible and that new information about returns arrives over time. He argues that investment should be undertaken only when the costs of deferring the investment project exceed the expected value of information gained by waiting, and that uncertainty diminishes the current rate of investment.

Eaton and Rosen (1980) examine the structure of an optimal linear income tax when workers are uncertain about their wages at the time they choose their labor supplies. They show that, given imperfect information about wages, lump-sum taxation is not efficient because a wage tax reduces the riskiness of wage income while some combination of a lump-sum tax and a wage tax will minimize the excess tax burden. Pindyck (1980) examines the effects of two sources of uncertainty on the behavior of exhaustible resource markets. They examine two dimensions of uncertainty: the uncertainty over the future demand for the resource, and uncertainty over the reserve base that will ultimately be available for exploitation. They focus on the implication of these uncertainties for market-price evolution, the optimality of the competitive market, and for the role and value of exploration. They argue that these uncertainties are likely to be present in most exhaustible resource markets because of the inherent long-run dynamics involved in resource production. They show that demand uncertainty has no effect on the expected dynamics of market price while reserve uncertainty shifts the expected rate of change of price only if extraction costs are nonlinear in reserves. More recently, Baker et al (2014) argue that economic policy uncertainty is caused by growth in government spending, increases in taxation, increased regulation, and political polarization.

Chichilnisky (1996) show that economic agents, such as traders, take optimal positions with respect to the uncertainty induced by their own actions and that this self-induced uncertainty can be hedged while uncertainty induced by economic changes such as unknown level of output cannot be hedged fully by traders. Starks and Sun (2016) formulated a theory which suggests that the ability of economic agents to respond to uncertainty is not constant in different policy environments. They analyze the case of mutual fund managers, and predict that the fund manager's skill is unlikely to be constant over different policy environments. They argue that, when market learning weakens during periods of higher uncertainty, managers would be less inclined to signal their ability because of the lower marginal effect their actions have on future compensation in uncertain times.

Measuring EPU

Economic policy uncertainty is commonly measured using an aggregate index developed by Baker, Bloom, and Davis (2016). The index also known as the BBD index, is considered to be a reliable measure of the overall level of economic policy uncertainty present in the economy. The BBD index is derived as a weighted average of three components. The first component is news-related reports on economic policy uncertainty. Baker, Bloom, and Davis (2016) quantifies the volume of news about policy-related uncertainty, every month starting in January 1985 to December 2020. This is done using a search of the archives of ten large newspapers, and counting the number of articles containing at least one of the terms ‘uncertainty’ or ‘uncertain’, at least one of the terms ‘economic’ or ‘economy’, and at least one of the terms ‘congress’, ‘legislation’, ‘white house’, ‘regulation’, ‘federal reserve’, or ‘deficit’. The number of policy uncertainty articles is then normalized by the total number of articles in that newspaper. These ten series are then normalized to unit standard deviation and summed within each month. The resulting index is then scaled to have an average value of 100 from 1985 to 2009 (Baker, Bloom, and Davis, 2016; Gulen and Ion, 2016). The second component measures the level of uncertainty related to future changes in the tax code. This component is estimated by the discounted value of the revenue effects of all tax provisions set to expire in the following ten years using data from the Congressional Budget Office on the tax provisions set to expire in the near future. The third and final component captures forecast disagreement about future monetary and fiscal policies. The forecast data is derived from the Survey of Professional Forecasters provided by the Federal Reserve Board of Philadelphia which is commonly used to obtain forecasts of consumer price index, and purchases of goods and services by all levels of governments. The forecast disagreement index is usually obtained by taking the average of the interquartile ranges of these two forecasts. To obtain the overall measure of economic policy uncertainty, each of the three components is first normalized and then a weighted average of the resulting series is calculated using a weight of one-half for the news-based component, one-sixth for the tax component, and one-third for the forecaster disagreement component (Baker et al., 2016; Gulen and Ion, 2016).

Effect of EPU on Firms

Wang et al (2014) examine how economic policy uncertainty influences the level of corporate investment for Chinese listed companies. They show that, when economic policy uncertainty is higher, firms lower their investment. Also, firms that have higher return on invested capital use more internal finance to mitigate the negative effect of economic policy uncertainty on corporate investment. Demir and Ersan (2017) examine the effect of economic policy uncertainty on cash holding decisions of firms in BRIC countries. Using firm-level data from 2006 to 2015, they find that firms prefer to hold more cash when uncertainty increases. Also, economic policy uncertainty has a significant positive impact on corporate cash holdings. Dang et al. (2019) examine the effect of how economic policy uncertainty on corporate tax burden, and find that economic policy uncertainty is positively related to corporate tax burden, and the effect is stronger when the tax quotas are higher. They also find that economic policy uncertainty strengthens tax collection by increasing government fiscal pressure, and thereby increasing the corporate tax burden.

Dash et al (2019) examine the causality and co-movement between economic policy uncertainties and stock market liquidity using monthly data from G7 countries. They find a positive relationship between economic policy uncertainty and stock market illiquidity, and a negative relationship between

economic policy uncertainty and stock market liquidity. In times of crises, the relationship between economic policy uncertainty and illiquidity is stronger, and illiquidity leads to economic policy uncertainty. Nagar et al (2019) find that high government policy uncertainty is associated with increased bid-ask spreads and decreased stock price reactions to earnings surprises. They also show that managers respond to government policy uncertainty by increasing their voluntary disclosures, but these disclosures only partly mitigate the bid-ask spread increase. Chen et al (2019) examine the impact of economic policy uncertainty on firm-level capital investment. They show that firms decrease short-term, long-term, and total firm investments when faced with higher economic policy uncertainty.

Khan et al. (2019) investigate the effects of firm-specific, market-based, CAPM-based, and economic policy uncertainty on the relationship between leverage and investment for state-owned enterprises and non-state-owned enterprises. They analyze Chinese listed firms from 1999 to 2016, and find that leverage has a significant and adverse impact on non-state-owned enterprises investment behavior. They also find that economic policy uncertainty and CAPM-based uncertainty reduces the association between leverage and investment for state-owned enterprises and non-state-owned enterprises. Chang et al (2019) examine the relationship between CEO-Chairman duality and firm performance, and find that CEO duality benefits a firm when economic policy uncertainty is high, which suggest that CEO-Chairman duality is a beneficial governance mechanism for coping with economic policy uncertainty. Wang et al (2019) use a news-based index of economic policy uncertainty, and find that economic policy uncertainty is positively associated with credit default swap spreads, and negatively associated with the number of liquidity providers in the credit default swap market. The findings suggest that investors find it more costly and difficult to buy credit protection when economic policy uncertainty is high.

Su et al. (2020) investigate the relationship between economic policy uncertainty and corporate precautionary cash holdings in firms. They find a U-shaped relationship between economic policy uncertainty and precautionary cash holdings in firms. Duong et al (2020) find that U.S. corporations increase their cash holdings in times of high economic policy uncertainty. The increase in cash holdings is more pronounced for financially constrained firms or firms with larger exposure to economic policy uncertainty. Also, holding more cash in the presence of increasing economic policy uncertainty helps firms to alleviate the negative impact of economic policy uncertainty on capital investment and firm innovation. Schwarz and Dalmácio (2020) investigate the relationship between economic policy uncertainty and corporate leverage for firms in Brazil, and find that the leverage ratio of Brazilian firms increases when economic policy uncertainty increases. Yao et al (2020) examine the impact of economic policy uncertainty on non-executive employees from the perspective of pay-performance sensitivity. They find that better-performing firms pay higher wages, which they adjust during uncertain times. Xu (2020) examines the cost-of-capital transmission channel through which government economic policy uncertainty may affect corporate innovation activities. They find that government economic policy uncertainty increases the cost of capital of firms, which in turn translates into lower innovation activities. Also, firms with more exposure to higher government economic policy uncertainty face a higher weighted average cost of capital and tend to reduce the level of investment further.

Iqbal et al. (2020) examine the relationship between economic policy uncertainty and firm performance of listed non-financial firms in the United States. They find that economic policy uncertainty has a strong negative effect on the return on assets, return on equity, net profit margin and Tobin's Q of firms. Jory et al. (2020) investigate the effect of government economic policy uncertainty on trade credit and its value implication for U.S. public firms. They find that firms reduce their receivables period, and face shorter payables period from suppliers during times of high economic policy uncertainty. The

tightening of trade credit during periods of high economic policy uncertainty increases shareholder value only to a certain point beyond which it is value-destroying because high reduction of trade credit can lead to losing customers to competitors. Liu and Zhang (2020) show that economic policy uncertainty significantly impedes real investment and reduces net debt issuance for private firms while economic policy uncertainty has no significant impact on firms' cash-holding decisions.

He et al. (2020) examine the effects of economic policy uncertainty on corporate innovation in China from 2017 to 2000. They find that in the low economic policy uncertainty period before 2008, economic policy uncertainty induced more innovation activity, but it decreased corporate innovation in the higher economic policy uncertainty period after 2008. Borghesi and Chang (2020) find that firms in high intangible-intensity industries and those engaging in R&D suffer the most from restrictive governance policies when economic instability is high. Frye and Pham (2020) examine whether economic policy uncertainty affects the decision of the Board to remove and replace the chief executive officer (CEO) of the firm. They argue that performance assessment may be more difficult when uncertainty is high. The Board of directors may find it difficult to appraise the performance of the CEO in times of high economic policy uncertainty as the CEO is likely to attribute his/her poor performance to the rising uncertainty in the business environment. In their analysis, the authors find that high economic policy uncertainty reduces the likelihood of forced CEO turnover. The results suggest that boards take into account macroeconomic pressures, such as economic policy uncertainty, when making personnel firing decisions.

D'Mello and Toscano (2020) examine the impact of economic policy uncertainty on trade credit. They find a decline in accounts payable, receivable, and net credit during periods of high economic policy uncertainty, and that firms react quickly to changes in economic policy uncertainty. Their findings suggest that uncertainty about monetary and fiscal policies, taxes, and regulations are the major drivers of trade credit changes. El Ghouli et al. (2020) examine how economic policy uncertainty affects accounting quality using data from 19 countries from 1990 to 2015. They find that accounting quality increases during periods of high economic policy uncertainty. The positive relationship between economic policy uncertainty and accounting quality is more pronounced for government-dependent firms and firms with higher political risk. Farooq et al (2020) investigate the impact of political uncertainty on the decision of private firms to use external auditors to verify their financial statements. The findings show that firms with high exposure to political uncertainty are more likely to use external auditors to verify their financial statements.

Effect of EPU on the Financial Sector

Economic policy uncertainty affects the economy through its effect on economic output (Bloom et al, 2007), investment (Bloom et al., 2007; Kang et al., 2014; Drobetz et al., 2018) and level of employment (Caggiano et al., 2017; Fontaine et al., 2018). Economic policy uncertainty also affects corporate decisions such as asset prices (Pastor and Veronesi, 2013; Brogaard and Detzel, 2015), corporate investment decisions (Julio and Yook, 2012; Gulen and Ion, 2016), higher costs of external financing (e.g. Pastor and Veronesi, 2012; Gilchrist et al, 2014), and initial public offering (IPO) activities (Colak et al., 2017)

Bloom et al (2007) show that higher uncertainty increases real option values which makes firms more cautious when investing or disinvesting. Julio and Yook (2012) find that political uncertainty is an important channel through which the political process affects real economic outcomes. Pástor and Veronesi (2013) find that political uncertainty commands a risk premium whose magnitude is larger in weaker economic conditions, and reduces the implicit protection that the government provides to the

market. Gulen and Ion (2016) investigate how corporate capital investment at the firm and industry level is affected by the uncertainty related to future policy and regulatory outcomes. They find that policy-related uncertainty is negatively related to firm and industry level investment, and the economic magnitude of the effect is substantial.

Kang et al. (2014) examine the effect of economic policy uncertainty and its components on firm-level investment, and find that economic policy uncertainty in interaction with firm-level uncertainty depresses firms' investment decisions. They observe that when firms are uncertain about costs of doing business due to possible changes in regulation, cost of health care and taxes, they become more cautious with investment plans. This behavior is more pronounced for firms with higher firm-level uncertainty and during a recession. Caggiano et al (2017) examine the effects of high economic policy uncertainty on unemployment in recessions and expansions. They find that the relationship between economic policy uncertainty and unemployment is stronger in recessions. Drobetz et al (2018) examine the effect of economic policy uncertainty on the relationship between investment and the cost of capital. They find that the negative relationship between investment and cost of capital decreases in times of high economic policy uncertainty. They conclude that economic policy uncertainty distorts the relationship between investment and the cost of capital. Ozili (2021) shows that economic policy uncertainty is correlated among countries and regions.

The literature has examined economic policy uncertainty in single country contexts (Zhang et al., 2015; Arouri et al., 2016; Bordo et al., 2016; Caggiano et al., 2017; Kang et al., 2014), and in multi-country contexts (Colombo, 2013; Dakhlaoui and Aloui, 2016; Bernal et al., 2016; Demir and Ersan, 2017). Also, the most common method of analysis used in the literature is the time-series techniques.

Effect on the Banking System

Most studies have been done on the effects of economic policy uncertainty on financial systems, particularly on the banking system (Hammoudeh and McAleer, 2015; Chi and Li, 2017; Hu and Gong, 2018; Lee et al., 2017). Bank credit supply and loan pricing are the main transmission channels through which economic policy uncertainty affects the banking system (Claus, 2011; Ciccarelli et al., 2015; Wulandari, 2012).

Economic policy uncertainty affects the loan portfolio of banks. Banks will often respond to high economic policy uncertainty by changing interest rates and reducing the amount of loan given to borrowers, which leads to a reduction in credit supply (Bordo et al., 2016). Bordo et al. (2016) examine the impact of economic policy uncertainty on aggregate bank credit growth. They find that economic policy uncertainty has a significant negative effect on bank credit growth. Chi and Li (2017) examine the effect of economic policy uncertainty on banks' credit risks and lending decisions using data for Chinese commercial banks from 2000 to 2014. They find a positive relationship between economic policy uncertainty and non-performing loan ratios, loan concentrations and the normal loan migration rate. Danisman et al. (2020a) explores the impact of economic policy uncertainty on credit growth, and finds that uncertainty in economic policies hampers the credit growth of European banks, and the negative impact of economic policy uncertainty on credit growth is more pronounced in civil law countries, increases with debt maturity, and weakens for banks with a larger number of employees and branches. Hu and Gong (2019) find that economic policy uncertainty significantly hinders the growth of bank credit but the effect varies across banks. The negative effect of economic policy uncertainty on loan growth is greater for larger banks and riskier banks, and weaker for more liquid banks and more diversi-

fied banks. Nguyen et al (2020) examine the influences of economic policy uncertainty at domestic and global levels on aggregate bank credit growth. They find that higher level of economic policy uncertainty has negative impact on bank credit growth, and the positive change in economic policy uncertainty has favorable effects on bank credit growth.

Economic policy uncertainty also affects banks' financial performance through lower profitability arising from low demand and low supply of credit in periods of high uncertainty. Killins et al. (2019) explores the impact of financial regulation policy uncertainty (FRPU) on bank profit and risk using data of 4760 US banks from Q1 2000 to Q4 2016. They find that FRPU negatively affects the profit for small and large banks. Saffar et al. (2019) investigate whether firm-level political uncertainty affects firms' bank loan contracting. They find that firms facing higher firm-level political uncertainty are charged higher bank loan costs. Tran (2020) examines whether economic policy uncertainty affects bank dividend policy using a large sample of US bank holding companies from 2000 to 2015. They find that higher economic policy uncertainty leads to a decrease in bank dividend payouts and stock repurchases, and large banks seem to experience the largest impacts. Also, they find that the majority of the explanatory power of the overall economic policy uncertainty is derived from its government spending economic policy uncertainty. Berger et al (2020) show that bank liquidity hoarding is an important channel through which economic policy uncertainty hurts the real economy. They show that, in response to economic policy uncertainty, banks hoard liquidity.

Economic policy uncertainty also affects banks' managerial discretion in financial reporting (Stein and Wang, 2016; Yung et al., 2019; Ng et al., 2020). In uncertain times, managers have incentives to alter financial (or accounting) numbers in the financial accounting process in order to achieve a desired financial reporting outcome particularly earnings and capital outcomes, in uncertain times (Ng et al., 2020). Yung and Root (2019) argues that economic policy uncertainty influences the financial and investment decisions of the firm, and they find evidence that economic policy uncertainty is positively associated with earnings management which implies that firms will increase (decrease) earnings management when economic policy uncertainty is high (low). Jin et al. (2019) investigates whether economic policy uncertainty is systematically related to bank earnings opacity. They argue that when economic policy is uncertain, it is easier for bank managers to distort financial information, increases the fluctuation in banks' earnings and cash flows, which provides some incentives and opportunities for bank managers to engage in earnings management. Using a sample of U.S. banks and an index for economic policy uncertainty developed by Baker et al. (2016), they find that high economic policy uncertainty leads to greater earnings management. Danisman et al. (2020b) examines the effect of economic policy uncertainty on loan loss provisions using data of 6384 US banks from 2009 to 2019. They find that in times of higher economic policy uncertainty, banks increase their loan loss provisioning. They use provisions for income smoothing rather than capital management during high economic policy uncertainty. Ng et al. (2020) examine how banks accrue for loan losses in response to economic policy uncertainty and the implications of these accruals in terms of actual loan losses and future liquidity creation. They show that banks recognize more loan losses in anticipation of high economic policy uncertainty, and the association is more pronounced for banks with a riskier loan portfolio and that have a history of lower loan loss reserves.

Table 1 summarizes the effects of EPU on the economic and financial system related in literature.

Table 1. Effects of high economic policy uncertainty

Transmission channel	Consequence	Evidence
Cost of equity	(i) high risk premium	Pástor and Veronesi (2013), Brogaard and Detzel (2015), Pham (2019)
Stock markets	(i) high economic policy uncertainty leads to higher risk premium, and (ii) increase in transaction cost	Pástor and Veronesi (2013), Gungoraydinoglu et al. (2017), Dakhlaoui and Aloui (2016), Xiong et al. (2018)
Bond spreads	(i) High economic policy uncertainty leads to decline in bond spreads	Qi et al. (2010)
Cost of external financing	(i) high economic policy uncertainty leads to higher borrowing costs	Bradley et al. (2016), Gilchrist et al. (2014), Pastor and Veronesi (2012), Pastor and Veronesi (2013)
Bank loan contracting	(i) high economic policy uncertainty leads to increase in interest rates, (ii) it imposes additional costs on loan contracts, and (iii) unfavourable changes in terms of loan contract	Ashraf and Shen (2019), Francis et al. (2014), Bordo et al. (2016), Chi and Li (2017), Gissler et al. (2016), Hu and Gong (2018), Lee et al. (2017)
Level of investment	(i) High economic policy uncertainty has a negative shock on investment, (ii) it reduces investment activity	Bloom et al. (2007), Drobetz et al. (2018), Kang et al. (2014), Bloom et al. (2007), Drobetz et al. (2018), Kang et al. (2014), Gulen and Ion (2016)
Employment	(i) high economic policy uncertainty leads to increase in unemployment levels	Caggiano et al. (2017), Fontaine et al. (2018)
Economic output	(i) high economic policy uncertainty lowers GDP growth	Bloom (2009), Colombo (2013), Bloom et al. (2012), Baker and Bloom (2013)
The banking system	(i) high economic policy uncertainty negatively hurts the banking system through increased NPL, reduced loan supply, worsen bank performance	Bordo et al. (2016), Chi and Li (2017), Lee et al. (2017), Hammoudeh and McAleer (2015), Hu and Gong (2018), Lee et al. (2017), Gissler et al. (2016)
Credit default swap spread	(i) credit default swap spread is significantly responsive to economic policy uncertainty shocks	Wisniewski and Lambe (2015)
Monetary policy	(i) high economic policy uncertainty reduces the effects of monetary policy on economic activities	Aastveit et al. (2017)
Financial services	(i) high economic policy uncertainty reduces demand for financial services	Junttila and Vataja (2018)

WHAT WE DO NOT KNOW: AREAS FOR FUTURE RESEARCH

Effect of Economic Policy Uncertainty and Political Polarization on Institutional Monitoring

The effect of economic policy uncertainty on institutional quality has not been explored in existing studies. It is possible that political polarization in uncertain times can create an environment that weakens the effectiveness of strong institutions. In politically uncertain times, strong institutions may lower their monitoring of firm behavior, and may be reluctant to discipline rule-breaking politically connected firms in times of high uncertainty to avoid attracting the anger of politicians and to avoid direct political interference in the institution's ability to operate. Future research can investigate the effect of economic policy uncertainty on institutional quality.

Do Politically-Connected Firms Perform Better Under High Economic Policy Uncertainty?

This is another question that has not been answered in the recent literature. It is possible that politically connected firms enjoy preferential treatment by government-owned enterprises, low taxation, preferential treatment in competition for government contracts, relaxed regulatory oversight, or stricter regulatory oversight of its rivals (Faccio, 2006), and these benefits can make politically connected firms outperform their peers and competitors in times of high economic policy uncertainty. Future research should investigate the performance of politically connected firms in times of high economic policy uncertainty to determine whether they perform better than rival firms or firms that are not politically connected.

Effect of High Economic Policy Uncertainty on Financial Inclusion and Exclusion

The literature suggests that financial institutions, particularly banks, will reduce the supply of financial services to firms and individuals through a reduction in loan supply and by charging high interest rates in times of high economic policy uncertainty as shown in section 2. Moreover, it is possible that households and poor individuals, who cannot find cheap loans in the formal sector when they want it, will exit the formal financial system in search for alternative financial services in the informal sector even though it comes at a high cost to them. It is worth exploring whether high economic policy uncertainty leads to greater financial exclusion or reduces financial inclusion.

Economic Policy Uncertainty in Low and High Concentrated Markets

The literature has not explored how firms in high and low concentrated markets respond to high economic policy uncertainty, and the role of market power in influencing firm behaviour. It is possible that firms with high market power and in concentrated markets are able to better withstand the effects of high economic policy uncertainty due to their market share advantage, and such firms will have incentives to delay their reaction to high economic policy uncertainty in the business environment compared to firms in less concentrated markets who are more likely to respond very quickly to high economic policy uncertainty in the business environment.

Further Research on the Effect of Each Economic Policy Uncertainty Indicator in the BDD Index

Many existing studies use the aggregate economic policy uncertainty index to test the effect of economic policy uncertainty on firm behavior and performance. Only few studies test the effect of each economic policy uncertainty component on the firm behavior and performance. Additional research is needed to explore the effect of the separate economic policy uncertainty components on firms' behaviour and performance. Each separate component of economic policy uncertainty may have a different effect on firms' behavior and performance.

Alternative Economic policy Uncertainty Indicators Other than the BDD Index

Finally, there is need to develop alternative indicators of economic policy uncertainty – particularly indicators that are not influenced or affected by political actions or political polarization.

CONCLUSION

This chapter has reviewed the emerging literature on economic policy uncertainty, with a focus on the interaction between economic policy uncertainty, corporate decisions and banking. In the process, the chapter offered several areas for future research that can set the agenda for economic policy uncertainty research in the coming years. The chapter has two limitations, One, the chapter focuses exclusively on economic policy uncertainty in relation to banking, firms' corporate decisions and the economy, and as such, may not cover other areas outside this focus. Another limitation is the application of a research quality threshold which led to deliberately neglecting other works that might have provided additional insights. However, such omissions would not have altered our findings and avenues for future research.

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KEY TERMS AND DEFINITIONS

Bank Lending: The process whereby banks issue loans to borrowers.

Banks: Financial institutions that give loans to borrowers and accept deposit from depositors.

Credit Supply: The provision of credit to borrowers.

Economic Policy: A policy that influence the level of economic variables.

Economic Policy Uncertainty (EPU) Index: An indicator of economic policy uncertainty.

Firm Performance: A measure of how well or poorly a firm performed over a period of time.

Policy Uncertainty: The uncertainty about what future policies might be.

Chapter 16

The Short-Term Effects of the Pandemic (COVID-19) on Banks With Activity in Portugal: Particularly With Regard to Capital Buffer

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ABSTRACT

In this chapter, the authors assess the short-term effects of the pandemic (COVID-19) on banks with activity in Portugal. Namely, with regard capital buffer, it is intended to describe, in a succinct way, the measures taken by Portugal government to minimize the crisis effects. On the other hand, researchers divided the factors that can influence bank capital buffer in several groups, namely management efficiency, credit quality, and profitability. The panel dataset is composed of report annual data of 18 banks operating in Portugal, representing about 98% of the Portuguese banking product. The dependent variable is the capital buffer (BUF). The results show that credit quality (ICV), management efficiency (CTIN), and profitability (ROA and ROE) have a significant impact on bank capital buffer. Banks that have good credit quality indicators (ICV), management efficiency (CTIN), capital adequacy, and capital buffer (BUFF) will be better prepared to face the pandemic that is just taking its first steps.

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INTRODUCTION

From the eighties onwards, there was a progressive opening of economies and markets internationalization, that represented the first steps of the phenomenon that today we call globalization. Globalization has had repercussions on every country's financial system. The lack of harmonization in regulatory and supervisory activities between countries led to the recognition that their convergence was important. Only in this way would be possible to optimize the functioning and confidence between banks based in different states.

Thus, the effort of some countries¹ to improve and harmonize the activities of regulation and supervision of banking activity culminated, in 1988, in the First Basel Accord (Basel I). Although concluded only by a limited number of countries, this Agreement had the merit of introducing transformations with international effects.

In practical terms, Basel I aimed at increasing supervisory activities. Its goal was to safeguard the solvency of financial institutions, their survival and confidence in the entire system. In this sense, a minimum indicator of 8% was established to cover credit risk, which was the most important in the financial intermediary activity.

In the following years, the growth of markets and financial operations forced the need to rethink the initial Agreement, to continue to ensure transparency and security throughout the system. In 1996, the First Accord was reformulated, also considering market risk (and not just credit risk). However, these new requirements were not enough for the increasingly complex reality of the global banking sector.

As a result of the progressive inadequacy of the first Accord, the Second (Basel II) emerges while continuing to maintain the value of 8% for the minimum solvency indicator and introducing changes in its calculation formula. In this context, in addition to credit and market risk, the new Accord also considers operational risk. Basel II was implemented in the European Union in 2006 and 2007 through Directives 2006/48/EC and 2006/49/EC, structures banking regulation in three pillars².

Basel III introduced a more rigorous definition of regulatory capital (minimum capital requirements) and, for the first-time, requirements of liquidity risk were defined. On the other hand, they introduced capital buffer requirements to reinforce the solvency of institutions and more effectively promote the internationalization of the financial system.

Portugal followed the evolution of the III Basel Accords. But are our banks prepared to face the pandemic that is affecting the entire world? That is the main purpose of this chapter. How are we facing this pandemic and what will be the consequences in the coming years?

Even if the bank is meeting all the requirements of the Basel Accords, the recent pandemic will have an impact that cannot yet be confirmed. One of the implicit factors is the duration and intensity of the restrictions imposed in Portugal. As it is common knowledge, both companies and families are exposed to the crisis. In many cases most employment contracts are temporary. On the other hand, companies are small and medium-sized. The measures imposed by the government may have positive impacts on the present and negative impacts quite soon in the future. The level of uncertainty is very clear. There are several aspects, still unknown, that may cause more adverse epidemiological situations in the near future, which may imply more persistent collapses in banking activity. With this chapter, it is essential to contribute to a small clarification of most of these constraints.

MEASURES TAKEN BY PORTUGAL (COVID 19)

The world almost stopped in the year 2020. At the beginning of the new year, a pandemic crisis (Covid-19), which originated in China, startled the world and redefined life. The pandemic forced Portugal to take extreme measures, which went from an imposed lockdown measures to a major suspension of economic activity, as never seen before.

In the last few months, the criteria for loans to companies and families have been stricter and it is expected that in the future there will be more restrictions again.

The criteria and conditions that banks currently apply are conditioned by:

- Deterioration of general economic prospects;
- Increase in credit risk;
- Less risk tolerance.

These levels of restrictions are still significantly below that observed during the 2008 financial crisis. The criteria resulted in an increase in spreads applied to higher risk loans, maturity, guarantees and amounts.

Banco de Portugal (BP) assumes a fundamental role in financial stability, in collaboration with other national and international entities. It is responsible for identifying, preventing, and mitigating sources of systemic risk. In other words, it is responsible to control risks that can cause disturbances in the supply of financial services, affecting the flow of loans to companies and families. BP supervises, regulates, and reviews, providing a greater capacity to absorb potential losses, such as the constitution of additional Capital Buffer, ensuring the wealth and financial strength of each bank.

To minimize any mistakes that have occurred in the past, together with other entities, BP has adopted measures to reinforce the resilience of the financial sector to crises, such as that one of 2008. One of these measures was the introduction of criteria for assessing the resources of borrowers against credit obligations, contributing to the promotion of sustainable financing.

The Covid-19 pandemic has created an environment of great uncertainty related to the magnitude and the extent of the crisis, as well as the cutback in the level of confidence in companies and families, interfering in investments and consumers decisions, which will affect the economic growth.

The current crisis is not financial. However, the sector will suffer repercussions related to the cutback of economic activity. In Portugal, banks are better prepared to respond to the challenges caused by the pandemic, due to the measures taken in previous years. The recovery of economic activity will depend on the effectiveness of the measures that are being adopted by the various entities, with the following steps standing out:

- Ensure that banks continue to finance the economy and can absorb potential losses in the future;
- Provide large-scale liquidity to the banking system at very low-interest rates, promoting the functioning and financing of the economy;
- Prevent the banking system from failing so as to ensure the necessary credit supply in order to let the economy functioning as expected;
- Flexibility in the performance of capital and liquidity reserves;
- Moratorium regime, implemented by the Government, applicable to a set of credit, which aims to suspend for a period (March 31, 2021) the payment of capital and interest;

- The APB (Portuguese Banking Association) Moratorium, the agreement between banks that apply the moratorium regime. Extra time on credits not covered by the legal moratorium;
- Credit lines provided by the Government to help companies that had an activity loss due to the pandemic.

Short Term Impacts on The Main Banks

Banks operating in Portugal were not unaware of this pandemic. Before the pandemic, some banks already struggled with difficulties in the development of their activity. The BPN bank was the first to be nationalized, in November 2008. Another bank striving, but not rescued by the Portuguese Government, was BPP which led to its bankruptcy in 2010. Many other Portuguese banks suffered huge losses in their profits and wealth and some of them had to be rescued by the Portuguese Government (CGD, BCP, BPI and BANIF). Together with the help of the Government, all private banks that were intervened had to reinforce their capital with private funds. BES was the only exception. The bank did not require the assistance of the Portuguese Government, however, leaned to private investors to increase Capital Buffer.

After the year 2019, with the four largest Portuguese banks - CGD, SANTANDER, BCP and BPI - closing their accounts with positive results, it was expected that the trend of positive results would continue in 2020.

However, banking and the world were affected by the pandemic crisis. A catastrophic year of 2020 was therefore expected at all levels, including the financial level. The 1st quarter of 2020 was the most affected by the recession in economic activity in Portugal and in the world. Despite the negative outlook for 2020, the third quarter reports show a different reality.

It was the first quarter of 2020 that endured the greatest impact in economic terms. Due to the current pandemic crisis and the forecast of its effects, banks made a safeguard reinforcement of their impairments and provisions, which negatively impacted net results. CGD saw its net profit fall by 29% compared to the same period in 2019. This reduction was influenced by the constitution of impairments in the amount of 220 million euros. However, CGD posted a net result of € 392 million.

It should be noted that CGD is in its last year of its Strategic Plan. The current economic crisis has made it difficult to achieve the goal set. After years of negative results, in 2016 it signed a Strategic Plan for the 2017-2020 triennium, with the purpose of returning to positive results and improving the quality of assets.

The credit to deposits ratio reached 68.6% at the end of the 3rd quarter of 2020, showing a 7.4% reduction compared to the same period in 2019. This reduction reflects a significant increase in customer deposits, which grew by 5.3 billion euros. However, around 9% was driven by an increase in the savings rate. On the other hand, credit to families decreased, despite the continued high demand. Customers intend to take advantage of the continued low in EURIBOR. Credit to companies grew by 3.4%, an indicator that reflects the support measures provided by the government and CGD.

The financial margin decreased by 9.0% compared to the 3rd quarter of 2019. This reflects the historically low levels of interest rates. The ECB has already announced that it will continue with the monetary policy of low-interest rates, so there is no prospect of the bank being able to increase its financial margin. The profitability and efficiency ratios remain positive, despite still not reaching the bank's Strategic Plan. At the end of the third quarter of 2020, the bank had an ROE of 6.6%, 4.2 p.p. lesser than in 2019.

On the other hand, there is an improvement in solvency and liquidity ratios. The bank placed its TIER 1 at 18.4%. The LCR (Liquidity Coverage Ratio) ratio of 382%, higher than the current regulatory

requirement for liquidity coverage (100%). This ratio is extremely important, especially in the current situation that the country and the whole world is going through. In fact, the liquidity buffer allows the institution to survive for 30 days in a stress scenario.

Banco Santander ended 2019 with a net profit of € 527.3 million. An auspicious 2020 year was expected. By the end of the first quarter of 2020, the main world economies and Banco Santander watched its results decline. At the end of the third quarter, Santander posted a net profit of 254.5 m €, a decrease of 34.8% compared to the same period the previous year.

The bank maintains its robust liquidity and solvency indicators and has one of the best ratings in the sector. The TIER 1 ratio stands at 23.8%. Despite the decrease, it continues to maintain good profitability and efficiency ratios, with an ROE of 8.0%.

Like CGD, Banco Santander saw its financial margin decrease by 7.9% to € 591.9 million, reflecting the fall in short-term interest rates; the decline in spreads; and the decrease in demand for credit lines to companies outside government lines. Total credit to customers increased by 6.4% since the end of 2019, driven by the increase in credit to companies within government lines. On the other hand, customer deposits increased by 3.9%, resulting in a transformation ratio of 114.7% (increased by 1.4 p.p.). Net commissions increased by 5.4% over the previous two quarters, driven by the increase in card commissions, due to the recovery in private consumption. Cards used in online commerce had an average monthly growth of 156%. The bank continues with its policy of maximizing the liquidity Buffer, which is, in the third-quarter results, at 14.4 thousand m €. Its LCR ratio is 122%.

Millennium BCP also saw its net result affected by the pandemic. In September 2020, the net result was a total of 146.3 m €, 45.9% lesser than in September 2019. In Portugal, the net result amounted to 91.9 m € and in international activity 54.4 m €, both values were lower than the values of the same period in the previous year. The constitution of impairments for credit risks resulting from the pandemic caused by COVID-19 had a negative impact on the result.

Although the net result was below expectations, the bank had high levels of liquidity, well above the regulated requirements. The LCR liquidity ratio is 243%, increased over the same period and is above the regulated minimum, 100%. ROE decreased to around half of the value obtained in the same period of 2019, currently standing at 3.4%. Despite the reduction, it remains at positive values. The financial margin remained almost untouched at 1,149.6 m €, largely influenced by the positive contribution of international activity, which absorbed the smallest contribution from activity in Portugal. The transformation ratio has decreased, currently at 83.5%. This ratio was influenced by the weak growth in credit to customers, compared to the growth in customer deposits, 3.4% vs 5.8%. Credit quality declined compared to the same period in 2019, the NPE³ ratio is currently at 6.5%. The solvency and liquidity ratios did not change significantly, with Tier 1 remaining at 13.5%.

Despite all expectations, the pandemic did not negatively affect the results of Banco BPI. In fact, BPI records a good 3rd quarter in the year 2020, based on strong commercial activity, with strengthened capital and liquidity indicators, maintaining high credit quality. BPI registered 100 M € of net loan impairments in the first nine months of 2020. Broadly speaking the bank presents a good performance of a commercial activity (customer deposits increased 2,271 M.€; loan portfolio increased 5.4%, mortgage production grew 37% and corporate loan production up 13%)⁴. On the other hand, it should be referred an NPE ratio of 1.9%. NPE coverage increased to 138%, including impairments and collaterals. Strengthened capital ratios, namely Tier 1 of 13.9%.

Impact of the Measures Taken on the Recent Future

It should be noted that short-term measures have a positive impact on economic activity. However, at the company level, government-guaranteed credits result in increased indebtedness and financial vulnerability. In the COVID 19 protocol lines, which cover all economic sectors, the economic and financial viability of companies is assessed, with some access conditions. Only companies with a positive net income will be able to access it.

Another measure that the Government and APB implemented was the legal moratoriums. This measure helped many Portuguese in economic difficulties due to the pandemic. However, it is necessary to assess the impact it will have in the future, as these measures have a timeline. It should be noted that delay credits do not default. This is not yet being considered in the results of banks.

Until September 2020, banks did not reinforce impairments regarding loans in default. However, this situation will change soon. More demanding risk credit assessments will apply. There is great uncertainty about the future. The effectiveness of these measures is questioned. Private consumption has not decreased, will spending on superfluous things increase? Are the families saving the amount of the credit payment, now postponed? Did the companies finance themselves to face the decrease in sales, or do they invest in another investment?

As previously mentioned, the uncertainty of the development of the pandemic, families and companies may not have the resources to meet their obligations. The results show that those who joined the legal moratorium regime, are individuals who are applying the savings for private consumption. By postponing the payment of credits, they will also be more exposed to interest rate risk. Euribor is nowadays negative. If Euribor goes up, the amounts of the credit instalment will increase, resulting in a disaster in the finances of families and companies. Are the banks prepared for this? In the next point, we intend to answer this question.

DETERMINANTS FACTORS OF CAPITAL BUFFER AND A LESSON FOR THE NEXT YEARS

So, the main purpose of the present point is to analyse the determinants of Portuguese Banks' capital buffer. The panel dataset is composed of report annual data on management quality, credit quality and profitability variables of 18 banks operating in Portugal, from the year 2015 to 2018.

Essential Literature to Framework this Research

The banking sector is specialized in risk-taking and can only survive if they make adequate risk management. A proper risk assessment is a key aspect of a bank solvability. So, is natural the Portuguese authority's concern oversight on this issue and the efforts developed to align our system with international best practices, considering the Basel Accords I, II and III.

The performance of the banking sector affects a country's economy and occupies a prominent place in the concerns of depositors, investors, analysts, managers, regulators, and governmental institutions. In fact, a decrease in the level of confidence in any of these entities may result in an unexpected bank run, causing a banking crisis with effects increasingly extended. Diamond and Rajan (2005) show in this research that bank failures can be contagious. A well-functioning and well-developing banking system

play a crucial role in promoting the growth of the economy. Kunt et al. (2012) contributes to a better understanding of the dynamic relationships among economic development, financial institutions, and securities markets.

The supervising authority tries to make an effective control over the levels of financial system solvability, to ensure that it achieves the minimum stipulated in terms of the relationship between capital buffer and risk-weighted assets. Alessandro et al. (2015) provides empirical evidence that supervisory culture influences the stability of banks. Their results have important implications, and it is the first paper to provide empirical evidence of heterogeneity in the supervision styles in Europe and its effect on banking stability. Also, Fernández (2016) concludes that banking stability helps reduce economic volatility more in countries with less bank market competition. It's important to control the recessions and endogeneity of banking stability.

So, is important to establish reglementary rules for the evaluation and accurate determination of the level of internal capital, the underlying risk profile of each institution. Consequently, banks with higher failure rates have a higher level of internal capital. It is in this context that, at the beginning of the eighties, regulation appeared for the first time to define minimum levels for the relationship between capital and bank assets, examples of which are the cases of the United Kingdom and the United States (Jackson et al., 1999). The Portuguese banking system provides an interesting setting to analyse this issue. The international dimension of the Portuguese banking system is relevant in two dimensions. First, domestic banks have important activities abroad, thus being exposed to foreign regulation through their branches and subsidiaries abroad. Second, foreign banks have a meaningful presence in the Portuguese banking system. Recent consolidation developments within the Banking Union suggest that this existence may be reinforced soon. Furthermore, Portugal is part of the European Monetary Union, thus not having a domestically targeted monetary policy (Bonfim, & Costa, 2017).

In the line with the mentioned above, the legislation in Portugal was based on the standards defined by the Basel Committee on Banking Supervision, namely, Basel I, Basel II and Basel III Accords. So, in 1988, a document was signed by ten countries⁵, which became known as the First Basel Accord (Basel I), in which, rules were established to improve the security and ensure the stability of the banking system, in the context of international competition, regarding credit risk.

Basel II was implemented in the European Union in 2006 and 2007 through Directives 2006/48/EC and 2006/49/EC, structures banking regulation in three pillars.

Basel III introduced a stricter definition of regulatory capital (own funds), defined for the first-time unified liquidity requirements at an international level, by means of two new metrics – one short-term (liquidity coverage ratio) and the other medium-term (net stable funding ratio). On the other hand, introduced capital buffer requirements, both of a structural and countercyclical nature, to strengthen the resilience of institutions and promote the internationalization, reducing the impact of possible costs for the financial system.

Despite numerous refinements and revisions over the last two decades, the weights applied to asset categories seem to have failed to fully reflect banks' portfolio risk causing an increase in systemic risk (Acharya & Richardson, 2009; Hellwig, 2010; Vallascas & Hagendorff, 2013; Behn et al., 2016). To confront this problem the new regulatory framework of Basel III has introduced a minimum leverage ratio, defined as a bank's Tier 1 capital over an exposure measure, which is independent of risk assessment (Ingves, 2014).

Concerns about solvability focus on the so-called “own funds” of a banking institution, which are made up of three components: basic own funds, Including the first quality components – Tier I, comple-

mentary own funds, and supplementary own funds.⁶ The idea underlying the prudent regulation of banks is to ensure that banks have sufficient capital so that the risk of insolvency is minimal. This concern is due, according to Hellmann et al. (2000), Repullo and Suarez (2004) and Vanhooose (2017), to the potential negative externalities that arise from bank insolvency situations. The basic concept underlying financial theory is that risk and expected return move together, which is to say, in an efficient market you can only expect more return if you take more risk. On the other hand, leverage, however, can mask the relationship between risk and return, for banks, which typically hold only a relatively small portion of capital relative to assets. As a matter of fact, banks have historically operated with low levels of capital regarding assets (Admati et al., 2013).

Literature Review – Capital Buffer

Bank capital is the part of the funds that are contributed by the owners or shareholders, as opposed to other external sources of funding which include deposits and obligations. The supervising authority tries to make an effective control over the levels of financial system solvability, to ensure that it achieves the minimum stipulated in terms of the relationship between capital buffer and risk-weighted assets. Alessandro et al. (2015), provided empirical evidence that supervisory culture influences the stability of banks. The literature on the determinants of European banks' capital buffers includes, among others researchers, Stolz and Wedow (2005) for German banks, Ayuso et al. (2002a) and Ayuso et al. (2002b) for Spanish banks and Lindquist (2003) for Norwegian banks. A dynamic model was estimated in the first three papers, whereas Lindquist (2003) does not explicitly model for the persistence of the capital buffer, i.e., for adjustment costs in banks' level of capital. Boucinha (2017), investigated which factors determine Portuguese banks' capital buffers, through the estimation of a dynamic panel data model. The dataset used for estimation covered 17 Portuguese banks. The level of banks' capital buffers was found to be positively influenced by several broad risk measures, indicating that banks tend to hold extra capital to cover for increased risk. Loan loss provisions and stable profitability were found to be substitutes for capital buffers. The level of banks' capital buffers was found to be positively influenced by several broad risk measures, indicating that banks tend to hold extra capital in order to cover for increased risk. On the other hand, concluded that high and stable profits and more conservative provisioning policies were found to be imperfect substitutes for higher capital. Pires (2013) sought to assess the adequacy of the solvency indicator for several Portuguese banks, adopting for this purpose methodologies already used in different geographical or conceptual contexts, such as those previously mentioned, but which are adapted to the defined research strategy, namely, canonical correlations and Component Factorial Analysis. The following variables were used to measure the solvability ratio: return on equity, return on assets, credit quality, the relationship between personnel expenses and banking product, cost income and, finally, liquidity. Solvability was assessed using Tier 1 and the solvability ratio. The estimated model suggests that the variables, credit quality, significantly influence the bank's solvability, as they represent the variables with the greatest explanatory power. This result makes it evident that banks with a higher default rate must hold higher own funds to achieve the minimum solvability ratio. Leal (2002) analysed the size, solvency, and efficiency of the Portuguese banking sector, for 1998, using the Principal Component Factorial Analysis. Ten variables were selected for the investigation, namely, asset value, credit quality, banking product, net income, number of branches, number of employees, bank solvability, return on assets, return on equity and business margin. With the multivariate statistical technique, three factors were obtained – bank size, solvability, and management efficiency – and explained around 84,19% of

the total data variance. These three factors also explained the dynamics of the Portuguese bank sector in the reported year. Analysing the structure of factor scores it was possible to compare and obtain the position of the 52 banks studied.

Atici and Gursoy (2013), studied the Determinants of Capital Buffer in the Turkish Banking System. They used the panel data of 87 banks covering the period 1988 -2009. The data was based on the reports published by the Banks Association of Turkey. The study was focused on economic GDP growth, bank size, return on equity and non-performing loans, as the determinants of the capital buffer. They found a significant negative relationship between capital buffer and bank size suggesting that the larger the bank the lower it was capital ratio. The relation between variable ROE and the capital buffer was minor for commercial banks. The relation of capital buffer and credit quality was found significantly negative, indicating that the higher the banks risk preferences, the lower the capital buffers they hold. Similarly, Prasetyantoko and Soedarmono (2010), analysed several factors that may determine the capital buffer of Indonesian banks. Using monthly data of 99 commercial banks during the period 2004 -2007, they highlighted that excess capital can be explained by the bank's specific, business cycle, regulatory and institutional variables. The dependent variable was Tier 1, the independent variables were, namely, credit risk, bank size, ROA, ROE and GDP Growth. They denoted that bank size has a negative relationship with Capital Buffer. Credit risk was negatively related to Capital Buffer and ROE was positively linked to the bank's capital buffer. In the same country, Runtu et al. (2015), researched the factors that influence 61 Indonesian commercial banks capital adequacy ratio. The result showed that operating expense to operating income and total asset had a positive and significant influence on solvability ratio – Tier 1. Interest margin showed a positive relationship with Tier 1, so this variable was found to be statistically significant. Finally, the research evidenced that a high level of capital increase cash reserves that can be used to extend credit and high solvability level. In line, solvability level opened greater opportunities for the banks to improve their profitability. Zhang and Jiang (2018) showed that the pressure of higher capital requirements was associated with a higher level of risk. The issue of banks' risk-taking was also affected by their size: large banks seem to be more stable than their smaller counterparts. This paper measured the impact of capital regulation on Chinese bank profit value and risk-taking and offered some support for the implementation of Basel III in China.

Haque (2018), investigated how ownership structure and bank regulations individually and interactively influenced the risk-taking behaviour of a bank. The empirical framework was based on a dynamic two-step system generalised method of moments (GMM) estimation technique to analyse an unbalanced panel dataset covering 144 conventional banks from 12 Middle East and North Africa (MENA) countries. Results suggested that foreign shareholding has an inverse relationship with bank risk-taking. In addition, official supervisory power was found to have a positive association with bank risk and this relationship was reinforced for banks with higher ownership concentration. In addition, capital stringency increased bank risk.

Danisman and Demirel (2019), used a sample of 6.936 banks in 25 developed countries between 2007 and 2015. Their paper explored the impact of market power and bank regulatory variables, such as capital stringency, restrictions in activities and the power of supervisory agencies, on bank stability. Capital requirements were the strongest regulatory tool for decreasing bank risk, so banks with more market power had a lesser bank risk.

Data and Methodology

In this chapter, the authors assess the main determinants of banks' capital buffer in Portugal over the period 2015-2018. The capital buffer (BUF) is defined as the ratio between excess capital and the regulatory minimum (dependent variable). The independent variable is the cost-income ratio (ctin), defined as administrative expenses, over total gross revenues; Liquidity Ratio (RAL); The loan loss Impairment over overdue loans (icv); return on assets (ROA); return on equity (ROE); Bank Size (LOGAT) or logarithm of total assets Bank; Financial Margin (MF) and Banking Product (PB). In this study, we use the general linear models' approach to explain the capital buffer.

We use panel data of 18 Banks for the years 2015 to 2018. The panel dataset is composed of annual data retrieved from the Banks' Annual Reports, on management efficiency, credit quality, Liquidity ratio and profitability. This period of time was chosen, because it represents the first years after the main impact of the crisis of the sovereign debt, and it turns possible to study the results consequence of the big effort of measures to increase the financial strength of Portuguese banks.

The sample of 18 banks includes *BPI, CATV, BCP, CGD, SICAM, CAL, STD, MTP, NB, BIC, BIG, CTT, BAI, FNT, CTL, BKT, DB, BEST* and it represents about 98% of the Portuguese banking industry. The sample consists of a public bank and seventeen private banks.

RESULTS AND DISCUSSION

The results presented in the next Table show that the model used is considered appropriate, given the results of the F statistic, which is significant at a 5% level. The R-squared is 55.5%, meaning that 55.5% of the variance of BUF is explained by the set of independent variables used.

Table 1. Results of the model

Y = BUF	B	Error	t	Sig.
ROA_t	-1,174	,401	-2,930	,005
ROE_t	-,216	,083	2,616	,011
ICV_t	,024	,012	1,930	,008
RAL	-2,129	,865	-2,460	,194
CTIN_t	,061	,046	1,314	,017
LOGAT_t	-1,485	2,815	-,528	,600
MF	-25,961	3,324	-7,811	,420
PB	20,168	4,313	4,676	,800
R ² R – Squared 55.50%				

Source: Own elaboration based on SPSS 24 results

Particularly relevant appear the variables ROA, ROE (Profitability Ratios), ICV (Credit Quality) and CTIN (Management Quality), statistically significant at a 5% level. The variable ICV (Credit Quality) shows that Banks with a higher default rate are forced to present more capital requirements (Capital Buf-

fer). Simultaneously, higher default also involves the establishment of greater provisions (impairment), which implies a reduction of the bank net income. This result is in line with Boucinha (2017), Pires (2013) and Atici and Gursoy (2013). However, this result does not confirm the study of Prasetyantoko and Soedarmono (2010).

The variable CTIN (Management efficiency) is defined as the operating costs over total gross revenues. This ratio measures bank operating efficiency and shows a positive impact on banks' Capital Buffer. The higher the bank's administrative costs, the greater the Capital Buffer they have. The result is similar to the one found by Runtu et al. (2015).

The variables ROE and ROA are statistically significant and show a negative impact on banks' Capital Buffer. The higher the bank's profitability, the lower the Capital Buffer they need. This result is in line with, for example, Boucinha (2017), and against the results of Prasetyantoko and Soedarmono (2010).

The variable RAL measures the relationship between liquid assets and total assets, exhibiting a negative but low impact on banks' Capital Buffer. The existence of liquidity reduces the likelihood of presenting a better Capital Buffer. Finally, the analysis of the results shows that the variable LOGAT is not statistically relevant. The banks' size has a negative but not statistically significant impact on banks' Capital Buffer.

In conclusion, the constitution of impairments is essential to bank survival. For this purpose, the existence of a robust Capital Buffer can make all the difference. The banks are subject to risk and, simultaneously, high administrative expenses. So, they cannot ignore good levels of capital requirements or Capital Buffer. So, a good Capital Buffer could be one important factor that will make the banks better prepared to face the increased risk related with the pandemic crisis.

CONCLUSION

Regarding the domestic reality, the rules established by the Three Basel Agreements have been subject to gradual transposition. The Portuguese supervisory activity is guided by the same internationally practised principles, namely regarding the minimum solvability indicator. In this context, although the geographical dimension of Portugal is small, the country is wide in the diversity of banking institutions. This diversity (different business areas) has implications for the solvability of each one of these institutions. The levels of risk to which they are subject, hence the need for a capital buffer to be adequate to the level of risk that each institution faces.

Even if our bank is meeting all the requirements of the Basel Accords, the recent pandemic will have an impact that cannot be determined yet. One of the implicit factors is the length and intensity of the restrictions imposed in Portugal. As it is common knowledge, both companies and families are exposed to the crisis. In many cases, most employment contracts are temporary, and on the other hand, companies are small and medium-sized. The measures imposed by the government may have positive impacts on the present and negative impacts in the near future. The level of uncertainty is very obvious.

With the research implemented, it was possible to conclude that there is great incertitude about the future. Originally, the government measures helped families and companies to better control their finances. However, they may result in an indebtedness increase and on the other hand, in the bank financial vulnerability. Everything suggests that the bank will soon reinforce impairments regarding loans in default.

After analysing the four largest Portuguese banks, we can understand that the biggest impact of the pandemic occurred in the 1st quarter of the year 2020, when the economy was shut down, while in the 3rd quarter, there was an improvement in bank indicators.

Despite the decrease in net results obtained at the end of the 3rd quarter, some ratios have improved. Loans to companies have greatly increased due to the legal and private moratoriums granted to companies. Also, loans to households have increased, as customers intend to take advantage of low-interest rates.

Banks maintain positive solvency and liquidity ratios, with the LCR ratio being above the minimum regulated value, which allows them to maintain a comfortable position to face the current situation. Nevertheless, some problems may arise in the coming years.

The results show that those who joined the legal moratorium regime, are the families, which are applying their savings for private consumption. Together with the delay in credit payments, the families will also be more exposed to interest rate risk. Euribor remains on negative grounds. As Euribor goes up, the amounts of the credit instalment will increase, resulting in a disaster in families' and companies' finances. Is the bank prepared for this?

Higher requirements on credit risk will have to be imposed. The banking sector must be prepared for an unpredictable future. A good capital Buffer could be the success factor that will make the bank better prepared to face the increased risk, especially credit risk.

From the literature review and the study carried out, it is evident that the robust Capital Buffer may come to influence the bank's existence. In fact, a bank with good capital requirements to face risks (credit, market, operational and liquidity) will be better prepared to face the near future.

If at present, the pandemic has not affected banks negatively, as explained in the previous points, soon, only well-prepared banks with good Capital Buffer will be able to face the risks taken on a daily basis. Banks that possess good credit quality indicators (ICV); Management efficiency (CTIN) and Capital Adequacy, the Capital Buffer (BUFF) will be better prepared to face the pandemic that is just taking its first steps.

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ENDNOTES

- ¹ G10 (Germany, Belgium, Canada, United States, France, Netherlands, Italy, Japan, United Kingdom and Sweden).
- ² Pillar 1 was established to make the prudential framework created by Basel I more sensitive to risk, changing the rules for the calculation of minimum capital requirements. Pillar 2 sets out the 'supervisory process' concept, which combines a set of principles essentially intended to reinforce the interaction between institutions under supervision and the respective supervisors. Pillar 3 introduced requirements for the disclosure of information by institutions to the public (i.e., customers, counterparties, investors, analysts) regarding solvency and other items describing the respective risk profiles, to ensure effective market discipline (www.bportugal.pt).
- ³ Non-performing exposures.
- ⁴ Report and accounts, 3rd quarter of 2020.
- ⁵ G10 (Germany, Belgium, Canada, United States, France, Netherlands, Italy, Japan, United Kingdom and Sweden).
- ⁶ For mor details about the Basel accord, see Roy (2005); Ward (2002); Veiga et al. (2011), Wright et al. (2016), among others.

Chapter 17

Credit Risk Aversion Model During Economic Downturns and Recovery

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ABSTRACT

Credit defaulting in the financial sector is a worldwide delinquency that has become a nightmare for this sector. The search for a solution to root out this problem remains a big challenge for academics, the financial sectors, and the governments. For instance, per the American Bankers Association's (ABC) Consumer Credit Delinquency Bulletin, unserviced bank cards plunged two basis points to 2.96% of all accounts between July-August 2019. This value remained below the 15-year average of 3.68%. (Per ABC, delinquency is a late payment that is 30 days or more overdue.) Though these terrifying statistics sounds like good news, the Trans Union's Industry Insights Report found that the unserviced credit card rate reached 1.81% in the third quarter of 2019, rising from 1.71% for the third quarter of 2018. These figures from the credit bureau are based on accounts that are 90 days or more overdue.

INTRODUCTION

Credit defaulting in the financial sector is worldwide delinquency that has become a nightmare for this sector. The search for a solution to root out this problem remains a big challenge for academics, the financial sectors and the governments.

For instance, per the American Bankers Association's (ABC) Consumer Credit Delinquency Bulletin (as seen in Gonzalez-Garcia, 2020), unserviced Bank cards plunged two basis points to 2.96% of all accounts between July-August 2019. This value remained below the 15-year average of 3.68% (Per ABC, delinquency is a late payment that is 30 days or more overdue). Though these terrifying statistics sounds like good news, the Trans Union's Industry Insights Report found that the unserviced credit card

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rate reached 1.81% in the third quarter of 2019, rising from 1.71% for the third quarter of 2018. These figures from the credit bureau are based on accounts that are 90 days or more overdue.

In China, the country's Supreme People's Court has blacklisted 6.73 million bank defaulters and restricted them from travelling by plane, applying for loans and credit cards or getting promoted (FE Online, 2017).

In South Africa, consumer debt has increased to R1.72 trillion, according to the latest Consumer Default Index - CDI (Dlamini, 2019). This staggering news notwithstanding, more consumers are accessing personal loans and available credit card facilities to support themselves (van Jaarsveldt, as in Dlamini, 2019). The outstanding debts are mainly due to unsecured banking product such as personal loans, which were more broadly accessible across the various consumer market segments.

The afore statistics highlight the fact that the credit risk and its associated defaults are real, and therefore the need to come out with a solution is imminent. In particular, it is essential to uncover the mechanism followed by the banks to dish out credit facilities in order to offer solutions for mitigating default payments. To this end, the study makes three contributions: 1. It will pinpoint the blind spots of the banks that are leading to so many bad borrowers. 2. Develop a risk management model to control the financial sector's susceptibility. 3. Contribute to the body of knowledge, current issues on credit risk.

BACKGROUND

Credit defaulting in the financial sector, especially the banks, is worldwide delinquency that has become a nightmare for this sector. The search for a solution to root out this problem remains a big challenge for academics, the financial sectors and the governments.

For instance, per the American Bankers Association's (ABC) Consumer Credit Delinquency Bulletin (as seen in Gonzalez-Garcia, 2020), unserviced bank cards plunged two basis points to 2.96% of all accounts between July-August 2019. This value remained below the 15-year average of 3.68% (per the ABC, delinquency is a late payment that is 30 days or more overdue). Though these terrifying statistics sounds like good news for economic growth because people seem to be spending. The Trans Union's Industry Insights Report found that the unserviced credit card rate reached 1.81% in the third quarter of 2019, from 1.71% of the same period the previous year of 2018. These figures from the credit bureau are based on accounts that are 90 days or more overdue.

In China, this situation got so bad that the country's Supreme People's Court blacklisted 6.73 million bank defaulters and restricted them from travelling by plane, applying for loans and credit cards or getting promoted (FE Online, 2017). These are drastic measures to punish nonpayers instead of ones that will seek to prevent future occurrences.

In South Africa, consumer debt has increased to R1.72 trillion, according to the latest Consumer Default Index - CDI (Dlamini, 2019). This staggering news notwithstanding, more consumers are accessing personal loans and available credit card facilities to support themselves (van Jaarsveldt, as in Dlamini, 2019). The outstanding debts are mainly due to unsecured banking product such as personal loans, which were more broadly accessible across the various consumer market segments.

In Ghana, eighty-one (81) financial institutions have been closed down by the current ruling government. Reasons cited for this unfortunate and heartbreaking action includes the failure of the banks to observe credit management principles and procedures due to highly exposed insiders and related dealings (Okyere, 2017).

The afore statistics highlight the fact that the credit risk and its associated defaults are real, and therefore the need to come out with a solution is imminent. It is therefore essential to come up with a model for the banks to follow when dishing out credit facilities as this will offer solutions for mitigating default payments.

NEED FOR BUSINESS MODEL

Since the start of the 1990s, the financial sector has seen substantially new businesses ventured into their operations. Though the period preceding the financial crisis was one of considerable energy, primarily in the banking sectors of many countries, the credits and profits of the bank grew at a much faster pace than economic activity, and risk control became a deserted policy (Committee on the Global Financial System, 2018). The practice of reckless lending has caused the operations of many banks which did not succeed in bouncing back whilst those who took prudent measures performed well (Ziegel, 2016; Christoffersen, 2011). Although all these are traceable to the pre-crisis developments in the banking sector, serious factors such as inadequate bank regulation and supervision, and lack of risk discrimination in the credit markets also need to be blamed. This pace of change, i.e., reckless lending, has continued to accelerate well into the 21st Century, and this demands that an okay thought of credit appraisal process to is put in place to control credits risks.

With the above understanding in mind, a taxonomy of credit risks and why banks should manage such attacks will help drum home why it is crucial for the institutions to take such threats seriously.

Taxonomy of Risks at a Glance

Market risk: this is the risk to a financial portfolio from movements in market prices, which affects equity prices, foreign exchange rates, interest rates, and commodity prices. Financial firms dare these kinds of risks and reap the profits (and losses) as the case may be. Nevertheless, they usually choose the type of risk they want to be exposed to among the lots and manage them actively.

Liquidity risk: is that particular risk from conducting transactions in markets with low convertibility options as evinced in low trading volume and large bid-ask spreads. Hence, an attempt to sell assets under such circumstances may push prices below their fundamental values or even transcend beyond the expected time of sales. By tradition, financial firms do not manage this kind of risk with any earnest devotion until the 1998 fall event.

Operational risk: the likelihood of physical catastrophe, technical failure, or human error in the process of a business, such as human errors, fraud, failure of management, and mistakes, is what is known as operational risk. Often referred to as “op risk,” the reward from being exposed to such risk is tiny and, therefore, should be mitigated and or eliminated. Op risk is naturally complicated to hedge in asset markets, though certain specific products like weather derivatives and catastrophe bonds might offer a kind of a border in certain situations. It is usually managed through self-insurance or third-party insurance.

Business risk: is the risk of changes in variables of a business plan that will destroy that plan’s viability and its quantifiable risks, such as business cycle and demand equation risk. Others such as non-quantifiable risks of changes in competitive behaviour or technology, for instance, are inclusive. Business risk is seen as an integral part of the core business of a firm that should be taken on.

Credit risk: as defined in the paragraph preceding this section by Christoffersen (2011) is the main focus of this study. Granting credit, and making interest out of this process constitutes the main business of commercial banks whereby they take on massive amounts of credit risk through loan portfolios. They pay investors a small fee for their deposits and lend out of these deposits to borrowers at a higher interest rate than the ones that are dished out to the investors. The difference between interest received from debtors and money paid to investors constitutes their primary source of income. Because many types of credit risks cannot be evaded in the financial markets, usually, corporations are often forced to take them on rather than to be without them. Hence, banks today are carefully spending much effort to manage their credit risk exposure. It is on record that a significant ground for bank catastrophe is low credit quality and risk assessment besides incorrect credit measurement practices (Akrong, 2017). What is even more dangerous is that any mistake to identify credit risks upturn in a suitable time can also cause real danger for the bank. For instance, some of the reasons cited for the collapse of the eighty-one (81) banks in Ghana in 2019 was that the banks did not observe credit management principles and procedures because insiders and related parties invaded the process (Okyere, 2017). The investigator also noted that the procedure followed in approving loans did not allow for diversity and varying opinion, hence, creating authorisation partialities. Auditors discovered that approved loans for related parties were not linked to the UT Group and followed poor credit management practices, governance, and supervision (Nyavor, 2018). These, in no small terms, underpin the critical question of whether banks must manage risk to reduce their susceptibility or not.

Justification for Risk Management

Risk management research has gain prominence not only for an academic standpoint but for the corporate interest as well. From the classic portfolio theory, we know that investors can reduce asset-specific risk when they diversify their holdings to include many different assets. If this is possible, then, having exposure to it will be a fruitless adventure. If the bank's primary function is to make money out of the deposits of investors, then they must manage risk on behalf of these investors. However, what is more, for them to remain in the competing world of finance, they must do this and do it well. The explanations for banks to manage risks facing them are (Christoffersen, 2011; Bonfim et al. 2013; Ziegel, 2016):

Bankruptcy costs: The direct and indirect costs of insolvency can knock out banks from bouncing back to operate again. If investors see future bankruptcy as an imminent possibility, the real costs of a company reorganisation from closure reduces its current valuation. Hence, when banks manage credit risk, they can increase their value by dipping the likelihood of non-payment.

Taxes: When banks manage risk, they can reduce their tax obligations by decreasing the volatility of earnings since many tax systems have built-in arrangements and limits on the ability to carry forward tax benefits of past losses. Thus, other things being constant, lowering the volatility of future pre-tax earnings will lower the net present value of future tax payments, which can increase the value of the bank.

Capital structure and the cost of capital: A significant source of corporate default is the inability to service debt (Bonfim et al. 2013). Other things being the same, when the debt-to-equity ratio is high, the riskier the firm becomes. Therefore, risk management can allow the firm to have a higher debt-to-equity ratio, which is beneficial if debt financing is only inevitable. Similarly, proper risk management can allow the bank to expand more aggressively and enhance its corporate image.

Compensation packages: Banks staffs have an implicit investment in firm-specific human capital and other key employees due to their extensive and unhedged exposure to risk. Therefore, if the risk

perception of the firm is high, the compensation of both current and would-be employees will want to stay or join the firm will also be high. Proper risk management can, therefore, help reduce the costs of retaining and enlisting key personnel.

Shadowing Risk Management to Justify Urgent Need for Banks to do the Same

The question that has been posed several times by the minds that are responsible for controlling credit risk in the banking setups is: Does risk management really improve banks performance? The response to this question, without any shadow of uncertainty, is a big yes. Studies of risk management practices in the gold mining industry (which is related to banking) revealed that after some risk management exercise, share prices became less sensitive to gold price movements (Christoffersen, 2011; Emmer et al. 2015). Better risk management in the natural gas industry has seen less variable stock prices. Again, some study has shown that risk management in a broad group of firms can lead to both reduced exposures to interest and exchange rates movement (Krause & Tse, 2016). Even more revealing is that researchers have found that less volatile cash flows result in lower costs of capital and more investment. It is also on record that all other factors being the same, a collection of firms using risk management outperforms those that do not (Ziegel, 2016; Christoffersen, 2011), and that, firms using foreign exchange derivatives had higher market value than those who did not. This success story of risk management practice seen here provokes the improvement and implementation of new tools to confront new challenges and pandemics. When this is done and applied correctly, there is no reason to think that it will not work at the banks when it did at other industries.

CREDIT RISK ASSESSMENT BY THE BANKS -THE ENSUING HYPOTHESES

A credit assessment is a study to identify the feasibility of a loan application. This process is necessary in order to assess if a potential counterparty has a business activity that is feasible and wanted, or in the case of an individual, s/he is economically viable by way of a reliable source of income, and for that matter, s/he can pay the loan when it is due. Usually, a banking account officer performs the credit assessment as part of an assessment committee to analyse all factors involved in a credit application. These include business financial performance and credit rating of the borrower. If sound principles are put in place, to do these assessments, the real credit risk nature of the borrower could be determined, and the appropriate decision taken. The Basel Committee (1999) defined credit risk as the potential that a bank borrower or counterparty will fail to meet its obligations per agreed terms (Basel Committee, 1999), and put up a list of principles that can help the bank managements assess the credit risk of their clients. Based on the Committee's (1999) principles, this study models banks assessment of credit risk process to avert susceptibility as below:

Phase One- Bank's invitation of borrower or counterparty due to a thorough understanding of him/her

Operating under a Sound Credit Granting Process Principle: Banks must operate within sound, well-defined credit-granting criteria.

Under this guideline, the Basil Committee's recommendation elaborates in Principle 4 (Appendix 1).

Following these recommendations, this study is of the view that, if banks create a system that is capable of monitoring potential clients and invites them for credit facilities, they will be able to achieve this sound credit-granting process and thus reduce the bank's susceptibility. A well-defined credit-granting criterion entails all that it takes to ensure that the banks have enough information to make a sound judgment for the credit facility they offer. Hence, this study states that;

Hypothesis One: following a clear indication of the target market, the banks will be able to provide supervisors with potential right clients for scrutiny to reduce their susceptibility by narrowing down borrowers to capable payers of credits.

Phase Two - Bank's assessment of clients under sound credit granting process

A Sound Credit Granting Process Principle means that the bank is supposed to have some fair review criteria about borrowers that can reduce the susceptibility of the bank. When hypothesis one is supported with processes that interrogate borrowers thoroughly in order to understand their credit needs, the bank is bound to reduce its susceptibility to default payment. Hence:

Hypothesis Two: banks will reduce their susceptibility to credit defaulting when they follow specific understanding criteria of the borrower or counterparty.

Phase Three - Independent internal risk rating system by the supervisor

Ensuring Adequate Controls over Credit Risk Principle: Banks must establish a system of independent, ongoing assessment of the bank's credit risk management processes, and the results of such reviews should be communicated directly to the board of directors and senior management.

Under this guideline, the Basil Committee's recommendation further states in Principle 10 (Appendix 2).

In the view of this study, whether the bank's internal rating system is consistent with the nature, size and complexity of its activities will depend on an independent review of the system. This is incumbent on the supervisor, when s/he reviews the system's compliance, hence:

Hypothesis Three: following Section IV, Principle 10, under the Basil Committees recommendation of the credit granting process, will lead to supervisors having an internal risk rating system of the bank to manage credit risk and reduce the susceptibility of the bank.

Phase Four - Supervisors independent evaluation to control credit risk for overall risk management

The Role of Supervisors Principle: Supervisors should require that banks have an effective system in place to identify, measure, monitor, and control credit risk as part of an overall approach to risk management.

Per this guideline, the Committee's recommendation explains in Appendix 3.

This commendation is undoubtedly meant to make sure that, during the processes of assessing clients' credit riskiness, any biases, favouritism or errors on the part of the banking staff does not go unchecked

by an independent supervisory body. This study is of the view that this is a prudence practice that is meant to provide a double-ended check of credit granting process to managements overall risk control. Thus, the next hypothesis posits that;

Hypothesis Four: an independent review of the credit granting process by supervisors to ensure that the bank has followed an effective system in place will lead to the overall predictability of clients' credit riskiness.

Phase Five - Ongoing credit administration

Maintaining an Appropriate Credit Administration, Measurement, and Monitoring Process Principle: Banks should have in place a system for the ongoing administration of their various credit risk-bearing portfolios.

The Committee's recommendation under this guideline elaborates in Principle 6, 8 and 16 of Appendix 4. Thus:

Principle 6

The spirit behind this principle is to ensure that there is vigilant monitoring of post granted credit to amend credit facility for possible replenishment requests. This means, in case there is no performing loan, the bank needs to take the necessary steps to prevent any delinquency.

Maintaining an Appropriate Credit Administration, Measurement and Monitoring Process

The Committee's reference here as stated in Principle 8 is that;

The word ongoing suggests a post granted credit monitoring process to make sure that clients remain obligated to honour the credit agreement. In case this is seen to be a threat, the bank is supposed to curtail the situation immediately.

Ensuring Adequate Controls over Credit Risk

Here, the Committee statement in Principle 16 is explained;

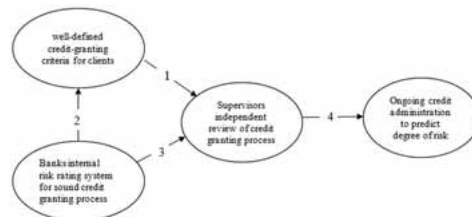
This principle is to ensure that the bank has a kind of early detection system in place for credit defaulters to take the needed steps to remedy the situation before it becomes too late.

From III, IV and V discussions above, this study posits its last hypothesis as;

Hypothesis Five: Banks can predict the degree of clients' credit defaulting to manage their credit risk and reduce their susceptibility.

Following the four hypotheses above, the study proposes the ensuing conceptual model below:

Figure 1. The Credit Risk Aversion Model (CRAM)



The Committee's work which has served as the secondary data for the current study, recommends several principles for banking practices to ensure prudent banking. It is a well-documented open-access manuscript issued for comments and has been published. This means that the document has been peer-reviewed. It has also been used by several scholars such as Zhu et al. (2019), Wanjohi et al. (2017), Kaaya, & Pastory (2013), Costa (2000) and many more. The document is, therefore, a suitable source for the current exercise especially when it comes to its reliability and validity, how the principles are defined clearly, and how it enabled this chapter to formulate its hypotheses and the conceptual model known as CRAM. The manuscript, however, failed to fashion out a graphical model that captures the principles—a gap, which this chapter interns to fulfil.

SOLUTIONS

The CRAM is carefully theorised to help the banks address the below questions that may crop up during the application process for credit facilities:

Q1: Following a clear indication of the target market, how can the banks provide supervisors with potential right clients for scrutiny to reduce the bank's susceptibility by narrowing down borrowers to capable payers of credits?

Hypothesis one sought to prove that, when the banks keep track of their excellent clients' and follow indications of the targets for credit facilities, they will be able to provide supervisors with the right clients for scrutiny to reduce the bank's susceptibility (Annappindi, 2015).

Q2: How can the banks reduce their susceptibility to credit defaulting when they follow thorough understanding criteria of the borrower or counterparty? -

Hypothesis two answers this question. Here, the study believes that banks will reduce their susceptibility to credit defaulting when they follow indications that enable them to thoroughly understand their borrowers or counterparties criteria (Haggerty et al., 2014).

Q3: Following Section IV, Principle 10, under the Basil Committees recommendation of the credit granting process, how can supervisors have an internal risk rating system of the bank to manage credit risk and reduce the susceptibility of the bank?

Under hypothesis three, the study believes that when the banks adhere to the Section IV: Principle 10, the staff will be able to allow supervisors have an internal risk rating system of the bank to manage credit risk and reduce the susceptibility of the bank (McMillan et al., 2018)

Q4: How can an independent review of the credit granting process by supervisors to ensure that the bank has followed an effective system in place lead to the overall predictability of clients' credit riskiness?

To answer the above question, (Q4), the study hypothesised (Hypothesis four) that an independent review of the credit granting process by supervisors to ensure that the bank has followed an effective system in place will lead to the overall predictability of clients' credit riskiness. This is proven from the Almansour (2015) model, which predicted a similar task.

Q5: How can the banks predict the degree of clients' credit defaulting to manage their credit risk and reduce their susceptibility?

Here, again, models have been used to predict the degree of clients' credit defaulting possibilities (McMillan et al., 2018; Annappindi, 2015; Haggerty et al., 2014, Haggerty et al., 2013; Eze, & Vo, 2009). Therefore, this study thinks that based on hypothesis five, CRAM is equally capable of predicting since it follows a well-documented principle of the Basel's Committee.

Notwithstanding the evidence of the benefits of risk management practices in the corporate sector, risk management systems in some U.S. commercial banks gathered losses above the risk forecasts. This is due to an improper model used to undertake the forecast exercise. To be able to estimate accurately, it is vital that the predicting model forecast an excessive loss for the future based on the current modelling. In this regard, this study recommends a Partial Least Square-Structural Equation Modelling (PLS-SEM) technique.

The objective of the PLS-SEM is prediction oriented, which assumes a predictor specification as well as being robust to deviations from a multivariate distribution. This makes it a de-facto tool for the current exercise aimed at estimating credit risk delinquency. It also supports exploratory and confirmatory research which fits well for the client's investigation before estimating his/her credit merit.

The confirmatory factor analysis (CFA) of this tool (PLS-SEM) helps to establish whether the widely accepted criteria for reliability and validity of interrogations posed to the borrower to determine his/her credit fitness are met. In this sense, any established criteria by the banks, based on well-founded principle such as that of the Basel Committees (1990) to ascertain the internal consistency can easily be gauged as follows:

$$\alpha = \frac{N - \bar{r}}{1 + (N - 1) - \bar{r}}$$

This can be confirmed through the calculation of correlations between item and factor (items to indicate how long a borrower has been in a certain income bracket or struggled to pay off a previous credit facility) as follows:

$$CR = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \sum (1 - \lambda_i^2)}$$

The extant literature has shown that correlations increase during financial disorder, which increases credit risk even more. Hence, this is necessary to calculate to enable the risk manager to uncover and understand the forces at work for a better decision. It tells the relationship between credit risk and profitability. After validating the correlation calculation to ensure that factors used to determine the counterparty's riskiness converge at a standardised factor loading above 0.5, the risk manager can be assured that the process is well on course to arrest a potential defaulter.

A model of variance demands that appropriate knowledge of the entire distribution of the asset is within reach so that it will be easy to calculate any desired risk measure. In this sense, a model for forecasting tomorrow's variance is desirable as this will give a reliable indication about a borrower's creditability. If the recent period tends to be one of high variance, *ceteris paribus*, that of the future is likely to be a high-variance as well. The easiest way to capture this phenomenon is by letting tomorrow's variance be the simple average of the most recent. A commonly used statistical measure of this concept is known as Average Variance Extracted (AVE). The AVE will help to determine the amount of variance that a factor captures from its measurement items- the likelihood of credit defaulting concerning the amount of variance due to measurement error as in:

$$AVE = \frac{\sum \lambda_i^2}{\sum \lambda_i^2 + \sum (1 - \lambda_i^2)}$$

After the above exercise, the overall structural model (Figure 1) can be confirmed by testing the relationships between them. The hypothesised causal paths should be used to provide the estimates and interpretation. For instance, a negative beta (β) coefficient with an insignificant p-value will mean that the bank in question is exposed to the high credit risk of the client, and this will affect the financial performance of the bank. If for any reason(s) the bank still wants to approve the credit facility, then, it must guarantee the safety of the loan with high-quality collateral to redeem the debts in future. The variance (R^2) of each dependent factor is an indication of how well the model fits the data. This shows the amount of a dependent factor that is explained by the model as below:

$$R^2 = 1 - \frac{\sum (y_i - \bar{y})^2}{\sum (y_i - \bar{y})^2}$$

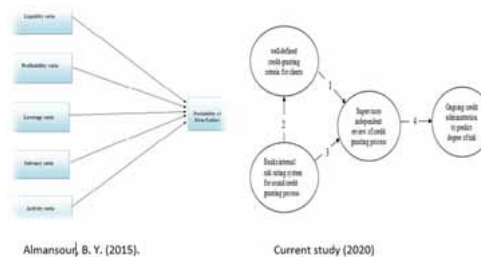
The assessment of the structural model is to validate the model fitness. Each of the hypothesised paths will have to correspond to a pathway in the structural model, and both R^2 and path coefficients will indicate the model effectiveness to show how well the model performs. The overall fit and explanatory

power of the structural model should be examined together with the relative strengths of the individual causal path. R^2 values of 0.75, 0.50 and 0.25 means substantial, moderate and weak, respectively, while values of 0.90 and higher are typically indicative of data overfit. However, owing to the high degree of noise in the squared returns, the fit as measured by the regression R^2 can be shallow, usually around 5 to 10%, even if the variance model used to predict is indeed the correct one. Thus obtaining a low R^2 in such regressions should not lead risk managers to reject the variance model- just that the proxy for real but unnoticed variance is wildly inaccurate. Q^2 values larger than zero are meaningful though values higher than 0, 0.25 and 0.50 depict small, medium and large predictive accuracy of the path model.

The Basel Committee on Banking Supervision (1999), Appendix 2, recommends several principles for banking practices to ensure prudent banking. These principles directly address the challenges that any probable defaulting client or counterparty may pose. When this model in Figure 1, which is based on these principles is applied correctly, one can expect a reliable forecast. The manuscript, however, failed to fashion out a graphical model to simplify the matters and did not compare to any other model.

To be certain of this, the model can always be compared to another, say, that of Almansour's (2015) which also attempts to predict credit failure. Nevertheless, Almansour's study used too many variables than that of the CRAM, and this could be difficult and time consuming to deal with. This creates another gap that this study addresses.

Figure 2. Two comparing models



The banks will need to compare CRAM to that of their competitors. This will make them to be sure that CRAM is neither too strict nor too loose for such important decisions. When models are compared, the consumer of the outcomes, in this case, the banks, benefits a lot, because the lack of comparison suggests that, there is little agreement on whether some causes exert more influence than others (Wang et al., 2019). Some studies have made such comparisons successfully (Odoom & Kosiba, 2020). For example, Venkatesh et al. (2003) combined eight current models to advance, the unified theory of acceptance and use of technology (UTAUT).

Thus, in comparing CRAM to Almansour (2015), while the model of Almansour (2015) shows a predicting capability just like the one for this chapter, it did not use the Basel principles nor any popular principles. It did not also compare with another to provide the benefits of comparing. These, therefore, leaves another gap for this chapter.

RECOMMENDATIONS

Credit Risk Aversion Model (CRAM) such as the one under consideration serves as a standard concept for banks to follow to manage the threat of credit defaulting. This is so, especially during periods of economic downturns and recoveries such as the like we are experiencing currently- Covid-19 pandemic. Hence models should be used to:

- serve as a standard of measure, and a free and fair tool that can reduce biases towards clients, and thus reduce the banks' susceptibility to risk;
- offer the banks a structure for suitably examining credit risk. These exposes and analyses marginal and absolute contributions to risk, and thus, helps the banks to improve overall capacity to ascertain potential risk quantity and manage such risk without any surprises;
- provide estimates of both possible and unforeseen losses from targeted portfolios; thus, providing a better view of concentration risk as opposed to non-portfolio ones;
- serve as a predictive instrument that may be influenced by shifts in economic lines, credit quality, and market variables. When this is done, a modelling approach provides a more revealing and reactive means for risk control;
- bid (a) improved systems and data collection, (b) standard ways of approving credits and deciding on limits (c) more accurate risk assessment, which contributes to obvious verdicts and (d) a more reliable method for granting credit.

FUTURE RESEARCH DIRECTIONS

During global pandemics, organisations that are impacted by the economic downturn usually experience changes in their dealings, which affect operations and revenues. This is due to lower consumer spending emanating from restricted access to credit facilities, job instability, possible unemployment and uncertainty in the future. These, in turn, impacts on the financial activities of the organisations in several ways, thus calling for careful financial management.

The above requires that the role of the chief financial officer (CFO) and other financial executives be altered to meet the changes in the environment, known as the 'new normal'. This change has to be more than just crunching numbers, working with investors, doing financial events, and raising finances to a broader operational and futuristic view. This means making sure that, the right people, processes and technologies are in place for the organisation to navigate the new normal uncertainties. These have to do with business units looking for more data and analysis to improve upon decision making, more focus on technology, strategic business decisions, business and risk management, making use of data analytics and more intense in risk management. All these can better be achieved through digitisation.

Ways to digitise must be pursued to bring about change in processes and cost savings that have been necessitated by the new normal. The CFO has to work with the other heads to put in place, cost-saving plans, information management for more informed decisions for the whole business, and this need to have much broader ranks when it comes to risk management through community intelligence.

Community intelligence saves money as well as improving efficiency. It is about collecting data on the transactions in the systems to address the questions of: who are our suppliers, who are we dealing with-customers, what are the speed of transaction (credit applications) approval, is the number of staffs

on the approval chains unnecessarily too long? All these must be benchmarked against competitors to know if the business is faster or slower in its dealings. In short, the traditional role of the finance manager has to be broad through digitisation in order to become resilient.

Becoming more resilient in recovery period needs to be researched to enable the business to prepare for the worst whilst hoping for the better. This will have to cut across political risk as well as economic shocks. Research into the needs of having arms around processes, people and systems in order to be agile will have to be carried out.

Research into the Process of Credit Appraisal

For a proper assessment and control of the credit risk of counterparties, it is necessary to take a closer look at the borrowers' economic and legal situations as well as the appropriate environment of industry and economic growth. The quality of credit appraisal processes depends on (among other factors) the transparent and comprehensive presentation of the risks and an adequate assessment of these risks. The level of efficiency of the credit appraisal system is a vital rating element that can make or break the actual risk involved in the process. Due to the considerable differences among various borrowers (e.g. private persons, listed companies, sovereigns, and so on) and the assets to be financed (e.g. real estate, production plants and machinery, and so on), there cannot be a uniform process to assess credit risks (Van Rooij & Fine, 2018). A large number of products and their complexity that may beg for bank facilities can also make the decision making quite sophisticated. However, some process can be more effective than others.

Opportunities, therefore, exist for research into the best process under each circumstance to ensure a more significant positive impact on borrower's proper understanding, assessment and monitoring processes. Based on the various parameters from such exercise, the model can be fine-tuned to serve its purpose for management.

Credit risks associated with the possibility of default by a counterparty typically arise because customers fail to honour their side of the contract regarding the facilities granted them. This could be because they did not provide the accurate information required by the bank to make a sound judgement. Thus, the banks may need to hedge their assets against such risk exposures. However, the banks need to be aware that, Credit risk exposure surges considerably when they depend heavily on a small number of large customers who are granted access to a substantial amount of credit so that they can decipher between various options of strategies. Again, the banks need to know that, the significance of credit risk varies between sectors, and is high in their area of operations, where short- and long-term lending are fundamental to the business. Hence, they can be exposed to the credit risks of other firms with which they deal with. For example, they may suffer losses if a key stakeholder has trouble accessing credit to continue trading with them. Thus, research needs to be rigorous on internal strategies such as:

- **Vetting:** this is the oldest and most basic means of handling credit risk exposure. The process should be thorough on prospective counterparties to evaluate their credit risk even when it requires the buying of data on them to supplement the process. For both small and medium-sized companies, this may mean the purchase of credit watch on specific businesses on which the watch agent will provide an alert service to the bank to inform them of critical events such as court judgements, director resignations, and so forth. Information on large companies usually takes the form of a formal credit rating by Standard and Poor's, Moody's or Fitch based on detailed analy-

sis of the company's financial position and performance, in addition to more general information about economic and market conditions.

- **Position limits:** imposing limits on the credit facility that can be granted to anyone counterparty can be both 'soft' and 'hard'. The former would be similar to targets that might occasionally be breached, while the 'hard' would be hard and fast limits that should not be exceeded come what may.
- **Monitoring:** a process of the banks must always monitor their ongoing credit risk exposures, to counterparties to whom they are heavily exposed for warning signals as counterparty approaches or breaches a position limit.
- **Netting arrangements:** to ensure that in case a party defaults, the amounts owed are the net and not the gross.
- **Credit enhancement:** techniques include periodic arrangements for debtors to settle outstanding debts, impose margin and collateral requirements, and to organise to receive further collateral payments if a party is downgraded. Purchasing credit guarantees from escrow parties and arranging to terminate contracts in case a party's credit rating hits a critical level must be on the options table.

CONCLUSION

Unlike risk management models of authors such as Almansour (2015), the CRAM is a simple kind of management model of only five steps that can help the banking officials to easily predict the degree of the credit delinquency of their teaming applicants. This is crucial, especially in the current times of the COVID-19 pandemic which has added misery to the vulnerable, thus forcing many to resort to credit facilities to cushion their daily lives (Staff Writer, 2020; Jayadev & Padma, 2019; FE Online, 2017).

This chapter theorised a set of hypotheses to come out with CRAM. It also demonstrated how it adopted theories converge to address the problem of credit delinquency and the overall objectives. The result shows that following well-defined principles can help fashion out a simpler model (CRAM) to predict credit delinquency as compared to others.

The information highway of the 4th industrial revolution, coupled with today's turbulent business climate demands that the CFO and other financial leaders be more holistic and broad within their organisation if they want to go through an economic downturn, recover and stay on top of their competition. They will have to create the enabling circumstance that gives them leverage over processes, people and technology, and this can be achieved through research in the areas of:

1. Compliance and risk;
2. Financial performance;
3. Digital transformation; and
4. Controls strategies and resilient over the future.

They have to be able to consolidate all their business spending into a single view, move away from their traditional functions of raising finance and boardroom actions to become much more operational in human resource. This will help them know exactly the right resources to lay hands on for solutions during economic downturns and recoveries. Banks are exposed to different types of risks, but credit risk is one of the most significant risks they face, considering that granting credit is one of the primary

income sources in their operations. The Basel Committee has identified it as a leading source of risk in the Basel Accord's early stage.

Credit risk arises whenever a borrower expects to use future cash flows to pay current debt, but the actual return of the investment turns to be different from expected return, hence, signaling the possibility of losing the original investment and the number of interests accrued on it. Cases of these scenarios have caused the lives of many borrowers in South Africa who resigned from their jobs to start something for themselves. Credit risk management in banks is vital due to its ability to affect the banks' financial performance, existence, and growth in addition to saving the lives of unimagined customers. Therefore, it should not be taken for granted. Effective management of credit risk should inextricably be linked to the development of banking technology, which will enable it to increase the speed of decision making and reduce the cost of controlling credit risk. This requires a complete base of a futuristic technology attitude that stems from new ideas and research to develop credit risks modalities.

It should always be the practice of mitigating losses by understanding the adequacy of both a bank's capital and loan loss reserves at any given time as a process that has long been a challenge for financial institutions. The absence of effective credit risk management led to the banking crisis, and inadequate risk management systems caused the financial crisis in the small island of Cyprus. It can occur anywhere. By effective management of credit risk exposure, banks support their own business's viability and profitability and contribute to systemic stability in the economy. Thus, the management philosophy should be that; the default of a small number of clienteles can result in a tremendous loss for the bank and spell out its demise.

There are numerous researches on the effect of credit risk management on financial performance (Blankson et al., 2017; Wirtz & Zeithaml, 2018; Astawa, 2019; Serwadda, 2018; Islam et al., 2019) to list the most recent, and how they effectively assist in reducing the possibility of failure and uncertainty of achieving the required financial performance. Most of these researches support the notion that there is a positive relationship between effective credit risk management and banks' profitability. However, many of them did not substantiate their arguments with any practical model that can serve as a basic standard for mitigating credit risk. To this end, this study has developed a CRAM based on well-documented procedure to aid the banks, and wish to maintain that credit risk management is a must for all severe organisations that intend to stay in business, and lack of such management can lead to bankruptcy resulting in the collapse of the organisation, particularly in these times. The CRAM, which contribution to credit management is already established in the previous sections, is meant to make an incremental contribution to the 'beast' of credit risk.

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APPENDIX 1

Banks must operate within sound, well-defined credit-granting criteria. These criteria should include a clear indication of the bank's target market and a thorough understanding of the borrower or counterparty, as well as the purpose and structure of the credit, and its source of repayment.

APPENDIX 2

Banks are encouraged to develop and utilise an internal risk rating system in managing credit risk. The rating system should be consistent with the nature, size, and complexity of a bank's activities.

APPENDIX 3

Supervisors should conduct an independent evaluation of a bank's strategies, policies, procedures and practices related to the granting of credit and the ongoing management of the portfolio. Supervisors should consider setting prudential limits to restrict bank exposures to single borrowers or groups of connected counterparties.

APPENDIX 4

Principle 6

Banks should have a clearly-established process in place for approving new credits as well as the amendment, renewal and re-financing of existing credits.

Principle 8

Banks should have in place a system for the ongoing administration of their various credit risk-bearing portfolios.

Principle 16

Banks must have a system in place for early remedial action on deteriorating credits, managing problem credits and similar workout situations.

Chapter 18

FinTech and Sustainable Development:

A Comparative Study of Indian and Chinese FinTech Ecosystems

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ABSTRACT

The landscape of the financial industry has witnessed a massive revolution in recent years as a result of the growth of IT. The potential of FinTech innovations is a game changer allowing a scope to align itself to meet the needs of environmental sustainability. The increasing levels of human consumption are unsustainable for the world which needs to be addressed. The world needs to lead the way by rethinking many of its industries which are causing havoc for the survival of ecosystems and ensure that they operate in accordance with the 17 Sustainable Development Goals of the United Nations. The synergy of FinTech and sustainability will help to offer a tradable, measurable, and allocable venue to move citizens towards a sustainable and financially stable future. This chapter aims to justify that the future of finance is FinTech and study the ecosystem of FinTech in India and China to understand its implications, which can help for the development in the financial sector and in making the world a sustainable, habitable planet.

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INTRODUCTION

FinTech: A Financial Disruptive Innovation

As the country advances towards a progressive financial future and the era of the internet, it brings with it the need and opportunity to establish various financial tools that will empower people. Financial Technology (FinTech), one unique tool and invention which has been around for decades is reinvented due to rapidly advancing technologies and a plethora of new players entering the FinTech ecosystem to explore its endless possibilities. The Financial Technology industry comprises of enterprises providing well designed financial services, as well as technological services directly to financial institutions. These enterprises use the perfect synergy between Finance and Technology to support and simplify financial transactions among businesses and consumers.

The advent of disruptive innovations and advances made in FinTech is upscaling demand for financial products and services and leading to healthy competition among enterprises to provide reliable, lucrative financial products and services. This has led to an increase in FinTech start-ups springing up and investments attention. FinTech is creating products and services to create and penetrate new areas of the financial system and to bring about a favourable perception and outlook towards financial bodies and services. These changes are making traditional financial firms to invest in innovation and technologies and pay attention to the trends and dynamics of change among customers. The new and existing players in the Financial Industry will be impacted by the changes taking place in the FinTech ecosystem but being able to grasp the changes and focus on the right kind of developments can be a tedious task.

The United Nations Sustainable Development Goals (SDGs) and its Implications

As we embark on this great collective journey, we pledge that no one will be left behind. Recognizing that the dignity of the human person is fundamental, we wish to see the Goals and targets met for all nations and peoples and for all segments of society. We will endeavour to reach the furthest behind first (UNGA, 25th September 2015).

Since its inception in 2015, the 2030 Agenda of the United Nations Sustainable Development Goals (SDGs) has provided a blueprint for a sustainable co-existence between man and nature, a world where all people can lead lives of vibrance, generosity and prosperity on a sustainable planet. The SDGs are a set of objectives for the world to attain sustainable co-existence at every level: from the biosphere of the globe to local communities and ecosystems. The aim is to bring economies out of poverty, save the world from rampant effects of climate change and make sure everyone enjoys peace and prosperity, now and in the future. Since the coming into force of the Global Goals in 2015, countries have taken a host of proactive measures to achieve the targets on time. Extreme poverty and under-5 mortality have reduced, many countries have ratified the 2015 Paris Agreement on Climate Change and developed policies to address rapid urbanisation and support sustainable consumption and production. Governments, private sector, development organisations, academia and citizens must accelerate their efforts to achieve the goals collectively.

The most urgent area for action by countries across the globe is Climate Change, which has grave implications for the survival of ecosystems on the planet as our actions have led to an uncalled existential crisis. We need a super-human effort to cut record-high greenhouse gas emissions that is causing

global warming which has not been seen in about millions of years, the effect on temperatures due to the impact of global warming is expected to soar to that of 1.5°C in the future, as claimed by the United Nations 2019 SDGs report. The clock for human survival is running out and decisive action on climate change is the need of the hour. Other indicators such as economic growth and employment and industrial innovation also require urgent action to help countries survive in the long run. Adequate policy actions are needed to achieve full and productive employment and good work for all women and men. The most important and crucial factor is that the intensity of global CO₂ emissions is starting to decline, showing signs of prospect for a sustainable future and successful progress has been made in mobile connectivity to connect people across the globe. Although there is a huge gap to fill in each country, the success of these goals will help the planet to become a more harmonious and habitable place to live in.

Synergy Between FinTech and Sustainable Development

Finance is a system filled with dynamism subject to various factors of change like any other economic process due to which the financial system has been in both periods of turmoil and transition. The financial crisis and its aftermath caused a huge turbulence and led to a prolonged period of instability and low levels of growth internationally. The transition of financial systems across the globe is in part driven by this turmoil and turbulence, through new policies and programmes and increased the influence of emerging and developing nations in shaping Global Finance with the help of disruptive innovations like the FinTech.

The world is struggling to address crucial issues that are a hindrance to the development of nations and mankind like the ever-widening inequality, the impact of climate change and widespread deterioration of natural resources on which the global economies and communities sustain their living. Banks act as intermediaries between borrowers and savers, helping in reducing the information asymmetry and enabling investment. As more and more people are getting connected to the Internet, the number of FinTech start-ups are increasing drastically. The potential for FinTech and its business innovations is tremendous, proving to be a rather very useful synergy and a strong foundation to try and achieve the vision of a sustainable, inclusive, habitable economy across the world.

For example, ENFUSE, a Finland based FinTech Company which offers payment and open banking services to banks, financial operators and merchants started a unique initiative known as My Carbon Action Report. This Initiative helps one to get insights on their everyday lifestyle habits that have a huge climate impact and help them in taking sustainable actions. Another such example is Ant Financials' Alipay, a mobile payment platform launched an initiative known as the Alipay's Ant Forest project which works on a rewards-based system and provides its users with green energy points each time they voluntarily try to reduce their Carbon footprint on the planet on an individual level.

Each of the above stated examples proves that FinTech can be used for Sustainable Development and provision of clean energy. But, with the Synergy of FinTech and Sustainability comes a huge number of challenges such as Financial literacy and Data Protection. A lot of companies are trying their best to solve these issues. Although FinTech has severe challenges, it can help in tackling obstacles to progress towards sustainable development and help in the development of rural economies all around the world.

Through this research paper the aim is to justify that the future of finance is FinTech, and we also study the ecosystem of FinTech in India and China to understand its implications, which can not only be used for development in the financial sector but help in making the world a sustainable planet for the survival of the human species.

REVIEW OF LITERATURE

Zhang (2011) shows the impact of financial and economic development on carbon emission levels in China. The analysis shows that the financial development of China acts as a force for an increase in the levels of carbon emissions. The paper shows how the carbon emissions is influenced by the financial intermediation scale and the financial development indicators is greater than the influence when taken into consideration. However, the influence of the efficiency is comparatively weaker although it may statistically cause a change in carbon emissions. It shows that the China stock market scale has a comparatively huge influence on carbon emissions whereas the influence of the scale's efficiency is very limited. Wang and Zhi (2016) highlights the importance of Green Finance in protection of the environment. The paper gets into the details of the current progress of Green Finance in the field of renewables and reveals some important gaps that needs to be addressed. By analysing the internal contradictions between Environmental Protection and Green Finance, the paper proposes solutions for better fulfilment of ecological balance and co-existence suggesting that if the structure of Green Finance is rational, it can help to push the easy flow of funds in the right direction which will help to obtain efficiency in management of environmental risks and the adequate provision of a healthy environment, social and other resources. It demonstrates the fact that efficient regulation and construction of policies and procedures will help in avoiding asymmetry in information and moral hazards involved. Building up of an efficient and reliable Green Finance System which coordinates the correlation between the fields of Finance and Ecology should be considered by the establishment of environmental protection.

Varga and David (2018) outlines a conceptual overview of the key factors behind FinTech which includes the utilization of business models, resource-based theory, and human-centred design. It introduces one to how FinTech can enable positive effects on the triple-bottom-line by innovation in the financial sector which helps those who live at the bottom of the pyramid. The paper also talks about how FinTech are bringing about efficiency and becoming powerful drivers of technological change in the financial sector and between 2010 and 2015 attracted more than 50 billion dollars of investment for the FinTech ecosystem across the globe. Nassiry (2018) describe three areas for FinTech's potential uses for green finance, including blockchain for sustainable development, renewable energy, finance for carbon credits and climate change. This paper shows examples from Europe that are pioneers in blockchain technology. This paper explores FinTech's future for emerging economies in Asia and provides hints and recommendations to interested policy makers and stakeholders for FinTech and blockchain technologies to address climate change.

Bieliński and Mosionek-Schweda (2018) outlines the efficiency of Green Bonds as a Financial Instrument for Environmental Projects Funding. The paper analyses the potential of the green bonds market to finance the shift of the global economy towards one with sustainable inclusion. The paper summarises the best practices that can be implemented in the countries belonging to the European Union to exploit the potential of the green bonds market using the method of case studies of countries leading in issuance of green bonds. Ding et al. (2018) outlines the work of Ant Financial which is China's largest FinTech company and is ready for revolutionary changes in China's financial network and ecosystem, including payments, money management and debt. This paper analyses the underbanked markets of large Chinese financial institutions and banks, low-income individuals, especially those living in rural areas. Ant Financial has made use of Taobao's platform which is the Chinese online shopping e-commerce platform owned by the Alibaba group along with its rural plan to lend out loans and help age-old agricultural enterprises to set up store on Taobao.

Ute et al. (2019) highlighted that the significance of innovation driven by Internet of Things (IoT) is growing in the energy sector. The usage of smart energy products such as smart meters satisfies the customers allowing easy usage and values that open potential for radical business transformations and improvisations. Deng et al. (2019) say that in the current scenario around the world, it can be observed that FinTech is affecting sustainable development in which urgent research needs to be done to make changes on sustainable lifestyles. The study is based on sustainable ecosystems and its development and aligns it with FinTech by conducting in-depth analysis based on data from peer-to-peer platforms in 31 Chinese provinces. The results show a U-shaped relationship between FinTech and Sustainable Development, which is mainly influenced by the pattern of significant economic growth and development. Song et al. (2019) found that the main ingredient in empowerment of an economy is powered by the green development of FinTech. This paper is based on the weighted least squares method of cross-sectional data and threshold regression methods that investigate the impact of FinTech development on agricultural nonpoint source pollution. The results show that there is a U-shaped relationship between FinTech and nonpoint source pollution, which means that Fintech may help prevent agricultural nonpoint source pollution. Jeffrey et al. (2019) dwell upon why Green Finance is Important, and which is defined as the heart of development of infrastructure projects. This research highlight how financial institutions are more interested in fossil fuel projects than green projects due to the many risks associated with these new technologies and they also give lower rates of return than fossil fuel projects. If we want to increase investment financing in green projects which will result in environmental benefits, the paper leads to the conclusion that this is only possible through the implementation of new financial instruments and new policies.

Ketterer et al. (2019) outlines the usage of Financial Innovation and Technology to Expand Green Bond Issuance in Latin America and the Caribbean. The ideas put forth in this research paper are intended to stimulate further dialogue with policymakers, public financial institutions and regulators, the main drivers of the green bond market development that are looking for efficient and innovative ways to meet their goals regarding green investment needs and capital market development. Green bond markets in the LAC region remain in a relatively nascent stage. Therefore, the paper concludes that guidance and support of a supranational institution are essential to provide the standards and assurance needed to attract investors internationally. Li and Peng, (2019) observes the genius behind Ant Forest, a scheme launched by AliPay mobile app, a subsidiary of Ant Financial Group as an initiative to drive Fintech towards Sustainability concerns. With the rapid development and innovation in the Digital age, Internet and Green Finance and Internet and Public Welfare has emerged even in the form of games. Alipay's Ant Forest game represents this one of a kind of innovation. The paper also analyses the role of the game in advocating and promoting low-carbon behaviours and effective reforestation. Bavoso (2019) outlines the possibilities and dangers of alternative market-based finance. The paper shows the growth and development of FinTech lending platforms in the United Kingdom. This study mainly studies the operations and structure of the main lending platforms recognising that some are banks that can easily adapt to a business model driven by technology, many platforms offering lending services function using a P2P business model. Interestingly, the paper concludes that the growth of peer-to-peer securitisation brings about several regulatory and policy questions that needs to be addressed. Suryono et al. (2019) discuss in length about peer-to-peer lending, its problems, and potential solutions. China has become the global leader with the presence of the greatest number of peer-to-peer lending platforms, but there also lies a moral hazard that makes this business need to be monitored. This study aims to identify problems in peer-to-peer lending and present various solutions to the problems identified. The paper makes use of

statistical tools like the Kitchenham Systematic Literature Review approach and analyses data from the, SCOPUS, AIS, IEEE, ACM and ScienceDirect databases and finds a clear picture creating a method to recognise problems and identify potential solutions.

Hinson et al (2019) dwell on agribusiness and its transformation in developing countries. One of the most important agenda laid down by the UN for Sustainable Development is that of development of agribusiness. This paper emphasizes the potential FinTech's hold in fulfilling the goals and states the potential risks and limitations that need to be addressed. It highlights a few factors that need urgent attention such as building of large-scale capacity, long-term infrastructure investments, extensive research on the economic viability of newer FinTech models to be able to order to progress towards sustainability. Zhang and Chen (2019) give us an insight about the digital economy of China which has expanded rather aggressively in the past couple of years. The paper shows that although the average digitalization of the economy remains lower than those of developed economies it is already high in certain regions and sectors such as FinTech and E-Commerce and in the coastal regions. The extent of digitization on a such a massive scale has provided an impetus to the growth of productivity with differential impact on employment. It stresses on the fact that digitalization will help to enhance China's economy with the help of Improving efficiencies and productivity and slow down the downward trend of economic growth as the economy matures. Yang et al (2019) talks about the continuous development of information science and technology in China using techniques of big data, cloud computing and AI. But on the contrary, it talks about how the traditional finance industry is unable to meet the current market needs because of the development of the consumption patterns and payment methods in China. Therefore, the paper concludes stating the need to utilize FinTech to develop the Chinese financial industry.

Allen et al. (2020) observes a Survey on FinTech Research and Policy Discussion. The main objective of this paper is to study the various policy aspects of Fintech and to provide an in-depth Fintech Literature Survey with relevant research studies. It includes market and peer-to-peer loans, central bank digital currency, cloud computing, blockchain, credit scoring, cyberspace, robot-advising, quantitative trading and investment strategy, artificial intelligence, machine learning, fraud detection, eKYC, RegTech, InsurTech and FinTech regulations. González-Ruiz et al. (2020) studied the effectiveness of Sustainable Financial Products in the Latin American Banking Industry. The purpose of this study is to identify the use of sustainable financial products with a deep understanding of the current economic situation and current research trends and to classify sustainable financial products in the industry. This paper points to the development of financial products that focus primarily on environmental, social, and governmental issues to develop more sustainable financial markets, products, and services in a sustainable Fintech ecosystem from a credit perspective. It also shows that environmental responsibility policies, green protocols and regulatory and government development have led to the development of green and socio-economic products that can meet the theme of sustainable inclusion in private financial institutions in Argentina, Colombia, and Brazil. Siddiqui and Siddiqui (2020) note the impact of FinTech in India on the analysis of the impact of telecommunications on financial inclusion. Telecom proves its impact on economic inclusion despite regional differences in India. It highlights the fact that telecom plays an important role in expanding financial services to improve the lives of rural people. It sought to promote comprehensive and holistic policies that would help increase telecom infrastructure and economic inclusion in India.

Ignatyuk et al. (2020) observes FinTech as an innovation challenge used for analysing big data for sustainable development. The findings of the research talk about the environmental and economic concerns relating to green businesses showing that there are many basic problems which arise at firms during the process of data collection and on the outcomes of their activities. They also analyse how the

green business and public sector is following global trends with the broader usage of big data analysis to increase efficiency of business activities and serve the interests of the public. The paper analyses of the changes that are to be made in approaches to the big data analysis in private and public sectors to act in accordance with the global trends for greener economies. It suggests that application of FinTech like simplified methods of processing large data sets and tools for enforcing the principles for a clean economy will help to increase the attractiveness of investment of eco-friendly businesses and will make collaboration between the state and enterprises easier. Arner et al. (2020) highlight the approaches towards Sustainability with the help of FinTech and Financial Inclusion. FinTech is a major stepping stone for achieving financial inclusion which can also help to bring a massive change in terms of sustainable balanced development and sustainable inclusion as defined in the UN Sustainable Development Goals. The capabilities of FinTech to support the Sustainable Development Goals can be achieved with the help of a progressive, unique, innovative, and robust approach to infrastructure development which will support financial transformation to more digital reliable processes across economies around the world. The study strategizes to achieve this based on four main aspects. The first aspect involves the development of identification of individuals digitally, banking processes made simpler and electronic-KYC systems, in support with the second aspect of open architecture that has multiple operated electronic payments systems in place. The third aspect makes use of the infrastructure of the first and second aspects efficiently to help in providing government services and payments digitally. The fourth aspect is based on the structure of online financial systems and markets which will provide wider and affordable access to financial investments. The implementation of these four aspects is a tedious task for any country's economy, but a framework with huge capabilities to transform not just the way finance functions but also the economy and society with the help of FinTech, financial inclusion, sustainable co-existence, and sustainable balanced development.

RESEARCH METHODOLOGY

This research study is designed as a descriptive research study. The research study mainly involves collection of qualitative data and quantitative statistics from various sources. Secondary Data is the main source of data for the research analysis. The secondary data was collected using websites, reports, news, articles, research papers, publications, etc. Further, the research parameters are classified based on the nature of data collected, that is, qualitative and quantitative parameters.

Research Parameters

Quantitative Parameters

1. **Adoptability** as a parameter shows the different levels of adoption rates of FinTech in India in comparison to China. It shows the distinct difference between the two economies and how India can grow further in terms of adopting to FinTech in various fields. The data helps one understand the penetration ratio and future growth rates in the consumer adoption growth rate in each of the countries. It also gives one a broad idea about the rate of opening bank accounts or mobile payments account. The parameter helps in analysing the challenges and adoptability rates of the two biggest markets of FinTech all around the world.

2. **Global Investment** shows the amount of investment and funds flowing into the FinTech industry of China and India. The most important parameter to measure the future growth rate of an Industry in a country is evaluating its Global Investments, which not only helps in growing the industry but also the entire economy and employment rates of a country. This parameter compares the Investments made in each of the countries and helps one understand the future FinTech Investment hub.
3. **Penetration of FinTech** illustrates the penetration rate across demographic groups that has fuelled the growth of FinTech in India and China. It helps one understand the number of people who use a smart phone and the gender comparison in terms of adoptability rate. It helps in understanding the amount of population who have been converted into loyal consumers and the challenges in converting the remaining population into consumers.
4. **Economy and Work Growth** as a parameter serves the purpose of helping one understand the extent of the contributions made by FinTech to the economies of India and China. It helps in drawing comparison between the economic growth and employment opportunities in each of these countries and helps in understanding the gaps that need to be filled in the industrial ecosystem so that it can help in powering economical advancements and higher employment rates.

Qualitative Parameters

1. **Ecosystem** is one of the key factors for any industry to flourish in any economy around the world. This parameter compares the change in ecosystems in China when compared to India. It helps one gain insight about the ecosystem that is flourishing in each of these countries and how these ecosystems are contributing to FinTech expansion and the Synergy between Sustainable Development and Financial Technological advancement.
2. **Evolution of Digital Economies** helps in gaining insights about the development and progression of the economies into seamless, digitized processes facilitating smooth functioning of activities in China and India. It also dwells on whether each of these countries are data rich or data poor and how the phase of digitalization over the years is helping to shape the FinTech industry and combining the aspects of Sustainable Development into the economy.

The above-mentioned parameters will be used for in-depth quantitative and qualitative analysis of FinTech and how it can be effectively utilised for achieving the vision of Sustainable Development.

ANALYSIS

Quantitative Parameters

Adoptability

FinTech is the next stark technological advancement of the digital era which has the power to create sustainable financial inclusion. Technological advancements are evaluated based on how successfully it has been accepted and adopted to by countries across the globe. Mainland China which is known as one of the global FinTech hubs is an epitome of technological advancement. The number of technological innovations has increased in the recent past enabling the citizens of China to get accustomed to

technology. FinTech being a synergy of Finance and Technology is one of the most accepted industries in China, with data showing an 87% adoption rate (Ernst & Young, 2019).

Research shows that the financial services which are used most often in the country are peer-to-peer payments, non-bank money transfers and mobile payments. China is a pioneer of a global trend stimulated by increased competition, improved on boarding experiences and the transferability of data enabled by technology which has driven consumers to expect a seamless on boarding experience as it has become an industry hygiene factor which means customers can prioritise other important work. With a score of 87% on Ernst and Young's (2019) Fintech Adoption Index, China leads the world in adopting Fintech, well above the world average of 64%. The high adoption rate of FinTech in China indicates the massive usage of financial platforms in the country. The key to the popularity and adoption of FinTech in the country is due to the ease of setting up an account. In the 2019 survey, data showed that 27% of users ranked first in the criteria for choosing price and 20% had picked the convenience of opening an account (Ernst & Young, 2019). Chinese customers felt that boarding access to FinTech services was the most important, which is a result of adopting large-scale open APIs and platform-based services, which made accessing and adopting financial services easier (Ngai et al., 2016).

On the other hand, India is one of the fastest growing fintech hubs in the world. India has the highest Fintech adoption rate along with China. According to research data, digital payments are valued at \$ 65 billion in 2019 and are expected to grow at CAGR of 20% till 2023, reflecting the shift towards fintech in the country. India ranked 2nd on FinTech adoption around the world with the number of FinTech users at 57.9%. Although India's adoption rate is far behind China's 83.5%, it has surpassed that of other developed countries which is at 34.2%. The users comprise of both individuals and organizations who have been appreciative of Indian economy's transition to technology-driven economy. Demonetisation was a driver to shift to cashless mode of transactions as 86% of currency in circulation became invalid, which gave rise to the onset of the boom of mobile payment FinTech services in India. The day-to-day transactions made by cash has paved the way to cashless transactions, mobile banking, and tech-driven financial services (Financial Sector in India | Fintech Industry in India, n.d.).

Overall, India is a good market and opportunity for FinTech investment as the consumers become more tech-savvy, tech-driven and the regulatory environment becomes smooth to give a level-playing field for global investments in the Indian market.

Global Investment

Foreign Investments play a vital role in the growth and development of an industry as well as the economy of that respective country. Global investments towards a particular industry show the investor's interest as well as optimism towards an industry's growth. The Fintech industry has been well received throughout the globe and has been garnering a fair amount of investment from all parties across the globe. As per the data revealed in the Accenture Report, China was the leading FinTech player in the world in terms of deals valued at \$25.5 billion – which makes up for 46% of global FinTech investments in 2018 (Global Fintech Investments Surged in 2018 with Investments in China Taking the Lead, Accenture Analysis Finds; UK Gains Sharply Despite Brexit Doubts Accenture Newsroom, n.d.).

There are a lot of domestic investment opportunities for FinTech in China, which means that these FinTech companies in China do not need foreign investment to get the funding they need. However, in 2020, things changed as India again outpaced China in terms of FinTech investment. An analysis by Global Data showed that Q1 2020 FinTech investment in China came in at \$270 million value while

in India the FinTech investment was a whopping \$330 million. The total transaction value of FinTech investments in the Indian market is projected to increase from approximately \$ 65 billion in 2019 to \$ 140 billion in 2023. India surpassed China as the top FinTech investment market in Asia with \$286 million and 29 deals in comparison to China's \$192.1 million and 29 deals in Q1 of 2019. As per the Invest India Government website, the FPIs was positive in India at INR 47,334 crore in the month of August 2020 (Financial Sector in India | Fintech Industry in India, n.d.).

In the third quarter of 2019, according to a CB Insights Fintech report, India Fintech's start-up ecosystem got investments of \$ 674 million, while China stood at \$ 661 million. The deal value has grown for India from \$352 million in the second quarter of 2019, which is caused by the retrieval of investments from China as the amount fell from an astonishing \$1.8 billion in the fourth quarter of 2018 to just \$337 million in second quarter of 2019 and has given Indian an upper hand. China saw its funding grow to \$661 million, but nowhere near to the 2018's funding highs as stated in the report by CB Insights (Crowning Asia's Fintech Hub: India, China Continued to Fight It out; Here's the Winner, n.d.).

The downward trend of FinTech investments in China gives India a good opportunity to draw in FinTech funding and investment, which the FinTech start-up ecosystem must capitalize on.

Penetration of FinTech

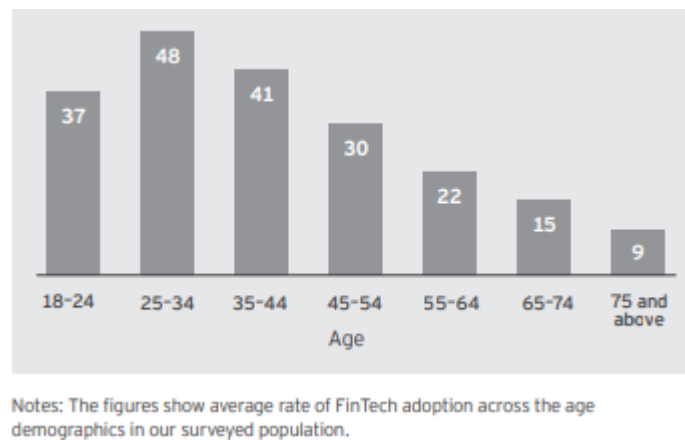
The major challenge for the acceptance of a commodity or service is how effectively an industry overcomes impending challenges to cater its services to the consumers, which constitutes as to how well an industry can penetrate the market. The penetration of FinTech is crucial for building sustainable economies and the Chinese FinTech sector has managed to do so by penetrating and transforming the Chinese economy significantly into a FinTech driven economy as most of the transactions happen through FinTech services offered by Tech giants like Alipay by the Alibaba Group and TenPay by Tencent Holdings. 69% of Chinese consumers in the last six months had used at least two fintech services. According to the EY report, India ranks second with 52% of consumers, followed by the United Kingdom at 42%. Mobile payment and transfer platforms are the most widely used Fintech services in China as 83% of Chinese customers make payments or transfer money through their phones. While 58% of Chinese consumers report using Fintech services for savings and investment, 46% use Fintech for credit purposes. According to Ernst and Young (2017) Alipay Head Li Wang for Europe, the Middle East and Africa (EMEA) said the mobile and online payment platform Alipay has 870 million active users, 600 million in China and 270 million worldwide.

FinTech customers make up more than 25% of the population, the highest percentage paid by 2015, with 358 million Chinese customers using mobile payments. Chinese citizens can make tax payments, receive results of consultations and health check-ups, book flights and other means of transportation, renew passports, request loans just by the usage of apps on their phones. But 10% of the entire global 'unbanked' population is in China which is almost 225 million people (What Is the Future of Fintech in China?, n.d.). Migrant populations suffer the most, with a system of receipts and slow wire transfers making sending and receiving money incredibly difficult. As this China Power report states, for decades, China reaped the benefits of a demographic dividend that supplied a young workforce for its manufacturing sector, which enabled China to emerge as a global economic power. The challenges of the Chinese based FinTech industry have an aging population, foreign competition, and global reputation.

On the other hand, FinTech in India has great scope since the country boasts of a youth demographic like no other country in the world which is rapidly growing as India is set to become the world's most

populated country over the next decade. Furthermore, penetration of smartphones in India is likely to grow from 26% in 2018 to 36% by 2020 and is forecasted to reach a billion users by 2025. The financial services market is untapped in India as 40% of the population have no association with any rural or regional bank and more than 80% of the transactions carried out are cash transactions¹. This gives FinTech start-ups a great opportunity to massively spread their markets in different segments. The Government of India in April 2016 brought in a structural change which categorizes peer-to-peer system as a Non-Banking Financial Company (NBFC). Peer-to-peer system is a type of crowd funding where loans are raised and is returned with interest. The platform or the two parties (borrowers and lenders) can mutually decide on an interest rate. Peer-to-peer will serve as a medium to make the borrowers and lenders transact with each other after the new norms are adopted. However, despite the significant changes, the country's population whose majority belongs to the rural landscape, poses a massive challenge for the FinTech sector to drive through and penetrate the Indian market (RBI Notifies P2P Lending Platforms as NBFCs: Agencies, n.d.).

Figure 1. Graph depicting FinTech Usage between the age of 18 - 75 years (%)
Source: Ernst and Young FinTech Adoption Index Report (2017)



The graphical analysis demonstrates the average rate of FinTech adoption across various age groups ranging from 18 years to 75+ years of age. The demographics goes on to illustrate how most of the younger population from 18-44 years have a higher FinTech adoption rate signifying their trust in the FinTech services and illustrating the tech-savvy nature of the upcoming generations in trying to adopt to tech-driven financial services in the Digital age.

Economy and Work Growth

Every industry plays a vital role in contributing to the economic growth of a nation, but the role of the FinTech Industry is of great importance as it has the power to change and transform economies beyond measure. The Financial Industry and Economy of China can be powered by FinTech services as it can promote the transformation and upgradation of the traditional financial industry. The traditional business can be continuously optimized and upgraded, improving the operational efficiency of the financial

markets, reducing operating costs, and continuously providing new vitality to the financial markets. For the macroeconomic environment, the development of Fintech plays a critical role. China's huge data network and consumer numbers have created a demand for the technical support of FinTech in various scenarios. For this reason, the future development of FinTech in the economy is particularly important.

China's FinTech ecosystem is supported by many Financial Services talents, complemented by technical and entrepreneurial expertise. China's 7.6 million Financial Services workforce provides a strong foundation for talent, with 500,000 financial expertise elites and 10,000 FinTech specific elites. However, there is a large gap between the requirements of SMEs and traditional banking products and systems. SMEs in China account for a significant share of China's GDP and employment, amounting to 80% and 60%, respectively, although their growth has slowed due to a lack of funding. As the economy of China slows down, banks are becoming more hesitant to address this issue presenting an important opening for the highly efficient, low-cost FinTech sector. Despite the enormous potential for growth of the insurance industry, which accounts for only 14% of GDP, it is much smaller than in the industrialised countries (Ngai et al., 2016).

FinTech has changed the development model of the financial industry by continuously expanding the financing channels of enterprises and reducing their operating costs. It has also changed China's economic structure by means of financial technology, big data, artificial intelligence, and cloud computing. FinTech has continuously innovated the financial industry's business platform to serve more investors. Through analysing the current development gaps in China's Fintech, such as imperfect laws and regulations, information securities and systems and technological development constraints, the development path of financial technology in the future is mainly concentrated on the legal, regulatory, and incentive mechanisms, to continuously improve the sustainability of the development of FinTech. The Chinese FinTech sector is estimated to contribute 1.97 trillion yuan in revenue by 2020.

Table 1. Figures showing comparison of economic parameters between India and China

PARAMETERS	INDIA	CHINA
Population	1,380,004,385 (1.3 billion)	1,439,323,776 (1.4 billion)
Gross Domestic Product	3.1 Trillion Dollars (nominal)	14.140 Trillion Dollars (nominal)
Mobile Penetration	394 Million (2017)	753 Million (2017)
Unbanked Population	191 Million (2018)	225 Million (2018)
FinTech Investments (in million dollars)	330 Million (Q1 2020)	270 Million (Q1 2020)

Source: Trading Economics (2020) and Government of India FinTech report (2019)

The ever-growing FinTech ecosystem in India has been helping in bridging the gaps between under-standing technology. The Indian FinTech sector has witnessed an inflow of investments valued at \$14.1 billion, showing promising signs of what is to come. FinTech offers an opportunity to get great work to a huge talent pool from engineering backgrounds (average pool of 850,000 graduate and post-graduates). In the future, India is expected to contribute 2.2% to the global digital payment market, with the value of such transactions expected to reach \$4.12 trillion worldwide by 2025. The Indian FinTech sector showed an investment of \$14.1 billion, indicating the future. Banks have transformed the operation model of the Global Extended Team into a service delivery model, which has led to the establishment of various cap-

tive centres in India. By 2035 the Indian financial sector will be growing rapidly, focusing on growing revenues, financial inclusion and digital adoption and India's digital payments could cross \$1 trillion. The Indian financial services sector is boosting the growth and opportunities of its economy ("Financial Sector in India | Fintech Industry in India", n.d.).

Digitisation of land records, timely updating and providing access to data (open APIs) will enable FinTech firms to enrol and deliver insurance products to the farmers in a hassle-free manner. It would also enable FinTech firms to leverage their credit underwriting models and lend higher credits to firms which will also help in the penetration of FinTech into the rural economy of the country. From a macro-prudential dimension, regulators in India would have to develop new methods of stress testing for the FinTech models. Well-connected, highly accessible economies will become much more important than the balance sheet size of the firms. Only once India meets all the challenges involved in pushing the growth of the FinTech ecosystem, can it help in bridging the gaps between the urban and rural population hence contributing to the economy of the country.

Qualitative Parameters

Ecosystem

Ecosystems are fundamental in creating an environment that acts as a catalyst for productivity, efficiency, and growth of an economy. The environment needs to have appropriate legal, technical, and production infrastructure that is necessary for the smooth functioning and growth of any industry. The FinTech Ecosystem in China is one of the most unique ecosystems across the globe as it has managed to synergise the sustainability aspect into the financial technology services provided in the country and stands out from the rest of the world as a pioneer in sustainable FinTech services. China has a wide range of mobile technology services like mobile payments when compared to some other countries. China has managed to incorporate and use FinTech in all the major financial sectors such as payments, borrowing, retail, banking, insurance, wealth management and trading. The payment market and healthcare market are both examples of vertical markets in contrast to the FinTech markets. The main underlying feature of Vertical markets is high barriers to entry for new companies. The FinTech start-up ecosystem in China has many more opportunities when it comes to creating products and reaching customers due to its wide application of FinTech. China has created a very competitive and unique landscape which comprises of monopolistic digital companies that have established all-inclusive multi licensed financial ecosystem. The country's ecosystem is not only unique due to the kind of technological advancement, but also due to the fact the companies have managed to incorporate sustainability. China's economy seeks to transit from investment led to consumer led hence increasing the demand among Chinese households for financial services. Alipay, a FinTech giant in the Chinese economy owned by the Alibaba group has a unique set of payment application that not only allows the users to experience FinTech seamlessly but helps them to understand the impact their purchases have on the environment and has incorporated a unique points system which enables the consumers to contribute their points for afforestation projects carried out by the company. The ecosystem in China is a perfect mix of technology, financial innovation, and sustainable inclusion.

A major kick-start in the Indian FinTech start-up ecosystem was provided by FinTech companies offering digital payment services. The ecosystem further diversified with many other FinTech services being offered such as P2P lending, credit rating, InsurTech, etc. India is ranked as one of the top 5

countries in terms of number of start-ups in the world. The start-up ecosystem is set to further expand its avenues with the help of digital and smart city initiatives taken by the government of India that are focused on building a robust technologically advanced infrastructure and ecosystems in the country. The development of such a sophisticated infrastructure would help in easing the process of customer onboarding and connectivity for the FinTech ecosystem in India. One of the new and unique trends that can be witnessed in the Indian ecosystem is that banks have started partnering with Accelerators and Incubators to show their support to the Fintech start-ups and one of the main elements influencing the strength of the development of the FinTech ecosystem is the availability of talent. India has the second biggest start-up ecosystem in APAC after China measured in deal size and number of deals. With SMEs being a part of the ecosystem in linking the rural and urban India, the Indian economy has started to grow multi-fold. Although a prominent link in the Indian economy, SMEs suffer from financial losses due to a wide gap created by inadequate financial access and lack of credit facilities, which the FinTech ecosystem is catering to fulfil by their tech-driven financial services and bridging the gap for adequate credit facilities. The scope for the Indian FinTech ecosystem lies in the opportunity to grow through certain challenges posed by the complexities of the Indian market. Challenges such as the absence of broad-based financial transaction infrastructure (which has been the reason for the extent of the un-banked population present in the country), lack of credit scores, home ownership details and the lack of financial and market literacy has played a major role in the lack of penetration of financial services. The Indian ecosystem has potential to become the world's largest and finest FinTech destination as the government envisions to move to a more transparent, seamless, and cashless economy and has scope to attain sustainable inclusion, giving a massive boost to the attainment of the Sustainable Development Goals of the UN.

Evolution of Digital Economies

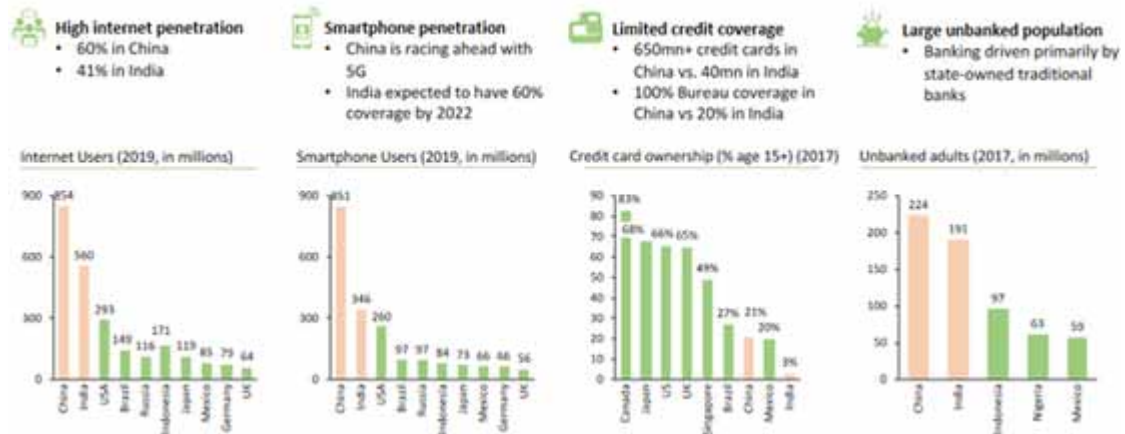
From the times of barter system to the introduction of currency and the evolution of cash transactions to cashless modes of payments, the structure and systems of economies have evolved drastically over time. The advancement in technologies has led to digitization of the economies and FinTech is the next great technological development in the evolution of economies into a digitized, transparent, and sustainable one.

In terms of development in China, it has been a global stand out economy and is regarded as one of the most dynamic and advanced markets as it has been successful in growing FinTech across the country. Its digital leadership is the outcome of its recent focus and innovation in digitizing and developing the economy, originating with the liberalising reforms of the late 1990s. Starting from lower levels of sophistication, efficiency, high degree of government interference and prominent State banks, the financial system in China has changed drastically in less than two decades. The key to this unrivalled modernisation has been possible with the help of new technologies, whose emergence coincided with awareness of the urgent need for bank restructuring. The emergence and establishment of extensive digital ecosystems supported by local technological firms is one of the key factors behind such a massive digital penetration. The vibrancy of China's FinTech industry also means that it will certainly face fresh challenges, and these will surely influence its future shape. In the short run, one of the most notable challenges will be the more demanding regulatory approach.

Figure 2. Graph depicting comparison of FinTech statistics between India and China

Source: World Economic Forum Innovation in Payments and FinTech Report (2020)

Figure 1: Market drivers supporting digital financial services³



As China revolutionised the financial aspect of their economy through digitalization, Internet Finance began to evolve rapidly in China and gained recognition across the globe since 2013 courtesy of the development of new connected network of information technologies and services which gave rise to various new business models such as third-party payment services, P2P loans, and crowd funding.

The Fintech ecosystem in China consists of 3 phases, the Phase 1 financial services revolution, the Phase 2 technology-based revolution and the Phase 3 business model revolution. Phase 1 includes financial products and services created using a variety of scenarios, the main driving force of which are Internet companies. Phase 2 includes new technologies that are being used to strengthen the financial supply to change the channels, products, and operations of financial institutions and to stay in close touch with demand. The main factors behind the second phase transformation are the financial institutions and internet companies of the centuries. Phase 3 involves the restructuring of the financial services business model, where the financial services in demand are transacted (How Fintech Is Shaping China's Financial Services? How Fintech Is Shaping, n.d.)

As India is growing from a data-poor to data-rich place, FinTech have started picking up. The Make in India initiative by the Government of India has been a radical change and a developmental initiative with a vision to be a global-manufacturing power and hub in the years to come. As a result of such an initiative, the boom of start-ups in India, particularly in the FinTech sector has provided a massive boost to the development of the innovative Tech-driven sector. FPIs are growing and remain positive in the Indian markets and as per August 2020 they hold a value of about INR 47,334 crore (FPIs Remain Positive on Indian Markets; Invest ₹47,334 Crore in August so Far, n.d.)

All this is made possible by various government initiatives such as the Digital India initiative and the Jan Dhan Yojana scheme, which aims to provide a bank account to every individual and expand the reach of banks across the country. India has a growing digital population of 370 million Internet users and still has less than 40% Internet access. The concept of digitization increases the access of existing FinTech start-ups and allows for new solutions and players. A new trend is emerging in India where banks have started collaborating with accelerators and incubators to support FinTech start-ups. The Indian

FinTech market offers a huge opportunity to increase demand in every segment like consumer loans, insurance, trade finance, digital payments. To promote cashless transactions, the government has taken active measures to move the economy to a cashless economy such as a tax rebate for merchants who accept more than 50% as an electronic payment. In the journey of FinTech in India lies many obstacles to conquer as Digitalisation makes way to transform lives of the financially backward rural population.

CONCLUSION

FinTech + Sustainable Development = Green Revolution

With the growing usage of Mobile phones, FinTech has taken the financial industry to the next level and has made financial procedures customer friendly. FinTech helps consumers and businesses to run seamlessly as it saves time and efforts because of the innovation of the financial players in this highly competitive sector. FinTech coupled with other radically growing technologies like Artificial Intelligence, Blockchain, big data, etc can prove to be a defining change and bring in ease to push towards sustainable and inclusive development along with transforming the financial and economic systems across the spectrum of the globe. Through this study the researchers evaluated the capability of FinTech to achieve sustainable living and whether it can be a key tool for Sustainable Development and further measured the levels of sustainability of India when compared to China. The evaluation indicators helped to reach certain conclusions about the future of FinTech in India as well as the globe such as,

1. Synergising FinTech and Sustainable Inclusion and Development is a task at hand for the world, but rapid advancement in technologies is making it easier to make such a vision a reality, and it can prove to be one of the finest advancements to help mankind progress to a sustainable, economical, healthy, and habitable living.
2. FinTech has not just opened a possibility to help advance financial systems and how finance takes place, but has also opened to multiple facets and dimensions like economic growth, environmental governance, social development, etc. The world, especially countries in the early stages of development must open an eye to an all-encompassing indicator like sustainable development rather than a one-dimensional indicator, such as the Gross Domestic Product (GDP) which focuses only on the economic aspect in the natural scheme of things.
3. Understanding the FinTech ecosystems in 2 very different economies like India and China, the scope for growth and what is next for these 2 economies in terms of FinTech, India, a developing country has a very huge scope in becoming the next FinTech Hub of the world as it transforms itself into a digitalised economy. China, a world economic superpower on the other hand has ventured into strategically using FinTech to incorporate Sustainable Inclusion in terms of further development of habitable living.

Through the research findings, the study concludes that when FinTech is synergised with Sustainable Development, it will lead to a Green Revolution and help the economies to not only attain their Sustainable Development Goals, but also address issues such as poverty, economic inequalities and push the countries to a more habitable, sustainable form of living.

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ENDNOTE

¹ Referred from Statista – Statistics Portal.

Chapter 19

Blockchain Technology in Securitization in India

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ABSTRACT

Blockchain and securitization's benefits go beyond the benefits of loan originating, underwriting, rating assignment and reviews, loan servicing, smart contracts, secondary market trading. This research is based on the qualitative data collected from external sources. The focus is on using secondary data from over 30 research papers, articles, and professional experiments that have been taken into account, and the formulas and conditions gathered from them have been experimented with the Indian economic scenario. The understanding is that securitization has always been a challenge in a country like India, but with the wide range of benefits from the 'blockchain', it can help improve the challenges and ensure a wider scope of securitization in a country like India, emphasizing that blockchain gives an elevated level of information security which brings about lower ingenuity trouble and disposes of administrative failures from the cycle of securitization.

INTRODUCTION

Blockchain is an arrangement of recording data such that makes it troublesome or difficult to change, hack, or cheat the framework. A blockchain is basically an advanced record of exchanges that is copied and dispersed over the whole organization of computer frameworks on the blockchain. Each square in

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the chain contains various exchanges, and each time another exchange happens on the blockchain, a record of that exchange is added to each member's record. The decentralized information base oversaw by different members is known as distributed ledger technology (DLT).

The very objective of this chapter is to understand the need of blockchain in a country like India. Focus of this chapter is based on how the Indian economy would be able to implement the decentralized blockchain method of securitization and what all problems the method would help the economy to solve. This research conducted would be based on the qualitative data collected from external sources. We focus on using secondary data from over a number of research papers, articles, and professional experiments that have been taken into account and the formulas and conditions gathered from them have been experimented with the Indian economic scenario.

In addition to the current introduction, the chapter includes two framing points, where a reflection on the impact and benefits of the implementation of the blockchain on asset securitization is carried out, a literature review and an analysis of the main challenges and possible solutions for its development in the Indian market. Finally, the general conclusions of the investigation are presented.

BLOCKCHAIN AND SECURITIZATION

Blockchain will bring vital changes within the potency, security, and transparency to several of the monetary sector's activities. The innovation's capability to disembarass procedures, lower prices, speed up exchanges, improve transparency, and brace security may impact all members within the securitization lifecycle—from originators, supports/guarantors, and servicers to rating offices, trustees, monetary specialists, and even controllers. Blockchain and securitization, their road ahead goes beyond the benefits of loan originating, underwriting, rating assignment and reviews, loan servicing, smart contracts, secondary market trading. Tracking financial assets on a blockchain can diminish dependence using credit card rating organizations and empower financial specialists to follow all the more intently the presentation of benefits and figure related hazards. This should expand certainty for speculators and increment enthusiasm for the optional market. By giving an elevated level of data security blockchain also can lower the due diligence burden and take away regulative inefficiencies from the securitization method. Blockchain, through its disintermediation and synchronic recording of data across the system, will just about eliminate time lags in data and payment flows throughout the securitization method, as well as within the secondary market. This increase in speed and certainty may considerably scale back counterparty risk, unleash capital, and scale back the come thresholds that investors demand. Blockchain's capability to extend the safety of transactions and knowledge and mitigate fraud may be appealing to the securitization trade, wherever integrity of knowledge is overriding. The speed during which blockchain technology will record transactions may additionally scale back efficiencies with reference to commerce and conjugation safety (Siddhartha, 2019).

Numerous budgetary organizations have begun attempting to apply blockchain innovation into monetary exchanges so as to diminish exchange expenses and increment operational efficiencies, particularly in money related note, cross-outskirt instalment and resource sponsored securitization. It tends to be seen that blockchain innovation can usually have application potentialities in cash connected fields presently (Conway, 2020).

Asset Backed Securitization suffers from information spatiality, inaccurate credit rating scores and poor product liquidity which results in NPAs (Non-performing Assets) as it does not provide reliable

data upon which financial institutions can grant credit to eligible candidates, blockchain technology overcomes this shortcoming and provides reliable and accurate data. Blockchain technology is in its earlier days and it can revolutionize the Indian finance industry and seek new growth in increased number of financial transactions by reducing the cost of intermediaries and providing security to clients' sensitive data. Blockchain technology decentralization in securitization will provide immense protection to digital data recorded in blocks of chain which will be extremely difficult for the hackers to tamper the sensitive data (Siddhartha, 2019).

Blockchain technology is like a web of a spider. The web is interconnected with each other through its centralized part and when a signal is passed it spreads to the entire web resulting in distribution of information. This means every time a new transaction occurs on the blockchain, a record of that transaction is added to every participant's ledger and every link contains the same information spread across the web whenever a signal is passed. By this we understand that it eliminates repetition of the same work multiple times. Blockchain technology reflects multiple effects whenever a transaction or an activity is performed. Blockchain technology has multiple applications over numerous industries like finance, supply chain, transportation, etc. which will reap benefits out of this futuristic technology. The blockchain technology in securitization has the power to revolutionize the outlook of the financial industry in the market. The blockchain technology can be greatly utilized throughout the securitization process. It reduces the service costs significantly and enables higher data management efficiency, transparency, and accountability, etc. which makes it the most impressive futuristic technology. It enhances the data protection and security of sensitive information right from asset origination to trading securities. Further in this chapter we will discuss how we can monetize the use of blockchain technology in Asset Backed Securitization (ABS) or Securitization process. Blockchain can make the securitization process much secured as it stores the data in digitally sealed form where it becomes next to impossible to tamper that information. As the name suggests blockchain is a chain of blocks where each block contains the information of activities performed and it is updated automatically whenever an activity is performed. The information stored in blockchain cannot be hacked. As every block is linked with each other and to tamper the information of one block you need to change the information of every block which makes it difficult for the hackers to even try hacking it (Sindle, et al., 2017).

Benefits of Blockchain in Securitization

According to different authors (for example, Sindle et al, 2017) the main benefits of blockchain are:

- **One stop destination:** Securitization faces loads of inefficiencies within the field of storage, transfer, reconciliation, and transparency of knowledge across totally different freelance entities. Blockchain facilitates elimination of these inefficiencies and helps maintain the information in a straightforward and economical manner;
- **Traceable audit path:** From credit origination to primary supplying, overhauling, and changes in proprietary within the secondary market, blockchain will create a consecutive and permanent review path of all transactions. With this ability, controllers and reviewers may eventually get a foundational perspective on the responsibility for hidden securitized resources;
- **Speed and certainty:** Blockchain, through its disintermediation and synchronic recording of data across the system, will just about eliminate time lags in data and payment flows throughout the securitization method, as well as within the secondary market. This increase in speed and cer-

tainty may considerably scale back counterparty risk, unleash capital, and scale back the come thresholds that investors demand;

- **Security:** Blockchain's capability to extend the safety of transactions and knowledge, and mitigate fraud may be appealing to the securitization trade, wherever integrity of knowledge is overriding;
- **Smart contracts:** totally different parties finalize dealing details and model the terms of the deal as a sensible contract. All parties would approve the model before it's recorded on the blockchain. Accord would eliminate duplication and scale back arrangement among totally different parties' models, making one "true" model for the lifetime of the dealing.

Literature Review

Blockchain Technology has been taken into the application by many financial institutions for financial transactions because it reduces transaction costs and increases not only operational efficiencies but also financial notes, cross-border payment, and asset-backed securitization. Blockchain technology has been looking forward to wider applications in the financial sector in the future (Wu & Duan, 2019). A major advantage of blockchain technology has been seen by decentralization, reliability, and modification of incomplete information game model of traditional securitization and a complete information game model of securitization of blocks in pattern as shown outstanding results were operating cost reduction gift management and profit increase over traditional securitization (Zhao, 2019).

Blockchain can play a significant role in most of the processes and fields of intellectual property asset securitization. It can use good data processing capabilities to make assets information more transparent and pricing more reasonable. Blockchain has achieved suburbanized agreement, blockchain would be ready to share a standard digital illustration of quality holdings and to stay track of the origination, execution, and settlement of the securities transactions. This might facilitate alter the interactions between players and manage the risks and assets in a very precise manner (Jiang, 2017).

Moreover, it has shown the potential it carries to establish a single course of information contestant among all parties which will ultimately show a drastic reduction in inefficiencies and costs. It has led to the most precise form of traceable, transparent, and auditable data at all stages in the securitization lifecycle from loan origination through secondary market transactions. It has minimized the risk of fraud and error. Regulators and auditors can use blockchain to trace ownership of the underlying securitized assets and any associated transactions (Apps & Mallia-Dare, 2019).

Financial Institutes that own too many long-term non liquid Assets and want to free up capital for new investment can benefit from securitization. The assets can be pooled together II and divided up into new securities, which can then be publicly traded. blockchain can be used to provide more transparency, and standardize and automate many of the securitization processes (Bankole, 2018), we will additionally perceive the blockchain technology helps break the possession of illiquid assets into items, decreasing the barriers for investment and increasing the liquidity of illiquid assets. The commerce method is additionally shortened and simplified by removing the intermediary (Mittal, 2019). Using blockchain, all the parties participating in the MBS are able to track assets, manage cash flow, and perform trusted business operations. it has transformed many activities in the securitization life cycle, it has significantly lowered the securities market, and has led to greater investor interest (Admin, 2018).

Blockchain when applied throughout the securitization process can help in the reduction in cost, time, and fraud risk, increases in certainty, trust and accuracy, the benefits can be significant. Tracking facility of blockchain has proven that it can reduce the reliance on credit rating Agencies and has helped

investors to track the performance of assets more closely and calculate the risk associated. This should increase confidence for investors and increase interest in the secondary market. Through the elimination of certain third-party intermediaries, blockchain can lower cost and save time (Cohen et al, 2017). Blockchain technology helps to prevent data tampering within the course of transaction, transactions on securities asset based on blockchain can be realized through the design of the storage system (Hongbo & Jing, 2018). Traditional business processes have a series of destruction because of blockchain introduction, centralized architecture for trusted third parties which needed to be verified can now operate in a decentralized way within the same level of certainty. Transparency, auditability, and security are the inherent characteristics of blockchain architecture. But the benefit we see blockchain being wrongly integrated as it solves the solution for rather than understanding the problem and proving that it has an adequate solution for it and therefore please market adoption challenges. More time should be spent by the companies on identifying the frictions and processes which benefit from the unique characteristic of this technology, we must understand that blockchain are just nodes of the network (miners) have the responsibility to link each other in a chronological manner. Every block must contain the hash of the previous block to create a chain (Crosby et al, 2016).

China has pioneered on the application of distributed ledger technology in the securitization market. Inefficiencies related to trade and service of the security can be reduced by the process and the speed at which the blockchain records the data. The trust in the accuracy and reliability of information has improved certainty which has led to faster payments and has made the securitization market as a whole more reliable (Blockchain, Cryptocurrency and Smart Contracts, n.d.), the unknown person behind bitcoin is Satoshi Nakamoto, a decade ago told how blockchain technology, a distributed peer-to-peer linked-structured, could be used to solve the of order maintenance of transactions and avoid double spending problems (Nakamoto, 2008) and its introduction had caused genuine disturbances to the customary business measures since the applications and transaction, which required centralized architectures or confided in outsiders to check them, would now be able to work in a decentralized manner with a similar degree of assurance. Ultimately, we must understand blockchains permit us to have a conveyed distributed organization where non-trusting individuals can undeniably communicate with each without the requirement for a confided authority (Crosby et al, 2016).

Blockchain currently has been applied in the financial field in a wide variety, which includes services by business, financial assets settlement, market prediction and economics in transactions. There is an expectation that blockchain technology will play an important role in sustainable development of the economies around the world, providing benefits to customers, to the current banking system and the whole society in general (Nguyen, 2016) there has been a wide exploration on ways of implementation of blockchain on financial assets such as securities, fiat money, and derivatives contracts. For example, massive changes such as more efficient ways of performing operations securities, derivatives transactions, (Vanderhoydonk, 2016) digital payments, loan management schemes, general banking services, financial auditing or cryptocurrency payment and exchanges(i.e., e-wallets) has been provided by the blockchain technology, loan management schemes, general banking services, financial auditing or cryptocurrency payment and exchange (i.e., e-wallets). Steps towards usage of blockchain technology in securitization has been initiated, the participant attitude plays a major role towards the success of its implementation, it has the power to reinvent the concepts and restore the confidence in the process and the financial industry (Bostrom, 2019), despite the fact that another innovation's latent capacity isn't constantly acknowledged, and it is once in a while acknowledged precisely as its first advocates foresee, the size of blockchain's potential makes it significant for the monetary world as a rule—and the securi-

tization business specifically—to proactively consider the difficulties and openings that this innovation will probably make (Sindle, et al., 2017)

Blockchain Will Become the ‘Beating Heart’ of the Global Financial System.” — World Economic Forum.

Though blockchain technology is in its early days, it has shown promising results in the finance industry with its futuristic technology which is going to be adopted by most of the business units leading to cost control, easy fast and safe economic transactions. The blockchain in securitization will touch upon important areas where investor’s data safety and security will be maintained at lower cost and quicker payment streams. The blockchain can potentially enhance liquidity and reduce the risk in securitization. This will improve prices and trading volume. The securitization will become safer and more stable which will help the economy in a broader aspect, and it will also lead to healthy demand and supply ratio in the financial market (Siddhartha, 2019).

Traditional securitization systems require a bulk of documentation that needs to be presented for availing any kind of loans or financial needs. Blockchain technology eliminates the paperwork to a large extent and prevents fraudulent activities as data is stored and sealed in digital records. With the advent of blockchain technology, it has now become possible to address many challenges with securitization. The data stored on the blockchain cannot be changed and there is no need to consult previous transactions as the information is imbibed in the blocks of the chain which makes it easier for auditors to verify the process efficiently. Blockchain has the resource to solve many problems in the field of securitization right from removing unfair credit rating, easy identification and status of assets. Blockchain ensures greater data security and thereby helps prevent any kind of fraudulent trades, blockchain can help in creation of smart contracts and can also be used to enhance efficiency throughout the securitization process (Siddhartha, 2019).

Blockchain Technology can help eliminate any kind of information distinction between the investors and financial intermediaries by combining the blockchain chronologically in a manner that information can be updated on a hyperledger or a distributed ledger, that can be viewed by both parties and thereby it guarantees the authenticity of information which cannot be falsified. Blockchain has achieved decentralized consensus, blockchain would have the option to share a typical representation of asset holdings and to monitor the origination, execution and finalizing of the securities transactions. This could help automate the interactions between players and manage the risks and assets in a precise manner. The blockchain’s consensus mechanism will impart more trust, automation and efficiency, immutability and remove or reduce human error. The decentralized nature eliminates the need for single authority and helps spread the authority over different investors (Siddhartha, 2019).

Blockchain has the potential to transform the securitization lifecycle, thereby reducing the risk in the securitization market, providing a better return to the investors. This platform brings all parties involved in the securitization process in the same bracket and removing the single authority system. Blockchain ensures parties involved in the Mortgaged backed securities (MBS) are able to track all the assets, perform various business transactions and functions, and at the same time ensure efficient cash management. Another highlight could be the smart contracts created that reduce expenses and fastens the speed of settlement. Blockchain technology ensures security and confidentiality in the matter ownership in the securitization process by authorizing the trustees in a block format, thereby regulators have full access right and gain full view of the asset ownership and monitor the systematic risk (Candence, 2019).

This technology ensures transparency in the rating of various assets and helps track the performance of the security, thereby reducing risk of the investors.

Security estimating would turn out to be more precise with an expected narrowing of spreads as all speculators gain the capacity to make constant evaluations of security esteems by following moving examples in advance level instalments. Different settlement stages can be made especially in the secondary market. Another key aspect of this technology is the smart contract which ensures that structured reporting and compliance become easier and mechanized (Candence, 2019).

Blockchain technology can easily track down financial assets and reduce reliability on credit rating agencies which will allow investors to closely observe the performance of financial assets and take calculated risks associated in investing activities. Blockchain technology helps in smooth use of smart contracts by bringing all the data under one umbrella by consolidating it and standardizing the process of servicing and tracking down the activities of service providers. The speed where blockchain technology can process and record transactions could likewise decrease efficiencies relating with exchanging and adjusting the security. Trust in the accuracy and accessibility of data takes into account expanded sureness and quicker instalments and much more prominent trust in the securitization segment all in all (Candence, 2019).

Blockchain's capability to build up a solitary wellspring of data steady among all parties will at last radically diminish wasteful aspects and expenses. This prompts discernible, straightforward and auditable information at all phases in the securitization lifecycle from advance beginning through to auxiliary market exchanges. Notwithstanding limiting the danger of extortion or mistake by and large, consistency commitments could be all the more effortlessly met as controllers and examiners can utilize the blockchain to trace any associated transactions and at the same time determine the ownership of the underlying securitized assets. Permissioned Blockchain ensures that various investors information and transactions are secured, wherein the access isn't alone with certain parties but rather with all investors in a secured format having access to their share in the securitization process which ensure greater transparency and compliance on part of the regulators. Budgetary foundations that own too many drawn out non-fluid resources and need to let loose capital for new speculations can profit by securitization. The resources can be pooled together and split into protections, which would then be able to be traded on an open market. Blockchain can be utilized to give more straightforwardness and normalize and robotize a significant number of the securitization measures (Mitchell & Moran, 2019).

Ultimately, we must understand blockchains permit us to have a conveyed distributed organization where non-trusting individuals can undeniably communicate with each without the requirement for a confided authority. The blockchain network make use of ordinary internet network and users can access blockchain applications easily via a browser. This is finished by changing the agreement into PC code and putting it in the organization. The agreement is changeless after it is made, and it acts equivalent to modified so arrangements will stay unaltered. Blockchain has achieved suburbanized agreement, blockchain would be ready to share a standard digital illustration of quality holdings and to stay track of the origination, execution, and settlement of the securities transactions (Mitchell & Moran, 2019).

Blockchain is an incomplete information base, half developed platform, and a network empowering agent. Similarly, as the World Wide Web empowers data streams with its innovation norms on top of the web, blockchain is another build of convention that sits on top of the web and empowers esteem potentially stream as unreservedly as data at present does. A consortium blockchain is a semi-decentralized blockchain, which implies it lies in the middle of a public and a private blockchain. Consortium blockchain halfway shows the properties of both public and private blockchains, however it holds a large portion

of the qualities of a private blockchain. A hybrid blockchain is a blend of both the public blockchain and private blockchain. It joins the points of interest qualities of each blockchain, individually, that is, a hybrid blockchain represses the protection advantages of private blockchain and straightforwardness advantages of a public blockchain as indicated by need. The protected Interchain capacity offered ascended to the hybrid idea of the blockchain empowering the half breed blockchain to have various chain organizations of blockchains (Mitchell & Moran, 2019).

ANALYSES, SOLUTIONS AND RECOMENDATIONS

In a country like in India where the scope of securitization of assets is huge, the growth of this market is slow due to the massive challenges faced in securitizing an asset. Based on different studies and researches identified below, we highlight 11 of the key challenges that affect the securitization of assets in India and the contribution of Blockchain to solve these problems

The Key Challenges Concerning Securitization in India are related with different issues. Although, blockchain can contribute in different ways to its dynamization. These ideas are presented after.

1. The floating rate of interest is not very popular in India because not many people have knowledge about it and those who have the knowledge can't take advantage of it because there is always a ceiling rate present to stop customers from drawing huge profits from it. Stockholders for the most part lean toward PTCs at fixed loan costs. Nonetheless, since foundation credits have floating rates connected to the bank's base rate, picking up stockholders' interest is a task (Romero-Torres et al, 2017). Blockchain can help in drifting financing cost MBS; besides, financing cost changes some of the time cause prepayments of credits. This causes in-adequate instalments from the hidden borrowers, which may cause diminishing yields or perhaps defaulting for instalment servicers. This is frequently additionally one among the torments of servicer hazard. Blockchain can reduce such exposure and eliminate undue fluctuation in the interest rate ("Blockchain Mortgage: Reduce home loan costs and reach settlement faster", 2018).
2. The process of syndication of banks providing loans for infrastructure assets represent a caution in providing infrastructure credit deals. The infrastructure loan in India is generally given by the banks or lenders operating in partnerships. In this way, securitizing a bank's portfolio will require no objection certificate from the other banks. The process takes tedious time and paperwork becomes costlier for both the customer and the banker (Romero-Torres et al, 2017). The blockchain can help banks in providing loans to individuals with ease as it is a decentralized ledger which helps in tracking the transactions with more transparency. With the help of blockchain technology, banks no more have to depend on custodial services and regulating bodies such as SWIFT in transferring money securely. The blockchain can help banks settle the transaction over decentralized ledger i.e. blockchain which can cut down unnecessary hassle in providing loan amounts ("Blockchain Solutions for Syndicated Loans", n.d.)
3. The Stamp duty and land laws create, also, some problems. One big, obvious problem with stamp duty is that it reduces churn, which makes the housing supply inefficient. Developing families are more averse to exchange up to greater houses regardless of whether space is tight, and most individuals are less inclined to exchange down, regardless of whether they are rattling around the empty nests (Romero-Torres et al, 2017). The realization of the complete benefits of blockchain technol-

ogy in land transactions would see the technology used not just for storage of data concerning land ownership, but act as a platform for payment of stamp tax, registration of title deeds, payment for utilities, and more. Land transactions in India are governed by multiple central and state-specific legislations. Interestingly, the knowledge Technology Act, a central legislation, doesn't afford legal sanctity to instruments (contracts) effectuating a change in title of immovable property (for example, land). Moreover, the Registration Act, handling registration of instruments including for property transactions, requires the physical presence of the parties and witnesses before the registration process. Other state specific legislations have made land transactions in India a frightening and very slow process. Some examples are stated below:

- a. Obligation to offer duly stamped documents when an amount greater than Rs. 20 is received (if so, demanded by the opposite party): Indian Stamp Act, 1889 the first act requires that the receipt be stamped and given in physical form. While some states have made a provision for online payment of stamp tax, however the concerned party still has to physically attend designated centers for printing of the stamp paper;
- b. Persons to present documents for registration: Registration Act, 1908 the first law requires an individual and his/her representative to be present at the registrar's office for the needs of registration. This law would wish to be amended for a full scale blockchain implementation to get rid of the mandatory presence of an individual since the whole process would be conducted digitally.

Key to the legislative and regulatory enterprise surrounding blockchain is the need for using clear and straightforward language to enable lawmakers and practitioners to grapple with, and starting assuming control over, the constantly evolving blockchain ecosystem. The choice of language will go an extended way in ensuring that the top users make informed decisions and reduce the facility imbalance, given the legal and technical risks surrounding blockchain applications. Adopting standardized terminologies for blockchain concepts will help demystify the technological enigma that blockchain is formed ("Blockchain: The India Strategy", 2020).

4. The homogeneity of underlying asset pool is other challenge. The RBI's securitization guidelines command the homogeneity of resources in the resource pool. The guidelines don't characterize the homogeneity from an administrative viewpoint, yet the pool of framework resources of various areas could be considered as "homogeneous." Therefore, the homogeneity test would rely upon how the resources are distinguished and are pooled just as on how the speculators see the business hazards in the structure (Romero-Torres et al, 2017). Blockchain can be very useful in helping pooling of homogeneous assets and it helps in meeting the requirements of the SPV. Using special algorithms of the Blockchain it can help the SPV gather such assets which are homogeneous in nature and ensure easy securitization of these assets. These algorithms can also help banking institutions to gain revenue from their NPAs as such assets can be easily securitized using the blockchain algorithms thereby acting as a source of revenue to the banking institution. These algorithms help the SPV to detect those assets which do not meet the requirements or standards which hampered the securitization process hence blockchain can help the SPV and originator ease in the process of pooling of homogenous assets ("Blockchain: The India Strategy", 2020).
5. The credit tranching includes the issuance of numerous classes (or tranches) of securities, with various risk-return profiles. Junior tranches are the higher-hazard tranches, which work security

instruments for the higher-evaluated senior tranches, through subjection in guarantee over the pool of cash streams. The incomes are organized to pay the senior-most tranches first, while the misfortunes are consumed by the lesser most tranches (Romero-Torres et al, 2017). The credit tranching is a multi-layered capital structure created which consists of senior and subordinated tranches i.e. classes. All tranches when formed together make up the capital/ liability structure and are paid in order of sequence from most senior to most subordinate. In India, the financial institutions face challenges in providing credit to genuine borrowers because the credit ratings given to an individual company/person are not accurate and it leads to defaults. With the introduction of blockchain technology into securitization it can improve the credit tranching aspect by giving most accurate credit ratings which can help the financial institution in lending funds to individuals and reduce the NPAs by a significant margin. The investors can find it more reliable in floating their investments and provide credit to genuine borrowers with better credit ratings. Though there are challenges in giving accurate credit ratings the blockchain technology can help improve the securitization process in India significantly (Meralli, 2020).

6. The absence of agencies like the Special Purpose Vehicle (SPV) ensures that the mortgaged assets are converted into liquid securities which helps in maintaining the cash flow in the economy (“Blockchain improves operational efficiency”, 2019). SPV is a challenge in India to convert illiquid assets into liquid assets due to absence of SPV agencies. The blockchain technology can help overcome this challenge by acting as SPV. As blockchain technology involves no intermediaries and with less paperwork hassle it can significantly play a major role of SPV in the securitization process in India by providing a more reliable and safer platform for the investors (Sindle, et al., 2017)
7. There is difficulty in transferring of assets by the banks to the Special Purpose Vehicle because various permits have to be obtained in the process. It involves lots of documentation work and multiple verifications which becomes strenuous for both the parties. Transferring assets is not an easy task and it brings in miscellaneous charges and duties which needs to be paid (Romero-Torres et al, 2017). The blockchain technology can help overcome this challenge by replacing intermediaries and reducing the paperwork. It can significantly improve the process of transferring assets from banks to Special Purpose Vehicles (SPV) by storing data on digitally sealed platforms which makes the storage of legal sensitive information more safe and secure (Sindle, et al., 2017).
8. The higher stamp and transfer charges also create difficulties. Stamp and transfer charge is a state subject, because goes under the domain of the states. Also, the stamp charge is distinctive in a few states. Significant level of stamp obligations would make the securitization exchange uneconomical. Maharashtra, Tamil Nadu and Karnataka have decreased the stamp charges payable on the securitization exchanges significantly (0.1 percent) in order to support the occasion of this instrument. However, usually the frequency of stamp charges stays as high as 13-14 percent (Legal & Taxation Recommendations, 1999). Blockchain technology can help ease any kind of transfer charges and stamp duty between the SPV and originator, utilizing blockchain throughout the transaction could help ease the process—while at the same time lowering audit risks, decreasing transaction and administrative costs, and allowing tax departments to switch their focus back to actively supporting the securitisation process. Blockchain provides a single-format data which gives complete history of each asset and individual price conditions along the trade flow, thereby improving their ability to set intercompany prices properly—and even automate price setting and Blockchain can help simplify the process of accurately charging and accounting for intercompany transactions. Using

smart contracts can completely remove the need for stamp duty, using the specific algorithms the burden of transfer pricing can be avoided, preventing incorrect or unanticipated intercompany transactions could all be automated within the private blockchain. Blockchain can ensure easier audits and at the same time limit the access of tax authorities. to validate transactions on the public blockchain, all participants must agree on the validity. Intercompany consensus could mean approval by the transacting parties, and automated checks put in place by the tax department, internal audit (Karanjia et al, 2017).

9. The process of securitization includes pooling of assets which can bring conflicts. The loans are negotiated on an individual basis in case of the infrastructure assets and therefore there is no existence of set terms and conditions. The clauses for giving credit must be scrutinized in order to see that the loan agreement doesn't clash within the pool created. And as a result, it poses a challenge for PTC issuance to the investors (Sindle, et al., 2017). Blockchain can help in immutable audit trails thereby permitting ever assets to be connected to a specific security. The blockchain technology will maintain crisp records of assets and track their homogeneity in terms of their value, maturity period, risk-return factor, etc. and also remove the risk of double-pledging assets. Blockchain can help in giving a structured or organized perspective towards possession of key securitized assets. It can help in identifying the true owner of the key securitized assets. Also, blockchain can help in the simultaneous recording of information of various assets and avoid any can kind conflicts. This technology can help auditing firms review the pool of assets and also help rating agencies monitor the securities or asset performance. Tokenization of assets can be another manner blockchain can help reduce the possibility of conflicts, ensuring efficiency during the process of pooling of assets (OECD, 2020).
10. Absence/partial credit enhancement have deeply affected the securitization market and its implementation. So far, CRISILs (CRISIL is a company that assign ratings to assets in India) experience with asset backed securities (ABS) has been good (Romero-Torres et al, 2017). Asset performance will certainly be influenced but at first ought to blockchain be embraced, nor would we be able to anticipate that borrower conduct should be affected by the use of blockchain. Accordingly, we accept the credit nature of the resources would be the littlest sum influenced mainstay of our examination. Chronicled execution information wants to measure our base-case suspicions in certain resource classes would probably be completely straightforward and less defenseless to control if accessible on the blockchain. By relocating to a blockchain stage, there may be less dependence on outsider review reports or other scientific overlays, which presently give comfort on information unwavering quality. Blockchain could likewise leave point by point advance level execution information and insurance qualities - for resources where this is regularly not the current norm, (for example, automobile advances and MasterCard receivables) - which could advise our credit examination (OECD, 2020).
11. Other issue is the transparency among participants. The banks prefer revealing the information for the asset-backed securities issued by them to reinforce the cashflow mobility in the economy. The level of transparency is wastefully low. We show that various varieties of public intervention (compulsory transparency guidelines or arrangement of liquidity to bothered banks) have very unique welfare implications. The numerous facts and numbers are hidden from investors. It results in lack of transparency and investors do not feel confident in making investments (Sindle, et al., 2017). With intervention of the blockchain technology many of these disadvantages turn into advantages with investors getting regular updates of the assets, its performance, understand-

ing the property market, about the borrowers. Furthermore, the use of smart contracts is ready to satisfy the rights, commitments, and potential results between two parties settled upon ahead of time. The investors do not have access to reliable data in order to make well-formed decisions in the markets. Application of Blockchain technology can significantly improve data transparency by recording, tracking and aggregating various data to put the investors on an advantageous side in making effective decisions in the market. Blockchain provides a real time encryption mechanism that safeguards the transparency. Blockchain technology can bring in more excitement, accountability and transparency among investors as the markets will not move based on hype created in the market but based on the various data provided by the blockchain technology and this in turn will bring a positive change in the economy. As a result, the transparency and investor security are protected (Karanjia et al, 2017).

CONCLUSION

Securitization is a key component for the growth of the economy and also an important source of capital for the financial sector, the potential of securitization in a country like in India. Securitization has always been a challenge in a country like India, but with the wide range of benefits from the 'blockchain' can help improve the challenges and ensure a wider scope of securitization in a country like India. Blockchain can help in a new lifecycle of securitization. Blockchain can ensure easy securitization of assets, perfection of data, quicker and secured payments, and better safety of securitized assets and ensure wider scope of easy investment for the investors. With the implementation of permissioned blockchains can confine a gathering's admittance to the blockchain and furthermore cut off such gatherings peruse and compose admittance to the information put away on the blockchain. Permissioned blockchain guarantees more noteworthy materialism in the money related administrations area. Structuring securities is an intricate cycle that includes an extraordinary duplication of the work, that can be completely automated and remove any kind of duplication and replication of works. Blockchain and securitization, their road ahead goes beyond the benefits of loan originating, underwriting, rating assignment and reviews, loan servicing, smart contracts, secondary market trading. Tracking financial assets on a blockchain can diminish dependence using credit card rating organizations and empower financial specialists to follow all the more intently the presentation of benefits and figure related hazards. This should expand certainty for speculators and increment enthusiasm for the optional market. By giving an elevated level of information security, blockchain can likewise bring down the due determination burden and eliminate administrative shortcomings from the securitization cycle.

We would conclude our paper by emphasizing that Blockchain gives an elevated level of information security which brings about lower due ingenuity trouble and disposes of administrative failures from the cycle of securitization. Blockchain eliminates outsider mediators and spares time and cost and can get critical changes, proficiency, security, and straightforwardness to a considerable lot of the monetary area's exercises. The advancement's ability to streamline systems, lower costs, accelerate trades, improve straightforwardness, and support security could affect all individuals in the securitization lifecycle—from originators, underpins/underwriters, and servicers to rating workplaces, trustees, monetary masters, and even regulators.

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KEY TERMS AND DEFINITIONS

Asset-Backed Security: An asset-backed security (ABS) is an investment security—a bond or note—which is collateralized by a pool of assets, such as loans, leases, credit card debt, royalties, or receivables.

Counterparty Risk: Counterparty risk is the likelihood or probability that one of those involved in a transaction might default on its contractual obligation. Counterparty risk can exist in credit, investment, and trading transactions.

Cryptocurrency: A digital currency in which transactions are verified and records maintained by a decentralized system using cryptography, rather than by a centralized authority.

Data Security: Data Security is a process of protecting files, databases, and accounts on a network by adopting a set of controls, applications, and techniques that identify the relative importance of different datasets, their sensitivity, regulatory compliance requirements and then applying appropriate protections to secure those resources.

Data Tampering: Data tampering is the act of deliberately modifying (destroying, manipulating, or editing) data through unauthorized channels.

Data Transparency: The ability to easily access and work with data no matter where they are located or what application created them.

Distributed Ledger Technology: Distributed ledger technology (DLT) is a digital system for recording the transaction of assets in which the transactions and their details are recorded in multiple places at the same time.

Smart Contracts: A smart contract is a self-executing contract with the terms of the agreement between buyer and seller being directly written into lines of code. The code and the agreements contained therein exist across a distributed, decentralized blockchain network. The code controls the execution, and transactions are trackable and irreversible.

Section 4

Financial Markets

Chapter 20

Foreign Exchange Market Shocks in the Context of the Global Pandemic (COVID–19)

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ABSTRACT

This chapter analyzes the efficiency, in its weak form, in the international exchange markets from January 1st, 2019 to July 21st, 2020. The results show that the foreign exchange markets show very high levels of integration, which may jeopardize portfolio diversification as well as possible hedging operations. The detrended fluctuation analysis (DFA) shows that the EUR.GBP, GBP.USD, USD.REAL foreign exchange markets show some signs of (in)efficiency showing persistence in yields, while the EUR.JPY, EUR.USD, JPY.CHF, USD.CHF, USD.JPY markets show signs of anti persistence (i.e., the existence of short memories). The USD.BITCOIN, USD.CAD markets do not reject the random walk hypothesis, that is, they are in equilibrium. By way of conclusion, the authors show that the uncertainty of the 2020 pandemic crisis has affected the memory properties of the foreign exchange markets since some returns can be expected, creating opportunities for arbitrage and abnormal profits.

INTRODUCTION

The market efficiency hypothesis is a very relevant concept for international investors who want to have their portfolios diversified to mitigate the inherent risk of global financial markets. With the global economy becoming increasingly integrated, international investors have sought to diversify their portfolios into more exotic markets in different ways, with the goal that their asset synchronizations are low.

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Testing the synchronizations between markets and inferring the existence of portfolio diversification hypotheses when markets are not integrated may give rise to distorted evidence. We have seen a strong correlation between past and future data series, which makes it possible for an investor to have anomalous returns when selecting an appropriate trading strategy. The possibility that investors can predict future price changes could cause imbalances in financial markets making it difficult to implement efficient portfolio diversification strategies (Alexandre, Dias, and Heliodoro, 2020; Alexandre, Heliodoro, and Dias, 2019; Dias, R. and Pereira, 2020; Dias, R. and Carvalho, 2020; Dias, da Silva, and Dionisio, 2019; Dias, Heliodoro, Alexandre, Santos, and Farinha, 2021; Dias, Heliodoro, Alexandre, et al, 2020a; Dias, Heliodoro, Alexandre, & Vasco, 2020b; Dias, Heliodoro, Alexandre, et al., 2020a; Dias, Heliodoro, Teixeira, and Godinho, 2020; Dias, Pardal, Teixeira, and Machová, 2020; Dias, Teixeira, Machova, et al., 2020; Heliodoro, Dias, and Alexandre, 2020; Heliodoro, Dias, Alexandre, and Vasco, 2020; Pardal, Dias, Šuleř, Teixeira, and Krulický, 2020).

Different studies have analyzed the issue of market efficiency, examining the hypothesis of predictability of returns, through the analysis of the reversion to the average in the prices of financial markets (Fama and French, 1988). When the hypotheses of random walk and informational efficiency are rejected, they cause extreme movements in stock prices. The occurrence of these phenomena may, eventually, decrease the implementation of efficient portfolio diversification strategies (Malafeyev, Awasthi, S. Kambekar, and Kupinskaya, 2019; Sadat and Hasan, 2019).

Speculation is part of the process of price discovery and that efforts to reduce such speculation significantly reduces information efficiency in the foreign exchange markets. In view of these events this chapter aims to test the efficiency, in its weak form, among the foreign exchange markets, EUR.GBP, EUR.JPY, EUR.USD, GBP.USD, JPY.CHF, USD.BTC, USD.CAD, USD.CHF, USD.JPY, USD.JPY, USD.BRL, in order to assess whether these foreign exchange markets have robust hedging and diversification characteristics. In order to conduct this analysis, different approaches were undertaken to assess whether: (i) in periods of high volatility, do foreign exchange markets tend to integrate? (ii) whether the global pandemic accentuates (in) efficiency in international foreign exchange markets? The results suggest that the foreign exchange markets are mostly integrated (63 out of 90 possible), which may jeopardize portfolio diversification. The results of the exponents Detrended Fluctuation Analysis (DFA), show that the foreign exchange markets reject, in the majority, the random walk hypothesis. These findings have implications for investors, since some returns can be expected, creating opportunities for arbitrage and abnormal earnings.

This investigation adds relevant contributions to the literature. The most relevant contribution is related to the study of the reversion to the average in the international exchange markets, with the objective of understanding the different predictability between them, in the context of the global pandemic (Covid-19). As far as we know, this is the first study to analyze these foreign exchange markets in isolation, in the context of the global pandemic (Covid-19). The authors Ning, Wang, and Su (2017), Matebejana, Motlaleng, and Juana (2017), Njindan Iyke (2019), Chaudhry, Hanif, Hassan, and Chani (2019), analyzed the reversion to the average in the foreign exchange markets, testing the random walk and efficient market hypotheses in their weak form, but the approach was essentially different from that followed in this essay.

In terms of structure, this chapter is organized in 5 sections. Section 2 presents a Literature Review regarding articles on the random walk hypothesis in international exchange markets. Section 3 describes the methodology and data. Section 4 contains the results. Section 5 presents the main conclusions.

LITERATURE REVIEW

The first notion of market efficiency was presented by Gibson (1889), the author considered that the value that stocks acquired when they became public in the market was considered the best value about themselves, because they reflected the most complete information. Later, the French mathematician Bachelier (1900), sharing the same idea of market efficiency, found that the behavior of asset prices fluctuates randomly and unpredictably, that is, they are independent of previous fluctuations, thus formulating the random walk hypothesis. Bachelier's work (1900) was a contribution to what would become one of the most famous theories in finance, the market efficiency hypothesis. Later academics such as Cowles (1933), Cowles (1944), Working (1949) reinforced the random walk hypothesis, explaining that investors could not influence future returns based on historical prices, so they could not face an apparently "perfect" market in order to obtain the expected extraordinary profits.

Later, other studies by Roberts (1959), Osborne, (1959), Granger and Morgenstern (1963) reinforced the random walk hypothesis, describing the behavior of asset prices as a stochastic process in which the future forecasts of securities are not affected by their historical prices.

Fama (1965b) in his article: The behavior of stock prices empirically tested asset price behavior using the random walk model, by analyzing the daily stock prices of thirty securities from the Dow-Jones Industrial Average index between 1957 and 1962. The results obtained are in accordance with the random walk model, where asset prices have no memory, thus making it impossible to predict future prices based on past prices, being totally unpredictable.

For Fama (1965a), the efficient market consists of a group of rational agents who compete to predict the behavior of asset prices. Assuming that all relevant information is already available to all market participants, any new information would be quickly reflected in the price of assets, thus preventing agents from being able to predict the price behavior and thus obtain additional profits without incurring additional risks. In short, an efficient market is one in which prices fully reflect all available information (Fama, 1970).

For Fama (1970), the verification of the market efficiency hypothesis implies that some conditions are verified, namely the inexistence of transaction costs, the free accessibility to information by all market players and finally a common agreement on the effect of information and its current and future impact on securities. The verification of these conditions is regarded as sufficient but not necessary, since these assumptions are not completely verified in the BRL market (Fama, 1970).

Given the available information set, there are three levels of market efficiency proposed by Fama (1970):

- weak form efficiency
- semi-strong form efficiency
- strong form efficiency

In order to identify each form of efficiency, several hypothesis tests were developed to validate in which state the market is or even if it is inefficient (Fama, 1970).

Eugene Fama contributed in a truly positive way, focusing much of his work between 1970 and 1991 on the market efficiency hypothesis. There is an evolution to be noted in this theme since the works before 1970 were entirely in favor of the efficiency hypothesis, whereas the works after that date present some disparate results.

Fama (1991) improved the tests of efficiency levels and suggested other designations with the objective of better describing each type of test. For the weak form tests, variables such as interest rate, annual dividends and the PER ratio were included and since then it has been called the predictability of returns test. The semi-strong form tests, which consider public information in the formation of stock prices, were changed to event study. And finally, the strong form tests were changed to private information tests.

Several literature have addressed the issue of market efficiency, analyzing the hypothesis of profitability predictability, through the analysis of patterns of reversion to the average of the stock market prices, inspired by the seminal works of Poterba and Summers (1988), Fama and French (1988), who documented the reversion to the average in the returns of the stock markets, over time horizons of more than one year.

Chiang, Lee, Su, and Tzou (2010), Lazăr, Todea, and Filip (2012), Bekiros and Marcellino (2013) analyzed the random walk hypothesis in the foreign exchange markets. Chiang, Lee, Su, and Tzou (2010) show that the foreign exchange markets in Japan, South Korea and the Philippines are efficient, in their weak form, while the foreign exchange market in Taiwan shows signs of (in) efficiency. The authors Lazăr, Todea, and Filip (2012) show that the 2008 financial crisis significantly affected the efficiency of the foreign exchange markets. In the second half of 2008 and the first months of 2009, the Turkish lira, Russian ruble, Czech koruna, Romanian leu, Polish zloty and Hungarian forint markets show signs of (in) efficiency. However, in the second phase of the 2008 crisis, the Hungarian, Polish and Romanian markets show signs of readjustment, while the foreign exchange markets in Russia, Turkey and the Czech Republic show minor signs of readjustment, that is, they still show some signs (in) efficiency. Bekiros and Marcellino (2013) investigated the dependence structure and the predictability of the foreign exchange markets at different time scales, and show (in) efficiency in these markets.

Sheik and Banu (2015), Palma and Sartoris (2016), Olufemi, Adewale, and Oseko (2017) tested the random walk hypothesis in the foreign exchange markets. Sheik and Banu (2015) examined the Efficient Market Hypothesis (HME) in the Indian exchange market, using the exchange rates of China, Indonesia, and the USA in relation to the Indian rupee. The results indicate that the three exchange rates analyzed follow the random walk hypothesis. Palma and Sartoris (2016) examined the hypothesis of market efficiency, in its weak form, in the Brazilian foreign exchange market, showing inefficiency in this foreign exchange market. Olufemi et al. (2017) examined the efficiency, in its weak form, in the foreign exchange markets of 10 sub-Saharan African countries against the US dollar, demonstrating that the markets show signs of (in) efficiency.

Ning et al. (2017), Matebejana et al. (2017), Njindan Iyke (2019) analyzed the multifractal fluctuation in the exchange rate series. Ning et al. (2017) suggest that the onshore exchange market increased efficiency after the reform, while the offshore exchange market lost efficiency after the 2015 Reformation. Matebejana et al. (2017) examined the random walk hypothesis in the foreign exchange market in Botswana, showing that this market shows signs of efficiency, in its weak form. Njindan Iyke (2019) tested whether the Indonesian foreign exchange market is efficient and shows that the efficient market hypothesis is rejected in 50% of cases.

Chaudhry et al. (2019) examined the efficiency, in its weak form, of the Pakistani foreign exchange market, represented by Japanese yen (JPY / PKR), Swiss franc (CHF / PKR), British pound (GBP / PKR), US dollar (USD / PKR). The authors show that Pakistan's foreign exchange market is efficient, in its weak form. Anggitawati and Ekaputra (2020) show bidirectional shocks between the returns of the NFI stock market, and the IDR / USD exchange market. Additionally, the authors show that the participation of international investors has more impact on the foreign exchange market than on the stock market.

In summary, this work aims to contribute to the provision of information to investors and regulators in the international exchange markets, where individual and institutional investors seek to efficiently diversify their portfolios, in a period of uncertainty and lack of confidence due to the global pandemic (Covid-19).

METHODOLOGY

Data

The data used for the preparation of the test were the prices index (daily) of the exchange markets, EUR.GBP, EUR.JPY, EUR.USD, GBP.USD, JPY.CHF, USD.BTC, USD.CAD, USD.CHF, USD.JPY, USD.JPY, USD.BRL. The sample covers the period from January 1, 2019 to July 21, 2020, with data extracted from the Thomson Reuters platform.

Models

The development of the research took place over several stages. The characterization of the sample used was carried out through descriptive statistics, from the adhesion test of Jarque and Bera (1980), as well as graphics of stability to the residues. To estimate the breakdowns in the financial markets, we used the unit root test by Clemente et al. (1998). To assess the integration between the foreign exchange markets we use the methodology of Gregory and Hansen (1996) that identifies breaks in structure. The general test model is based on the fact that the cointegration vector varies with time. The method developed by Gregory and Hansen (1996) is considered a complement to the ADF test, and a multivariate version of the model by Zivot and Andrews (1992). In order to validate the results, we will use the Detrended Fluctuation Analysis (DFA) methodology. DFA is an analysis method that examines time dependency on non-stationary data series. This technique, assuming that the time series are non-stationary, avoids spurious results when the analysis focuses on the relationships of the data series in the long run. The Detrended Fluctuation Analysis presents the following interpretation: $0 < \alpha < 0.5$: anti-persistent series; $\alpha = 0.5$ series has a random walk; $0.5 < \alpha < 1$ persistent series. The function of this technique is to examine the relationship between the x_k and x_{k+t} values at different times.

The main advantage of applying DFA is the ability to remove trends from the series, which skew the true correlation of the fluctuations of the random variables involved, and thus allow to see long-range correlations in signals with polynomial trends, which can mask the true correlations. Briefly, the DFA Method involves the following steps:

- 1 - Consider a sign $u(i)$, where i goes from 1 to the total number of points N in the series. Then we integrate the signal and obtain a new series

$$y(k) = \sum_{i=1}^k u(i) \quad [1]$$

- 2 - The integrated signal is divided into boxes of equal length n .

- 3 - For each size box n , we adjust a degree polynomial l , which we designate by $y_n(k)$, and this value represents the trend in each box.
- 4 - The signal $y(k)$ is subtracted from in $y_n(k)$ each box.
- 5 - So for each size box n we calculate its average square root, that is,

$$F(n) = \sqrt{\frac{1}{N} \sum_{k=1}^N [y(k) - y_n(k)]^2} \quad [2]$$

- 6 - The above calculation is repeated for several box sizes (n^s). Therefore, if we have a power law type relation for $F(n)$, then this function is proportional to

$$F(n) \propto n^\alpha \quad [3]$$

α this case it represents the long-range correlation exponent, that is, the high-affinity of the signal, it has the following interpretation:

Table 1.

$\alpha=0.5$	Random Signal
$\alpha>0.5$	Persistent Signal
$\alpha<0.5$	Anti-Persistent Signal

Source: Own elaboration

For a better analysis on the *Detrended Fluctuation Analysis (DFA)* methodology see the papers by Dias, da Silva, and Dionísio (2019), Dias, Heliodoro, Alexandre, and Vasco (2020), Dias et al. (2020), Dias, Heliodoro, and Alexandre (2020), Dias, Heliodoro, Alexandre, Santos, and Farinha (2021).

RESULTS

Figure 1 shows the fluctuations, in levels, of the foreign exchange markets, EUR.GBP, EUR.JPY, EUR.USD, GBP.USD, JPY.CHF, USD.BTC, USD.CAD, USD.CHF, USD.JPY, USD.JPY, USD.BRL. The sample comprises the time horizon from January 1, 2019 to July 21, 2020, which is a period of considerable complexity, due to understanding the global pandemic (Covid-19). The financial market indices analyzed clearly reveal the instability experienced in these markets in the months of December 2019, January, February, and March 2020.

Foreign Exchange Market Shocks in the Context of the Global Pandemic (COVID-19)

Figure 1. Evolution, in % change, of the foreign exchange markets, in the Complete period.

Source: Own elaboration.

Note: Thomson Reuters: January 1, 2019, 406 point data.

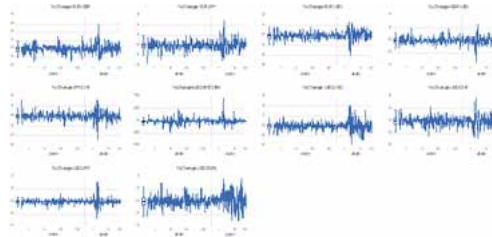


Figure 2 shows the evolution of the foreign exchange markets under analysis, and we can see that the time series have a relatively high dispersion around the average, as well as a relatively synchronized behavior between the data series. Through graphical analysis, high volatility is observed in the second quarter of 2019 and in the first quarter of 2020.

Figure 2. Evolution, first differences, of the foreign exchange markets, in the Complete period.

Source: Own elaboration.

Note: Thomson Reuters: January 1, 2019, 406 point data.

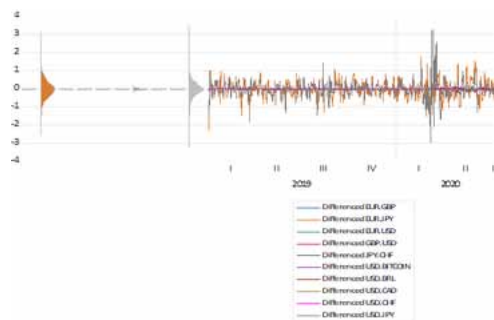


Table 2 shows the main descriptive statistics of the foreign exchange markets under analysis, and we find that the market averages are negative, except for the EUR.GBP, USD.BRL markets. The USD.BTC market has the sharpest standard deviation. Overall, the coefficients of asymmetry and kurtosis are statistically different from those of a normal distribution, being the same leptocurtic and asymmetric. These evidences are corroborated by the Jarque-Bera test that rejected the null hypothesis, that is, the data series do not follow a normal distribution.

In figure 3 shows the stability tests performed on the residues of the foreign exchange markets, and the presence of structural breaks is easily verified. The existence of disturbances in the variance, and the failure to verify structural breaks in the data series, cause biased results in estimating the models, that is, evidence of false positives and / or false positives may appear. In addition, we can assess the existence of a clear violation of the probability limits, which indicates the presence of turbulence in these foreign exchange markets.

Table 2. Descriptive statistics, in returns, of the 10 foreign exchange markets, in the Complete period.

	EUR.GBP	EUR.JPY	EUR.USD	GBP.USD	JPY.CHF	USD.BTC	USD.CAD	USD.CHF	USD.JPY	USD.BRL
Mean	8.48E-06	-6.13E-05	-5.81E-06	-1.32E-05	-5.73E-05	-0.002293	-2.76E-05	-0.000110	-5.20E-05	0.000781
Std. Dev.	0.005224	0.004645	0.004002	0.006160	0.004056	0.045578	0.004442	0.004041	0.004957	0.010452
Skewness	0.319856	0.243026	-0.246802	-0.258115	-0.209748	0.599230	0.434255	0.058715	0.707049	0.069546
Kurtosis	6.098461	6.224973	5.880968	7.703709	8.108905	12.07940	7.181135	5.275306	14.80167	4.153753
Jarque-Bera	169.3307***	179.9375***	144.5296***	378.7874***	444.5172***	1418.832***	308.4957***	87.81117***	2389.973***	22.84581***
Observations	406	406	406	406	406	406	406	406	406	406

Source: Own elaboration.

Note: *** represent significance at 1%.

Figure 3. Stability tests performed on residues from the foreign exchange markets, in the Complete period.
Source: Own elaboration.

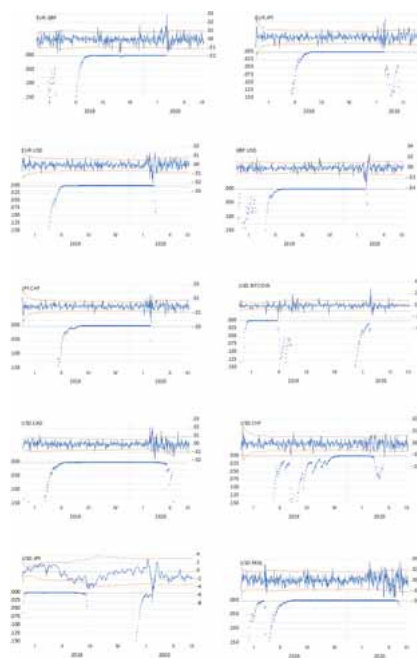


Table 3 shows the results of the test by Clemente et al. (1998) that identifies structure breaks in the foreign exchange markets in March 2020, with the exception of the EUR.JPY, JPY.CHF markets, which show breaks in January 2019. The results are in line with the findings of the authors Ali, Alam, and Rizvi (2020), Ashraf (2020), which show significant structural breaks resulting from the global pandemic (Covid-19).

Table 3. Unit root tests, with structural breaks, referring to the foreign exchange markets, in the Complete period.

Market	t-stat	Break Date
EUR.GBP	-20.96(0)***	18/03/2020
EUR.JPY	-20.89(0)***	04/01/2019
EUR.USD	-19.91(0)***	19/03/2020
GBP.USD	-18.43(0)***	18/03/2020
JPY.CHF	-22.63(0)***	04/01/2019
USD.BTC	-22.63(0)***	12/03/2020
USD.CAD	-20.98(0)***	18/03/2020
USD.CHF	-19.33(0)***	19/03/2020
USD.JPY	-24.51(0)***	09/03/2020
USD.BRL	-22.16(0)***	07/05/2020

Source: Own elaboration.

Note: Lag Length (Automatic Length based on SIC). Break Selection: Minimize Dickey-Fuller t-statistic. The lateral values in parentheses refer to lags. ***, **, *. represent significance at 1%, 5% and 10%, respectively.

Table 4 shows the results of the Gregory-Hansen test (1996), referring to the 10 foreign exchange markets and 63 pairs of integrated markets are easily detected (out of 90 possible). The USD.JPY, USD. CAD exchange markets integrate with all their peers (9 out of 9 possible), while the JPY.CHF, USD.CHF markets feature 8 integrations. The USD.BRL market has 7 integrations, and the EUR.USD, GBP.USD, USD.BTC markets integrate with their peers 6 times, while those that least integrate with their peers are the EUR.GBP exchange markets EUR.JPY (2 out of 9 possible). With regard to structure breaks, most of them occur in 2019 (37 out of 63 possible), and in 2020 there are 27 breaks. In a global way, these foreign exchange markets present very high levels of integration, during the period of the global pandemic (Covid-19) under analysis, which may show reduced coverage and diversification hypotheses. However, the EUR.GBP, EUR.JPY exchange markets have the most significant assumptions for hedging and diversification operations.

Table 5 shows the results of the Deteriorated Fluctuation Analysis (DFA) of the exponents, and we see that the EUR.GBP, GBP.USD, USD.BRL currency markets show some signs of (in) efficiency, showing persistence in returns, while the EUR.JPY, EUR.USD, JPY.CHF, USD.CHF, USD.JPY markets show signs of anti-persistence, i.e. the existence of short memories. The markets USD.BTC, USD.CAD do not reject the random walk hypothesis, i.e. they are in equilibrium. These results show that prices do not fully reflect available information and that changes in prices are not i.i.d. in most markets. This has implications for investors, as some returns may be expected, creating arbitrage opportunities and abnormal gains, contrary to the assumptions of random walk and information efficiency. These findings partly validate the second research question. These results are corroborated, in part, by the authors Palma and Sartoris (2016), Olufemi et al. (2017) who tested the hypothesis of market efficiency (HME) in several foreign exchange markets, showing that the markets show signs of (in) efficiency.

Foreign Exchange Market Shocks in the Context of the Global Pandemic (COVID-19)

Table 4. Integration tests of Gregory and Hansen, with structural breaks, referring to the foreign exchange markets, in the Complete period.

Markets	t-statistic	Method	Lags	Break Date	Results
EUR.GBP / USD.CHF	-5.33**	Trend	3	22/10/2019	Integration
EUR.GBP / USD.JPY	-5.45***	Trend	3	13/03/2020	Integration
EUR.JPY / EUR.USD	-4.93*	Trend	3	16/05/2019	Integration
EUR.JPY / GBP.USD	-5.00**	Regime	0	16/10/2019	Integration
EUR.USD / EUR.JPY	-5.74***	Regime	3	03/03/2020	Integration
EUR.USD / JPY.CHF	-4.88	Regime	3	30/12/2019	Integration
EUR.USD / USD.BTC	-5.09**	Regime	2	24/03/2020	Integration
EUR.USD / USD.CAD	-6.80***	Trend	4	07/04/2020	Integration
EUR.USD / USD.CHF	-5.00**	Regime	5	07/04/2020	Integration
EUR.USD / USD.BRL	-5.03**	Regime	4	13/03/2020	Integration
GBP.USD / EUR.JPY	-5.83***	Trend	3	03/10/2019	Integration
GBP.USD / JPY.CHF	-5.26**	Regime	5	28/02/2020	Integration
GBP.USD / USD.BTC	-5.02**	Regime	3	24/03/2020	Integration
GBP.USD / USD.CHF	-5.10**	Trend	3	22/10/2019	Integration
GBP.USD / USD.JPY	-6.02***	Trend	3	22/10/2019	Integration
GBP.USD / USD.BRL	-4.98*	Trend	3	03/06/2019	Integration
JPY.CHF / EUR.JPY	-5.45***	Trend	5	19/12/2019	Integration
JPY.CHF / EUR.USD	-5.11**	Trend	5	10/12/2019	Integration
JPY.CHF / GBP.USD	-5.28**	Trend	4	19/12/2019	Integration
JPY.CHF / USD.BTC	-47.65**	Regime	4	05/12/2019	Integration
JPY.CHF / USD.CAD	4.73*	Regime	4	19/12/2019	Integration
JPY.CHF / USD.CHF	-4.73*	Regime	4	05/12/2019	Integration
JPY.CHF / USD.JPY	-4.96*	Trend	4	18/12/2019	Integration
JPY.CHF / USD.BRL	-5.51***	Trend	4	01/05/2019	Integration
USD.BTC / EUR.GBP	-4.74*	Regime	4	22/04/2019	Integration
USD.BTC / EUR.USD	-5.01**	Regime	4	07/06/2019	Integration
USD.BTC / JPY.CHF	-5.49***	Regime	1	24/04/2019	Integration
USD.BTC / USD.CAD	-6.76***	Regime	2	05/06/2019	Integration
USD.BTC / USD.JPY	-4.93*	Regime	2	26/03/2019	Integration
USD.BTC / USD.BRL	-5.92***	Regime	3	03/06/2019	Integration
USD.CAD / EUR.GBP	-4.89*	Trend	0	04/03/2020	Integration
USD.CAD / EUR.JPY	-5.25**	Trend	4	04/03/2020	Integration
USD.CAD / EUR.USD	-7.92***	Trend	0	03/03/2020	Integration
USD.CAD / GBP.USD	-5.45**	Regime	0	08/10/2019	Integration
USD.CAD / JPY.CHF	-5.22**	Regime	0	10/03/2020	Integration
USD.CAD / USD.BTC	-6.24***	Regime	1	12/03/2020	Integration
USD.CAD / USD.CHF	-6.94***	Regime	0	28/02/2020	Integration
USD.CAD / USD.JPY	-4.69*	Regime	0	27/03/2020	Integration
USD.CAD / USD.BRL	-6.66***	Trend	0	20/04/2020	Integration
USD.CHF / EUR.GBP	-6.46***	Trend	2	05/12/2019	Integration
USD.CHF / EUR.JPY	-5.06**	Trend	2	04/04/2019	Integration
USD.CHF / GBP.USD	-5.43**	Trend	2	10/04/2019	Integration
USD.CHF / JPY.CHF	-5.25**	Trend	2	19/09/2019	Integration
USD.CHF / USD.BTC	-5.41**	Trend	2	04/04/2019	Integration
USD.CHF / USD.CAD	-5.77	Trend	0	28/02/2020	Integration
USD.CHF / USD.JPY	-5.00**	Trend	4	19/12/2019	Integration
USD.CHF / USD.BRL	-5.30**	Trend	4	02/03/2020	Integration
USD.JPY / EUR.GBP	-5.87***	Trend	3	13/03/2020	Integration
USD.JPY / EUR.JPY	-5.44**	Trend	3	03/10/2019	Integration
USD.JPY / EUR.USD	-5.05**	Regime	3	17/05/2019	Integration
USD.JPY / GBP.USD	-5.74***	Regime	3	09/03/2020	Integration
USD.JPY / JPY.CHF	-5.21**	Regime	3	06/06/2019	Integration
USD.JPY / USD.BTC	-5.76***	Regime	3	16/05/2019	Integration
USD.JPY / USD.CAD	-5.60***	Regime	3	16/05/2019	Integration
USD.JPY / USD.CHF	-4.77*	Regime	4	05/12/2019	Integration
USD.JPY / USD.BRL	-6.24***	Trend	3	06/06/2019	Integration
USD.BRL / EUR.GBP	-4.98*	Trend	2	05/03/2020	Integration

continued on following page

Table 4. Continued

Markets	t-statistic	Method	Lags	Break Date	Results
USD.BRL / EUR.USD	-6.21***	Regime	4	09/03/2020	Integration
USD.BRL / GBP.USD	-4.76*	Regime	3	18/11/2019	Integration
USD.BRL / JPY.CHF	-4.95*	Trend	2	09/03/2020	Integration
USD.BRL / USD.BTC	-4.77*	Regime	2	05/03/2020	Integration
USD.BRL / USD.CAD	-6.72***	Trend	0	17/04/2020	Integration
USD.BRL / USD.CHF	-5.24**	Trend	0	09/03/2020	Integration

Source: Own elaboration.

Notes: The critical values are found in Gregory and Hansen (1996). The asterisks ***, **, * indicate statistical significance at 1%, 5% and 10%, respectively.

Table 5: DFA exponent for return. The values of the linear adjustments for α DFA always had $R^2 > 0.99$

Index	DFA exponent (Covid-19)
EUR.GBP	0.55 ± 0.0019
EUR.JPY	0.42 ± 0.0085
EUR.USD	0.47 ± 0.0331
GBP.USD	0.55 ± 0.0304
JPY.CHF	0.38 ± 0.0050
USD.BTC	0.51 ± 0.0002
USD.CAD	0.50 ± 0.0005
USD.CHF	0.45 ± 0.0221
USD.JPY	0.43 ± 0.0335
USD.BRL	0.55 ± 0.0010

Source: Own elaboration.

Note: The values next to the DFA alpha are the standard errors that allow for the rejection of the null hypothesis at a 5% significance level (1.96).

CONCLUDING REMARKS

In this chapter we analyzed the efficiency, in its weak form, among the foreign exchange markets, EUR.GBP, EUR.JPY, EUR.USD, GBP.USD, JPY.CHF, USD.BTC, USD.CAD, USD.CHF, USD.JPY, USD.JPY, USD.BRL, in the period from January 1, 2019 to July 21, 2020. In order to conduct this analysis, different approaches were undertaken to assess whether: (i) in periods of high volatility, do foreign exchange markets tend to integrate? (ii) whether the global pandemic accentuates (in) efficiency in international foreign exchange markets?

In order to answer the two research questions, we assess the integration between foreign exchange markets using the Gregory and Hansen methodology that identifies breaks in structure. To answer the second research question, we use the DFA methodology to estimate the existence of long memories in foreign exchange markets.

The results of the integration test show 63 pairs of integrated markets (out of 90 possible). The foreign exchange markets USD.JPY, USD.CAD integrate with all their pairs (9 out of 9 possible), while the markets JPY.CHF, USD.CHF present 8 integrations. The USD.BRL market has 7 mergers, and the EUR.USD, GBP.USD, USD.BTC markets integrate with their pairs for 6 times, while the ones that

integrate less with their pairs are the EUR.GBP, EUR.JPY exchange markets (2 out of 9 possible). Most of the breaks in the structure occurred in 2019 (37 out of 63 possible), and in 2020 there were 27 breaks. Overall, most of these foreign exchange markets show very high levels of integration during the period of the global pandemic (Covid-19), which could jeopardize the diversification of portfolios in these foreign exchange markets.

The exponents Detrended Fluctuation Analysis (DFA) show that the foreign exchange markets EUR.GBP, GBP.USD, USD.BRL show some signs of (in) efficiency, showing persistence in yields, while the markets EUR.JPY, EUR.USD, JPY.CHF, USD.CHF, USD.JPY show signs of anti-persistence, i.e. the existence of short memories. The USD.BTC, USD.CAD markets do not reject the random walk hypothesis, that is, they are in equilibrium. These findings show that prices do not fully reflect the available information and that changes in prices are not i.i.d. in most markets.

The general conclusion to be retained and sustained in the results obtained, through the tests carried out with econometric and mathematical models, suggests that these foreign exchange markets present marked levels of integration, which may jeopardize the diversification of portfolios in an efficient way. In corroboration, through the DFA model, we verified that the analyzed foreign exchange markets present signs, in their majority, of (in) market efficiency, in their weak form. This situation has implications for investors, since some returns can be expected, creating opportunities for arbitrage and abnormal returns, contrary to the assumptions of random walk and information efficiency. In conclusion, the global pandemic of 2020 has affected the memory properties of these foreign exchange markets, the authors suggest that the implementation of efficient portfolio diversification strategies in these markets may be questionable. These conclusions also open space for regulators in these markets to take action to ensure better information between these markets and international markets.

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Chapter 21

Performance of Exchange-Traded Funds in Europe: Beta-Performance Ratio

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ABSTRACT

In this study, the authors analyzed the performance of the exchange traded funds (ETFs) of the European iShares family, using risk-adjusted performance measures: Sharpe index, Treynor index, Sortino index, and Jensen's alpha. They also checked the beta-performance ratio and conjectured that ETFs with the highest betas are the ones that perform best. From the results obtained, they conclude that all ETFs had an average return lower than that of the respective benchmark. Using the Sharpe index, they found that no ETF performed better than its benchmark. As for the Treynor index, two ETFs, namely Belgium and Switzerland, performed better than the respective benchmark. As with the Sharpe index, for the Sortino index, no ETF exceeded its benchmark. As for the beta-performance relationship, the results indicated the existence of the low-risk anomaly.

INTRODUCTION

Exchange-traded funds (ETFs) are exchange-traded investment funds that combine the diversification of a mutual fund with the flexibility of stocks (Neves, Fernandes & Martins, 2019). ETF's are a good vehicle for investors looking to invest in fully diversified exchange-traded securities, (Coeurdacier &

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Guibaud, 2011). This financial innovation has not yet been the subject of many empirical studies, as is the case with traditional funds. In this direction, the authors intend with this study to contribute to the literature on this innovation of the financial industry, when analyzing the performance of the European ETF's of the iShares MSCI family. For this, they will use the following performance measures: Sharpe index, Sortino index, Traynor indicator, and Jensen's alpha. The analysis will be finalized by comparing the performance of ETF's with that of the respective indexes that they track (Benchmark). Next, they will analyze whether the ETFs with the highest risk (beta) are the ones with the best performance. they care more about this study to analyze the influence of beta on ETF's performance. The literature on this particular point is even more scarce.

The work will be structured as follows: in section 2 they will make a brief review of the literature on the subject matter of the study, then in section 3 they will present the research design considering their sample and the methodology used, the results will be discussed in section 4 and finally, they will present their conclusions, limitations, and lines for future works.

Background

Exchange-traded funds (ETF) is the most modern version of traditional investment funds, often described as a prototype of the future evolution of the investment fund industry (Gastineau, 2001; Poterba, Shoven & John, 2002). ETFs are open-ended investment funds admitted to trading on a stock exchange and whose aim is to obtain performance dependent on the behavior of a certain benchmark, the benchmark (Neves, Fernandes & Martins, 2019). That is, they follow a specific benchmark that offers investors a passive exposure to this index through single negotiable security (Buetow & Henderson, 2012). These investment vehicles may consist of a variety of assets individually or a mixture of them and divide ownership of those assets into shares that they sell on the stock exchange.

According to Masterson (2010), ETFs have four main characteristics that attract financial consultants and institutional investors: 1) intraday trading; 2) portfolio transparency; 3) tax efficiency; and 4) low cost. Exchange-traded funds can be traded at any time during normal trading hours, unlike traditional funds that can only be traded after closing. As for transparency, ETFs show all the constituent values so that investors know exactly what they are investing in. About tax efficiency, one of the main reasons considered has to do with the fact that ETFs create less taxable events. As most ETFs follow a specific index, their turnover tends to be lower, that is, they only sell or buy securities when their relevant index is rebalanced. Finally, again because it follows an index, its management fee is lower than that of traditional funds.

ETFs follow a mechanism of creation and redemption "In-Kind" that is single (Milonas & Rompotis, 2006). A fund is created when an authorized financial institution (AFI) deposits a portfolio of an asset with an administrator/sponsor and receive as return the ETF shares (Poterba et al, 2002; Milonas & Rompotis, 2006). It is also deposited the accumulated dividends. Next, ETF shares are traded on the secondary market like a stock. In opposite, in redemption, the AFI changes ETF shares with a portfolio of stock along with the amount of associated dividend held by the fund. The AFI is responsible to restrict divergencies between the market price and the net asset value (NAV) of underlying stock which compose the ETF, by creating and redeeming ETF shares. IF the NAV of the underlying assets is greater than the market price of ETF shares, then the AFI will redeem ETF shares and will receive the underlying stocks. Contrary, if the NAV of the underlying stocks is smaller than the market price of ETF shares, then the AFI will buy the underlying stock and it will deposit in the fund to create new ETF shares.

LITERATURE REVIEW

Regarding its origin, according to Deville (2008), the first ETF appeared in 1990, in Canada, called the Toronto 35 Index Participation Fund (TIP). This fund had as a benchmark the Toronto index 35, being traded on the Toronto stock exchange. This fund was known to have low management fees; however, it was forced to leave the market in 2000, due to low maintenance fees, which became expensive for the exchange and members. It was on January 22, 1993, that, according to Deville (2008), what was emerged for many the world's first ETF - Standard & Poor's 500 Depositary Receipt (SPDR). The SPDR was traded on the stock exchange and aimed to replicate the main index of the American market - the S&P 500. The European Stock Exchanges only traded their first ETFs in April 2000, when they had already gained popularity in the USA. They appeared for the first time, on the German stock exchange (XETRA - Deutsche Börse) and the Londrina stock exchange (LSE - London Stock Exchange). Since their inception, ETFs have grown considerably. In Portugal, investors have increasingly resorted to ETFs to implement market views, both short term, and long term.

Concerning performance, studies are focusing on the risk-adjusted measure as a metric of performance, and others aiming to measure the difference of return between ETF and their respective index known as tracking error. Regarding the first strand, Harper, Madura, and Schnusenberg (2003) compare the return of iShares with closed funds of an identical category (CEFs) and conclude that ETFs have higher risk-adjusted returns. On the contrary, Chang and Swales (2003) found opposite results showing that iShares provide lower levels of profitability than CEFs. Chang, Krueger, and Witte (2015) also observed higher risk-adjusted returns on CEFs, and even that investors can benefit from low levels of downside risk when investing in these financial products. Mateus and Kuo (2007) investigated the performance and persistence of 20 iShares MSCI country-specific ETFs in comparison with S&P 500 throughout the period July 2001 to June 2006, with a resource to the Sharpe, Sortino, and Treynor ratios as performance measures, and Spearman rank Correlation coefficient and winner-Loser contingency table to understand if there is any relationship between past and future performance. Their results showed that ETFs can beat the market based on risk-adjusted performance and that there is evidence of ETFs' performance persistence based on the annual return. Sharifzadeh and Hojat (2012) examined whether the increasing demand for ETF can be explained through their outperformance as compared with index mutual funds. The authors matched ETFs and index mutual funds, with inception date before 2002, with the same investment style and compared the performance of the pairs in terms of Sharpe ratio and risk-adjusted buy and hold total return. Then they used Wilcoxon Signed rank test to examine whether ETF had better performance than the index mutual fund during the sample period. The results indicated statistically no significant differences between these funds' performance, and that investors' choice is related to product characteristics and tax advantages.

Relating to the second strand, much more researchers have computed the tracking error of ETFs and their determinants. Among them, there are Blitz, Huij, and Swinkels (2010) that analyzed the performance of European ETF's and concluded that none of these funds exceeded their benchmark. The authors indicated as a cause of this inferior performance the taxes on dividends withheld at source, which they argued had an explanatory power, at least equivalent to the expense ratio. Singh and Kaur (2016) investigated the performance efficiency of Indian ETFs and revealed that these ETFs exhibit a significant tracking error while trying to replicate the return of their Benchmark. The researchers have also appointed that assets under management and volume positively affected the tracking ability of ETFs whereas volatility has hurt that ability. Osterhoff and Kaserer (2016) investigated the determinants factors of daily tracking

error of ETFs in the German DAX universe and found out daily tracking error to be dependent on the liquidity of underlying portfolio, management fees, cash holding, dividend yield, cash distribution from ETFs to investors, portfolio adjustment and the process of creation/redemption of ETF shares. For those authors, cash inflow and cash outflow in the form of dividend and distribution, respectively, appeared to be the factors with the most substantial effect on the tracking ability of ETFs in their model. Milonas and Rompotis (2006) investigated the performance and trading characteristics of 36 Swiss ETFs during the period 2001-2006 using daily data and found that Swiss ETFs underperformance their benchmark index. As for tracking ability, these funds presented a tracking error of approximately 1.02% on average. Further investigation revealed that the tracking error is positively related to the management fees and risk of ETFs while the impact of expenses on ETFs is negative on ETFs investors' returns. Rompotis (2006) carried out empirical research on iShares ETFs performance and trading characteristics, finding that there is a significant tracking error among ETFs and index return, especially for iShares that track international capital indexes of Morgan Stanley. The author also showed that ETFs mainly trades at a premium from their net asset value, and demonstrated that tracking error is also induced by the premium and trading volume of iShares. Rompotis (2011a, 2011b) investigated whether the ETFs (50) can beat the market, S&P 500, examined ETFs outperformance persistence, computed tracking error and assessed their persistence, investigated the factor that induces tracking error, and assessed whether there are predictable patterns in ETF's performance. The result revealed that the majority of ETFs outperformed the market, both at an annual and aggregate level while the return superiority persisted in the short-term level. The tracking error of ETFs also persisted in the short-term level. As the factor that induces tracking error, the author found expenses charged by the funds, age, and risk of ETFs. The author demonstrated that ETFs' performance could be somehow predictable. Shin and Soydemir (2010) estimating the tracking error of 26 ETFs, and they found that it is significantly different from zero and display persistence. The authors also demonstrated that the exchange rate is a significant source of tracking error. Charupat and Miu (2013) appointed many factors dictating tracking error such as management fees, transaction costs, dividends, and cash holding and choice of replication strategy.

Recently some authors have measured the efficiency of ETF using Data Envelopment Analysis (DEA) that is a non-parametric approach that combines simultaneously multiple inputs (e.g., Measure of risk) and output (e.g., Return and risk-adjusted measure) resulting in an only measure, the efficiency (see Chun, Chen & Leung, 2010; Choi & Min, 2017).

The authors are considering in their study that ETF's with higher beta perform better. As it is a recent product, there are still few studies about it. According to Peltomäki (2017), the beta influences trading activity and the cash flow for ETFs. According to Baker, Bradley, and Wurgler (2011), investors have irrational preferences for high beta stocks. Because of their irrational preferences, Frazzini and Pedersen (2014) suggest that investors invest more in high-risk ETFs (beta). Also, for Baker et al. (2011), the demand for ETF increases with the Beta so it is expected that the performance of the highest beta ETFs will tend to be higher, according to classical financial theory. However, the low-risk anomaly reported by Baker et al. (2011), which is divided into two components, macro, and micro, in Baker, Bradley, and Taliaferro (2014). The macro component originates in low-risk countries and industries, keeping the risk level of stocks constant, and the micro-component originates in the actions of these low-risk countries and industries, keeping the risk level of these countries and industries constant.

RESEARCH DESIGN

Sample

The sample chosen for performance analysis is composed of the iShares ETF's from MSCI Germany (EWG), Austria (EWO), Belgium (EWK), Spain (EWP), France (EWQ), Netherlands (EWN), Italy (EWI), Sweden (EWD), Switzerland (EWL) and Finland (EFNL).

The authors chose these European iShares because they were the ones that allowed them several homogeneous observations.

Based on the ETFs considered, the authors intend to study their performance relative to their benchmark. In the table below they have the description of the funds under analysis and the respective benchmarks. The sample consists of daily data and extends from January 1, 2014, to April 4, 2019. In total, there are 1235 observations for each fund and the respective benchmarks. The data relating to the funds were taken from the Yahoo Finance website and the data relating to the benchmark were collected from Investing.com.

As for risk-free interest rates, it was chosen as a proxy for the return on the asset "Moody's AAA Corporate Bond", also known as "Moody's AAA". This is an investment in bonds that acts as a performance index for all bonds that are classified as AAA, by Moody's. Data were obtained from the Federal Reserve Bank of St. Louis website, which is available daily, as intended for this study, also used by Neves et al., (2019).

Table 1. ETFs and Benchmarks

Fund	Code	Benchmark
iShares MSCI Germany	EWG	DAX
iShares MSCI Austria	EWO	ATX
iShares MSCI Belgium	EWK	BEL 20
iShares MSCI Spain	EWP	IBEX 35
iShares MSCI France	EWQ	CAC 40
iShares MSCI Finland	EFNL	OMXH Helsinki 25
iShares MSCI Netherlands	EWN	AEX
iShares MSCI Italy	EWI	FTSE MBI
iShares MSCI Sweden	EWD	OMXS 30
iShares MSCI Switzerland	EWL	SMI

Source: Own elaboration

Table 1 presenting the name of the funds under analysis; their codes, as well as the benchmark that they seek.

Methodology

The performance analysis will be materialized through statistical measures such as profitability, excess return and tracking error, and the relative measures of Sharpe, Treynor, Sortino, and Jensen index performance that are common in this type of analysis. The performance of ETFs will be compared with that of their benchmarks. Besides, the authors will assess whether the funds with the highest beta are those that perform the best. Next, they will describe each of the measures. The indicators will be calculated in Excel, except beta and Jensen's alpha, which will be calculated using the Gretl software.

Returns

In the analysis of the performance of the assets, the returns of the assets should be used, not the respective prices. This is because the returns are a complete and non-scale summary of the investment opportunity, and the return series is easier to work with than the price series since they have more attractive statistical properties.

To convert the price series into the return series, we can use one of the following formulas:

The arithmetic return is the easiest to calculate, R_t , and for a single period it can be obtained as follows:

$$R_t = \frac{P_t - P_{t-1}}{P_{t-1}} = \frac{P_t}{P_{t-1}} - 1 \quad [1]$$

P_t being the price of an asset at time t .

For multiple periods we have:

$$R_t[K] = \left[\prod_{j=0}^{K-1} (1 + R_{t-j}) \right] - 1 = \frac{P_t}{P_{t-K}} - 1 \quad [2]$$

The logarithmic return for a period, r_t , is calculated as follows:

$$r_t = \ln(1 + R_t) = \ln\left(\frac{P_t}{P_{t-1}}\right) = \ln(P_t) - \ln(P_{t-1}) \quad [3]$$

For multiple periods we have:

$$r_t[K] = \ln(1 + R_t[K]) = r_t + r_{t-1} + \dots + r_{t-(K-1)} \quad [4]$$

Logarithmic returns have some advantages over arithmetic returns, namely: 1) for multiple periods, the logarithmic return is given by the sum of the returns in each period; 2) the statistical properties of logarithmic returns are more attractive.

Excess Return

We can compare the return on a portfolio and the respective benchmark using an arithmetic formula, as follows:

$$\text{Excess return} = r - b \quad [5]$$

Where r is the return on the portfolio and b the return on the benchmark.

Through excess return, we can identify whether the fund follows an active management strategy or a passive management strategy. Active management is one that tries to beat the market, that is, it aims to obtain a performance superior to the reference index. In passive management, there is the maxim that the markets are efficient, for this reason, the market return cannot be exceeded. In this passive management, the portfolio that is created replicates the benchmark, and differences try to be minimized by minimizing tracking error.

Tracking Error

Indicates how closely a portfolio follows the index to which it is compared. It can be measured using the standard deviation of the difference between a portfolio's return and its benchmark. Thus, the lower the value obtained, the closer the relationship between the portfolio's risk/return characteristics and its benchmark. The calculation method is as follows:

$$TE = \sqrt{\frac{\sum_{i=1}^n (R_p - R_B)^2}{N - 1}} \quad [6]$$

Where TE is the tracking error; R_p is the portfolio return; R_B is the benchmark return; N represents the number of periods.

Sharpe's ratio

Measures the return on investment over the risk-free interest rate per unit of the total risk of the investment. This ratio measures the quality of the relationship between the risk of an investment and its return. The higher the indicator, the better the performance of the investment, as it will reward the level of total risk assumed.

The calculation method is as follows:

$$SR = \frac{R \cdot p - R \cdot f}{\sigma p} \quad [7]$$

Where $\bar{R}_p$ is the return of portfolio p ; $\bar{R}_f$ the rate of return on risk-free assets; σp is the portfolio risk (standard deviation of the return).

Treynor's Ratio

The Treynor index is a powerful tool for assessing the performance of portfolios and investment funds. Similar to the Sharpe index, this indicator measures the quality of the risk/return ratio, the difference being that it considers only the systematic risk (beta).

Its calculation formula is as follows:

$$Tp = \frac{R \cdot p - R \cdot f}{\beta p} \quad [8]$$

Where $\bar{R}p$ is the return of portfolio p; $\bar{R}f$ the rate of return on risk-free assets; βp is the systematic risk (beta).

Sortino's Ratio

The Sortino indicator also measures excess profitability concerning the risk-free interest rate per unit of risk incurred. The only difference compared to the Sharpe index, is that it only considers the standard deviation of negative returns (downside risk).

This indicator is calculated as follows:

$$SO_p = \frac{R \cdot p - R \cdot f}{DSDp} \quad [9]$$

Where $\bar{R}p$ is the return of portfolio p; $\bar{R}f$ the rate of return on risk-free assets; DSDp is the standard deviation of negative returns.

Jensen's Alpha

It is a measure of risk-adjusted performance that makes it possible to measure the average return on investment, above or below that predicted by the CAPM.

Its calculation formula is as follows:

$$R_{p,t} - R_{f,t} = \alpha_p + \beta_p (R_{B,t} - R_{f,t}) \quad [10]$$

Where, $R_{p,t}$ is the portfolio's return; $R_{f,t}$ is the return on the risk-free asset; α_p is the alpha; β_p is the beta; $R_{B,t}$ is the profitability of the benchmark.

The alpha is the one ordered at the origin, where the portfolio depends on the benchmark. It thus represents the greater or lesser return of a fund relative to its benchmark.

When it presents a negative value and close to zero, it means that there is a lower return on the portfolio relative to its reference index.

The beta is the indicator of market risk and measures the sensitivity of the ETF's return to the market, based on historical returns. When beta is greater than 1 it means that there is a tendency for the portfolio to vary more than the reference index.

RESULTS

In this section, it will be presented the results obtained and the respective interpretations. First, the authors perform statistical measures and then risk-adjusted performance measures.

Table 2. Descriptive Statistics

Country	Return		Standard Deviation		Excess return	Tracking error
	ETF	Benchmark	ETF	Benchmark		
Germany	-0,0000758	0,0001939	0,0117195	0,0119057	-0,0002697	0,0083619
Austria	0,0000385	0,0001630	0,0121638	0,0118692	-0,0001245	0,0080345
Belgium	0,0001324	0,0002139	0,0098634	0,0101389	-0,0000815	0,0082219
Spain	-0,0001873	-0,0000221	0,0138805	0,0127468	-0,0001652	0,0089946
France	0,0000709	0,0002039	0,0114943	0,0114691	-0,0001330	0,0085377
Finland	0,0001352	0,0003253	0,0117149	0,0110452	-0,0001902	0,0084820
Netherlands	0,0001488	0,0002707	0,0106370	0,0105716	-0,0001219	0,0082331
Italy	-0,0000709	0,0001030	0,0153937	0,0153548	-0,0001739	0,0091994
Sweden	-0,0000826	0,0001608	0,0120961	0,0107018	-0,0002434	0,0090067
Switzerland	0,0000737	0,0001176	0,0087530	0,0095245	-0,0000439	0,0083200

Source: Own elaboration

Table 2 shows the returns, standard deviation for each of the ETFs, and respective benchmarks, as well as the excess return and tracking error.

Figure 1. Mean Returns

Source: Own elaboration



Figure 2. Standard Deviation

Source: Own elaboration



Performance of Exchange-Traded Funds in Europe

Figure 1 presents the return of each ETF's and its respective benchmark. For the period under review, four funds have negative average returns (Germany, Spain, Italy, and Sweden), with only one benchmark also showing a negative return (Spain). All ETFs are lower than the respective benchmark, as the excess return is negative for all ETF's, with Germany showing the most negative value, indicating that it was less than replicating its benchmark. The evidence that ETFs fell short of their benchmarks is reinforced by the tracking error indicator, however, presenting low values for all funds, indicating a close relationship between the risk/return characteristics of the funds and the respective benchmarks.

Figure 2 exhibit the standard deviation (total risk) for the funds and their benchmark, and this indicator, most funds have a greater deviation than the respective benchmark, as it is possible to see through the figure, thus showing greater risk, as is the case in Austria, Spain, France, Finland, Holland, Italy, and Sweden, although the differences are tiny.

Table 3. Relative performance measures~

Country	I, Sharpe		I, Treynor		I, Sortino	
	ETF	Benchmark	ETF	Benchmark	ETF	Benchmark
Germany	0,007207	0,029750	0,000100	0,000354	0,007202	0,029718
Austria	0,016340	0,027235	0,000227	0,000323	0,016376	0,027268
Belgium	0,029678	0,036912	0,000448	0,000374	0,029632	0,036901
Spain	-0,001943	0,010841	-0,000030	0,000138	-0,001947	0,010861
France	0,020113	0,031752	0,000274	0,000364	0,020085	0,031740
Finland	0,025220	0,043967	0,000337	0,000486	0,025220	0,043967
Netherlands	0,029058	0,040770	0,000365	0,000431	0,029009	0,040695
Italy	0,005805	0,017148	0,000102	0,000263	0,005808	0,017151
Sweden	0,006427	0,030005	0,000089	0,000321	0,006425	0,029993
Switzerland	0,026734	0,029181	0,000295	0,000278	0,026723	0,029164

Source: Own elaboration

Table 3 presents risk adjust measures for each fund and their respective benchmark during the period under analysis.

Figure 3. Sharpe Ratio

Source: Own elaboration

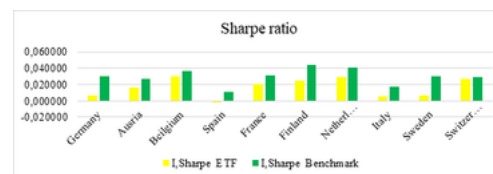


Figure 4. Treynor Ratio

Source: Own elaboration

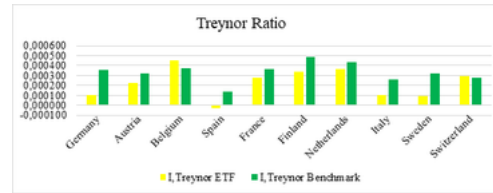


Figure 5. Sortino's Ratio

Source: Own elaboration

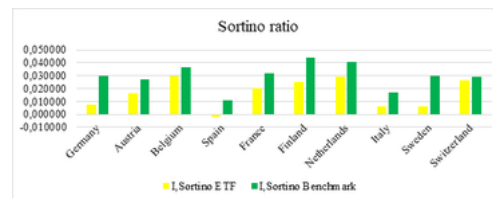


Figure 3 shows the values for the Sharpe index. Using the Sharpe ratio as a performance measure, it appears that no ETF has managed to outperform its benchmark, with Spain having the worst performance under this indicator. The Sharpe index for this ETF was negative because the expected return for the portfolio is lower than the risk-free interest rate. Belgium is the fund that shows the best performance and that came closest to replicating its benchmark.

Figure 4 shows the values for the Treynor indicator. Regarding this indicator, only 2 ETFs, namely Belgium and Switzerland, outperform their respective benchmarks. The remaining ETFs (Germany, Austria, Spain, France, Finland, Netherlands, Italy, and Sweden,) underperform their respective benchmarks, with Spain being the most notable case for the negative.

Table 4. Jensen Alpha

País	Alfa Jensen	Beta	Adjusted R ²
Germany	-0,0002143	0,84***	0,7473515
Austria	-0,0000841	0,87***	0,7721708
Belgium	-0,0000198	0,84***	0,7249144
Spain	-0,0001508	0,90***	0,7500132
France	-0,0000757	0,84***	0,7354974
Finland	-0,0001302	0,88***	0,7388611
Netherlands	-0,0000558	0,85***	0,7367851
Italy	-0,0001407	0,87***	0,7752729
Sweden	-0,0002013	0,87***	0,7031042
Switzerland	0,0000136	0,79***	0,6949874

Source: Own elaboration

Performance of Exchange-Traded Funds in Europe

Table 5. Organization of ETF's in decreasing order of performance and beta

I.Sharpe		I.Treynor			
Country	ETF	Country	ETF	Country	Beta
Belgium	0,029678	Belgium	0,000448	Spain	0,90
Netherlands	0,029058	Netherlands	0,000365	Finland	0,88
Switzerland	0,026734	Finland	0,000337	Austria	0,87
Finland	0,025220	Switzerland	0,000295	Italy	0,87
France	0,020113	France	0,000274	Sweden	0,87
Austria	0,016340	Austria	0,000227	Netherlands	0,85
Germany	0,007207	Italy	0,000102	Germany	0,84
Sweden	0,006427	Germany	0,000100	France	0,84
Italy	0,005805	Sweden	0,000089	Belgium	0,84
Spain	-0,001943	Spain	-0,000030	Switzerland	0,79

Source: Own elaboration

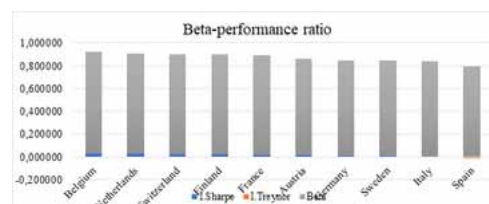
Figure 5 presents the situation in the case of the Sortino ratio, the result is similar to what happened with the Sharpe ratio. None of the ETF's outperforms their benchmark, with Spain performing the worst and Belgium performing the best under this indicator. The determinant of underperformance on the one hand is related to the choice of the benchmark, that is, when evaluating funds, we can generate different classifications, depending on the market index used. On the other hand, it has to do with the impact of taxation, according to Blitz et al. (2010) funds listed in Europe are subject to dividend taxes. The authors believe that dividend taxes are a cost component with a magnitude that is, in many cases, comparable to the expense ratio.

Table 4 shows the results of the regressions with daily data. The values of alpha, beta and adjusted R^2 of the regression are presented, for a significance level of 1% (***). About the alpha performance measure, it appears that most alphas are negative, except for Switzerland. However, the alpha is not statistically significant.

Beta coefficients, on the other hand, are all statistically significant at 1% and are less than one. This means that, in all cases, the systematic risk of the ETF is lower than that of its benchmark, thus being less susceptible to changes in the underlying index. For the total of the period under analysis, the lowest beta is from Switzerland with 0.79, while Spain has the highest beta coefficient, of 0.90.

Figure 6. Beta-performance ratio

Source: Own elaboration



Concerning the adjusted determination coefficients (adjusted R^2) it appears that it has a value greater than 50%, ranging from 70% to 77%.

Results of the Beta-Performance Relationship

Now ETF's will be grouped in decreasing order of performance and beta, to gauge whether the top-performing ETFs are the riskiest. The table and the following figure illustrate this organization of ETF's.

Table 5 and Figure 6 show that Belgium exhibits the highest value for both the Sharpe index and the Treynor index. Conversely, Spain has the lowest value for both indicators. Contrasting the two performance indicators with the beta, it is possible to see that Belgium that performs best is the second least risky ETF, and Spain that performs worst is the riskiest ETF. For intermediate funds, it is also not found the trend "the largest has the best performance". The Netherlands with the second-best performance is the sixth most risky, while Switzerland with the fourth-highest value for the Treynor index is the least risky of all. The only situation close to what classical financial theory mirrors is the case of Finland, which has the third-highest value for the Treynor index and is the second most risky ETF. This way, in the authors' opinion, suggests the existence of the low-risk anomaly reported by Baker et al. (2011), bringing relevance to our work on a topic still little explored, such as these new investment vehicles, ETFs. This result is under the project of the authors' research.

CONCLUSION

Exchange-traded funds (ETFs) are exchange-traded investment funds that combine the diversification of a mutual fund with the flexibility of stocks. ETF's are a good vehicle for investors looking to invest in broadly diversified securities.

In this chapter, the authors analyzed the performance of the European traded funds (ETF's) of the European iShares family, using risk-adjusted performance measures: Sharpe Index, Treynor Index, Sortino Index, and Jensen's alpha. They also checked the beta-performance ratio and conjectured that ETFs with the highest betas are the ones that perform best.

From the results obtained, it was concluded that all ETF's had an average return lower than that of the respective benchmark. Using the Sharpe index, it was found that no ETF performed better than its benchmark. As for the Treynor index, two ETF's, namely Belgium and Switzerland, outperformed their respective benchmarks. As with the Sharpe index, for the Sortino index, no ETF exceeded its benchmark. What does it mean from an economic or financial point of view?

These results may have to do with the lack of efficiency on the part of the managers in the choice of securities that compose the ETF's or the benchmarks in question are inefficient. In case the benchmarks in question are inefficient, the authors suggest choosing another benchmark, one that is common to all ETFs, or using an evaluation methodology that does not involve comparing ETFs with a reference index. Another question that can be raised has to do with whether or not the manager takes into account the timing activities.

As for the beta-performance relationship, the results indicate the existence of the low-risk anomaly.

In carrying out this analysis, the authors encountered some limitations. First, in what concerns the collection and treatment of data, specifically, in the standardization of the sample. Second, the lack of literature strictly related to this topic also prevents them from comparing the results obtained.

In the future it would be interesting to carry out this analysis, replacing the various benchmarks used by one common to all funds, such as MSCI Europe, which covers all countries involved in this study and to replace the risk-free interest rate used. With these innovations and using for example the DEA methodology, it would be possible to identify the most efficient ETF.

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Chapter 22

Do the Stock Market Indices Follow a Random Walk?

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ABSTRACT

This chapter aims to test the hypothesis of an efficient market, in its weak form, in the stock markets of Brazil, China, South Korea, USA, Spain, Italy, in the period from December 2, 2020 to May 12, 2020. The results show that the market efficiency hypothesis is rejected in all markets. In corroboration the DFA exponents show long memories, which put in question the market efficiency, in its weak form, suggesting that the stock markets analyzed show some predictability. In conclusion, investors should avoid investing in stock markets, at least while this pandemic lasts, and invest in less risky markets in order to mitigate risk and improve the efficiency of their portfolios.

INTRODUCTION

History has witnessed many epidemic diseases that have caused many deaths. Some examples are: the Black Plague “Plague Outbreak” which led to the death of 75 -100 million people in the period of 1347 and 1351; the Bloody Fever that occurred in Mexico in 1545-1548; the cholera epidemic between 1899 and 1923; the AIDS virus that first appeared in Cameroon in 1908; the severe acute respiratory syndrome (SARS) that was relevant in Asia and Canada between 2002 and 2003; and more recently Ebola and swine flu. The Covid-19 coronavirus is an outbreak that first appeared in December 2019 in Wuhan City, Hubei Province, China (Ruiz Estrada, Park, Koutrouas, Khan, and Tahir, 2020).

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The Covid-19 pandemic has negatively affected global trade, as well as social and cultural life, tourism, trade in goods, production and sectors such as transport. Thus, rating agencies such as Moody's and Standard & Poors have lowered China's growth forecast for 2020 (Liu, Manzoor, Wang, Zhang, and Manzoor, 2020).

In line with all these negative effects and as the global pandemic (Covid-19) was evolving, stock markets broke sharply in the week of 24-28 February 2020. The UK's main stock index (FTSE100) fell 13%, while the DJIA and S&P500 stock market fell 11-12%, respectively, being the sharpest weekly drop since the subprime financial crisis of 2008. On March 9, 2020, the oil war between Russia and Saudi Arabia in 2020 caused Europe's stock markets to fall by almost 8%, with the Italian market (FTSE MIB) breaking by 11.17%. Asian markets also fell, and the S&P 500 index fell 7.60%. On March 12, 2020 and after the ban on travel from Europe to the U.S., stock prices fell sharply. The DJIA stock market fell 9.99%, and the S&P 500 and NASDAQ indices each fell about 9.5%, while Europe's major stock markets had fallen more than 10% (Ashraf, 2020; Ms Krishika Narayan, 2020; Ngwakwe, 2020; Okorie and Lin, 2020; Şenol and Zeren, 2020; Yan, Stuart, Tu, and Zhang, 2020).

Speculation in financial markets is a way that involves the attempt of international investors to be able to anticipate asset prices. Market regulation itself, by trying to avoid this process, reduces in part, the informational efficiency of financial markets. The information that reaches the market is not adjusted immediately in the stock prices, which sometimes causes some imbalance (Dias, da Silva, and Dionísio, 2019; Dias, Heliodoro, and Alexandre, 2020; Dias, Heliodoro, Teixeira, and Godinho, 2020; Dias, Heliodoro, Alexandre, Santos, and Farinha, 2021).

In view of these events this chapter intends to test the hypothesis of efficient market, in its weak form, in the financial markets of Brazil (BOVESPA), China (Shanghai), South Korea (KOSPI), USA (DOW JONES), Spain (IBEX35) and Italy (FTSE MIB), in the period between January 1, 2015 to January 11, 2021. The choice for these stock markets is related to the observed severe impacts of the global pandemic in 2020. Asian countries were the first to feel this effect to China (epicenter), and then South Korea, while in February and March 2020, the outbreak spreads in Europe with severe effects in the countries of Italy and Spain. Months later we found that the coronavirus entered the American continent, with a very significant relevance in the USA and Brazil. The results show that in the pre-Covid subperiod the markets do not present serial autocorrelation in their returns, except for the Brazilian market (0.55). In Wright's model, through the Rankings test (homocedastic), evidence shows that the Italian market rejects the hypothesis for the lags 2 and 4 days, while for the Signals test (heteroscedasticity) there is a rejection for the 2-day lag. In order to validate results, the DFA exponent shows an alpha of 0.52, but not significant, which may induce that this market is in balance. In the Covid subperiod, we found that all markets present autocorrelation in series. These findings are validated by the results of the Wright model of Rankings and Signs, and α DFA that present significant long memories, except for china. This evidence validate, in part, the research question, that is, the global pandemic of 2020 affected the memory properties of the analyzed stock markets.

This chapter differs from previous studies, as it tests efficiency, in its weak form, in markets where the evolution of the pandemic has been more pronounced. Other investigations are more related to report the integration and shocks caused in the financial markets resulting from the global pandemic (Covid-19). As far as is known, the authors Zeren and Hizarci (2020), Dias, Heliodoro, Alexandre, and Vasco (2020), Dias, Teixeira, Machova, et al. (2020), Pardal, P., Dias, R., Šuleř, P., Teixeira, N., and Krulický (2020) analyzed the impact of the pandemic on financial markets, but the research issues, the analyzed markets and the adopted methodology, were essentially different from those followed in this chapter.

Do the Stock Market Indices Follow a Random Walk?

In terms of structure, this chapter is organized into 5 sections. In addition to the current introduction, section 2 presents an analysis of the Literature Review with regard to articles on the random walk hypothesis in international financial markets. Section 3 describes the methodology and section 4 contains details on data and results. Section 5 presents the general conclusions of the work.

LITERATURE REVIEW

The first concept of market efficiency was presented by Gibson (1889), where the author considers that stock prices incorporate all information available. Later the French mathematician Bachelier (1900), found that the behaviors of asset prices fluctuated randomly, that is, they are independent of previous fluctuations, formulating the random walk hypothesis.

According to Fama (1965a) the efficient market is constituted by a group of rational agents that competes for the prediction of asset prices behavior. In an efficient market all relevant information is already available to all market players, i.e. the arrival of new information is quickly reflected in the prices, preventing agents from being able to predict their fluctuation and thus obtain abnormal returns without incurring in additional risk. Later, Fama (1970) shows that the market can be efficient, as long as, a significant number of participants have rapid access to the available information. Even if, among them, there is no agreement in relation to this information, this is not a reason enough for the market to be inefficient, since prices are not defined by consensus among all actors, but by an elected group of operators who actively transact each security. For this purpose there is a group of analysts, arbitrageurs and investors who invest time and resources in search of securities with misadjusted prices, through the access to powerful databases with up-to-date information. Then, they use techniques and models, so that they can act in a timely manner, and therefore, when acting in their own interest, contribute to the rapidly incorporating of new information in prices. In order to validate these assumptions, it defines efficiency in three groups:

- *weak-form efficiency* - where the current price of shares reflects only their historical value, i.e., the present prices incorporate only the information contained in past prices. Thus, no investor will be able to obtain abnormal gains systematically, using only the historical information contained in the prices of assets.
- *semi-strong form efficiency* - at this level of efficiency, the price of assets instantly incorporates all new public information available. Investors will only be able to make abnormal gains if they have access to inside information, namely if they are aware of the existence of incorrectly valued assets.
- *strong-form efficiency* - all information, even of “confidential” nature, is reflected in the current price of assets, thus not allowing the use of inside information by any investor to obtain abnormal gains.

The defined typologies are gradual, which means that the semi-strong form of efficiency encompasses the weak form, while the strong form encompasses the previous two levels.

The theme on the efficient market hypothesis (EMH) has motivated several studies to test this assumption of efficiency and if the current price of assets reflects all available information at a given time and adjusts, rapidly, as new and unforeseen information comes to market. The hypothesis of mean reversion, also called negative series correlation, has been interpreted as an efficient correction mechanism

in developed markets and a sign of a speculative bubble in emerging financial markets (Summers, 1986; Fama and French, 1988).

Shirvani and Delcours (2016), Urquhart and McGroarty (2016), Ngene, Tah and Darrat (2017) examined whether stock prices follow random walk or mean reversion processes in international markets. Shirvani and Delcours (2016) analyzed 16 OCDE stock markets and they show that markets are efficient in their weak form. Urquhart and McGroarty (2016) examined the hypothesis of an efficient market, in its weak form, in the S&P500, FTSE100, NIKKEI225 and EURO STOXX 50 indexes. Tested the predictability of stock returns, with daily data from January 1990 to May 2014. The results show that there are periods of predictability in profitability, but also episodes without predictability. Ngene, Tah and Darrat (2017) examined 18 emerging capital markets in the presence of multiple unforeseen and successive structural breakdowns. When they used single-break tests, the random walk hypothesis was rejected. However, when they used double-level change tests in the mean and tolerance to several structural breaks, the results were consistent with the random walk hypothesis in most analyzed markets.

Mensi, Tiwari, and Yoon (2017), Ali, Shahzad, Raza, and Al-Yahyaee (2018) analyzed market efficiency, in its weak form, in the Islamic stock markets. Mensi, Tiwari, and Yoon (2017) showed that the MF-DFA analysis showed efficiency for sectorial stock markets. In addition, the results show high efficiency, in the long term, but moderate in the short term, and that these markets become less efficient after the onset of the global financial crisis. Ali, Shahzad, Raza, and Al-Yahyaee (2018) using the MF-DFA analysis shows that developed markets are relatively more efficient, followed by BRICS stock markets. Comparative analysis of efficiency shows that almost all Islamic stock markets, with the exception of Russia, Jordan and Pakistan, were more efficient than their conventional peers. Furthermore, evidence indicates that the adjustment of the Islamic stock market to speculative activity is, in fact, greater than its conventional peers.

Aggarwal (2018), Rehman, Chhapra, Kashif, and Rehan (2018), Malafeyev, Awasthi, S.Kambekar, and Kupinskaya (2019) empirically examined the efficiency of the market, in its weak form, in the Asian financial markets. Aggarwal (2018) analyzed the Korean stock price index from July 1997 to September 2016. The author emphasize that the analyzed series did not follow a random walk model. The results have significant implications for investors, as market inefficiency could affect domestic and international flows from an economy. Rehman, Chhapra, Kashif, and Rehan (2018) analyzed the indices KSE 100, S&P BSE 500 and CSE All Share, showing that the hypothesis of random walk and market efficiency, in its weak form, is not verified. Malafeyev, Awasthi, S.Kambekar, and Kupinskaya (2019) studied the stock markets of China and India, analyzing the impact of the global financial crisis of 2008 and the recent Chinese crisis of 2015. Data from the last 20 years of the Bombay Stock Exchange (BSE200) and the Shanghai Stock Exchange Composite Index was selected and divided into four subperiods, i.e., before the period of the financial crisis (period I), during the 2008 financial crisis (period II), after the subprime crisis and before the Chinese crisis (period III) and the beginning of the Chinese crisis to date (period IV). The evidence confirms that the Indian and Chinese stock markets do not show market efficiency in its weak form. These markets did not follow the random walk in the first three periods (1996 to 2015), although efficiency, in percentage terms, increased after the global financial crisis of 2008.

Ali, Alam, and Rizvi (2020), Ashraf (2020), Liu, Manzoor, Wang, Zhang, and Manzoor (2020), Zeren and Hizarci (2020) analyzed the impact of the global pandemic (Covid-19) on financial markets. There, Alam, and Rizvi (2020) investigated the reaction of financial markets as the epicenter of coronavirus moved from China to Europe and then to the US. The authors show that international markets went into free fall, especially in the contagion phase. Ashraf (2020) examined the stock market's response to the

Covid-19 pandemic, and for this purpose used daily data of confirmed cases and deaths and the returns of 64 markets in the period from 22 January 2020 to 17 April 2020. The author points out that the stock markets reacted negatively to the growth of confirmed cases of Covid-19, that is, the returns of the stock markets decreased as the number of confirmed cases increased. Liu, Manzoor, Wang, Zhang, and Manzoor (2020) studied the impact of the coronavirus outbreak on 21 stock indexes. The authors show significant structural breakdowns resulting from the 2020 global pandemic outbreak, suggesting that, in the most part of the stock markets, there was a decrease in value. Zeren and Hizarci (2020) analyzed the effects of the Covid-19 epidemic on the stock markets in the period of 23 January 2020 and 13 March 2020. The authors show that the global cases of the outbreak are integrated with the SSEC, KOSPI and IBEX 35 markets, but not with the FTSE MIB, CAC 40, DAX 30 markets.

In summary, this work aims to contribute to the provision of information to investors and regulators in international stock markets, where individual and institutional investors seek to efficiently diversify their portfolios, in a period of uncertainty and lack of confidence arising from the global pandemic (Covid-19).

METHODOLOGY

Data

Data on the stock market prices index of Brazil (BOVESPA), China (SHANGHAI), South Korea (KOSPI), USA (DOW JONES), Spain (IBEX35) and Italy (FTSEMIB), was obtained from the Thomson Reuters platform. We collect daily quotations that comprises the period from January 1, 2015 to January 11, 2021 (1573 time data). The quotations are in local currency, in order to mitigate distortions in exchange rates. The sample was partitioned into two subperiods: pre-Covid, January 1, 2015 to January 31, 2019 (1067 time data); Covid, February 1, 2019 to January 11, 2021. We choose these markets, since they are related to the most severe impacts observed of the global pandemic of 2020, observe. Asian countries were the first to feel this adverse effect, China (epicenter), and then South Korea. In February and March 2020, the outbreak spreads in Europe with severe effects in Italy and Spain. Some months later coronavirus affected the American continent, with a very significant relevance in the USA and Brazil (see table 1).

Methodology

The development of the research took place through several stages. In a first phase, we show the evolution of the markets using stock prices, in levels, and in first differences. Sample characterization is shown through descriptive statistics, through the Jarque & Bera (1980) adherence test and through quantile graphs to estimate the distribution of the time series. In order to validate whether the time series follow a white noise (mean = 0; constant variance), we used the tests of unit roots in panel by Breitung (2000) and Levin, Lin, and Chu (2002) that postulate the same null hypotheses (H_0 =unitary roots). To verify structural breaks we estimate stability graphs for the residues and the test of Clemente, Montañés, and Reyes (1998), since we are analyzing a highly troubled period in the financial markets. In order to answer the main research question, we used a non-parametric test developed by Wright (2000), because it is a more resilient to test time series that does not show normality, and quite consistent, when they present serial correlation. In order to validate results we use the Detrended Fluctuation Analysis (DFA) methodology.

Table 1. Scope of research, countries and indices.

Country / Region name	Index
Brazil / Latin America	BOVESPA
China / Asia	SHANGAI
South Korea / Asia	KOSPI
USA / America	DOW JONES
Spain / Europe	IBEX 35
Italy / Europe	FTSE MID

Source: Own elaboration.

Wright's methodology (2000), consists of two types of tests, the position test (Rankings) for homoscedastic series and the Signals test for heteroscedastic series. The position test (Rankings) of variance is supported in the ordering of the series of returns. The position of $r(r_t)$ returns shall be considered, r_t between: $r_1, r_2, \dots, r_T$

$$r'_{1t} = \frac{\left(r(r_t) - \frac{T+1}{2} \right)}{\sqrt{\frac{(T-1)(T+1)}{2}}} \quad [1]$$

$$r'_{2t} = \Phi^{-1} \left(\frac{r(r_t)}{T+1} \right) \quad [2]$$

In what Φ^{-1} translates the cumulative inverse standardized normal distribution, it is a r'_{2t} standardized linear transformation of the position of returns and r'_{2t} is a standardized reverse normal transformation.

$$R_1(q) = \left(\frac{\frac{1}{Tq} \sum_{t=q+1}^T (r'_{1t} + r'_{1t-1} + \dots + r'_{1t-q})^2}{\frac{1}{T} \sum_{t=q+1}^T (r'_{1t})^2} \right) \times \left(\frac{2(2q-1)(q-1)}{3qT} \right)^{-1/2} \quad [3]$$

$$R_2(q) = \left(\frac{\frac{1}{Tq} \sum_{t=q+1}^T (r'_{2t} + r'_{2t-1} + \dots + r'_{2t-q})^2}{\frac{1}{T} \sum_{t=q+1}^T (r'_{2t})^2} \right) \times \left(\frac{2(2q-1)(q-1)}{3qT} \right)^{-1/2} \quad [4]$$

Do the Stock Market Indices Follow a Random Walk?

The rejection of the *random walk hypothesis* of returns is generated by a simulation process, in which the values of statistics r'_{1t} and r'_{2t} are replaced by the simulated values r^*_{1t} and r^*_{2t} . Using bootstrap estimative, which result in successive and random generation of data, in order to simulate the statistical properties of the true sample distribution, the exact distribution of $R_1(q)$ and $R_2(q)$ can be approximated to a certain level of confidence. The Wright (2000) methodology, proposes a second test, called a ratio of variances by signals, which considers the signal of returns, r_t to calculate the ratio of signals, being the same heterocedastic, so we can use the following test statistics, now let's see:

$$S_1(q) = \left(\frac{\frac{1}{Tq} \sum_{t=q+1}^T (S_t + S_{t-1} + \dots + S_{t-q})^2}{\frac{1}{T} \sum_{t=q+1}^T (S_t)^2} \right) \times \left(\frac{2(2q-1)(q-1)}{3qT} \right)^{-1/2} \quad [5]$$

Where

$$S_t = 2v(r_t, 0) \quad [6]$$

$$v(x_t, p) = \begin{cases} 0,5 se & x_t > p \\ -0,5 se & x_t \leq p \end{cases} \quad [7]$$

The distribution of $S_1(q)$ can be approximated through $S_1^*(q)$ using bootstrap techniques, and as happened in the variance ratio by *rankings*. $S_1^*(q)$ is obtained from the sequence $\{S_t^*\}_{t=1}^T$, as each of its elements being able to record the values 1 or -1, with the same returns.

The Detrended Fluctuation Analysis (DFA) method is applied to identify and measure the autocorrelation of non-stationary time series, originally developed by Peng et al. (1994). This method has been used for the analysis of time series in several fields of study, but in the area of financial markets are highlighted the studies Mantegna and Stanley (1995), Liu et al. (1999), Podobnik and Stanley (2008), Ruan and Zhou (2011), Zebende, Da Silva, and Machado Filho (2013), Dias et al. (2019), Dias, Heliodoro, and Alexandre, (2020).

The calculation of the DFA method is performed through the following steps (Machado Filho, Da Silva, and Zebende, 2014):

1. Considering a variable u_i with i ranging between 1 and N (represents the length of the time series), the first step is to integrate the u_i signal in order to obtain the integrated series $y(k)$:

$$y(k) = \sum_{i=1}^k [u_i - \langle u \rangle] \quad [8]$$

where (u) it represents the mean of u_i and $k=1, \dots, N$;

2. The series $y(k)$ is divided into intervals of equal length n .
3. For each length range $n, y(k)$ it is adjusted through a polynomial order function I , demonstrated by $y_n(k)$ which represents the local trend in the range.
4. The integrated signal $y(k)$ is subtracted from $y_n(k)$ in each size amplitude n .
5. 5. For a given size range n , the root mean square fluctuation, $F(n)$ for this integrated and trendless signal is calculated by:

$$F_{DFA}(n) = \sqrt{\frac{1}{N} \sum_{k=1}^N [y(k) - y_n(k)]^2} \quad [9]$$

6. The above calculation should be performed for a repeated period with n the range between $4 \leq n \leq N/4$, in order to provide a relationship between F_{DFA} and n .

The Detrended Fluctuation Analysis (DFA) presents the following interpretation:

Table 2. Detrended Fluctuation Analysis (DFA)

Exponent	Type of Signal
$\alpha F_{DA} < 0.5$	long-range anti-persistent
$\alpha F_{DA} = 0.5$	uncorrelated, white noise
$\alpha F_{DA} > 0.5$	long-range persistent

Source: Own elaboration.

RESULTS

To analyze the behavior of financial markets, Tsay (2005) proposes the use of series of returns to the detriment of price series, because investors are primarily interested in knowing the profitability of an asset or an asset portfolio. In addition, the returns series show statistical characteristics that simplify analytical treatment, namely the characteristic of stationarity, which is not usually present in price series. For the above reasons, the series of price indices were modified into series based in the differences of neperian logarithms of current and previous prices (logarithmic returns), instantaneous or continuously composed r_t , by the following expression:

$$r_t = \ln P_t - \ln P_{t-1} \quad [10]$$

where r_t it is the rate of return, on the day t , and P_t and P_{t-1} are the closing prices of the series, at the times t and $t-1$ respectively.

Figure 1 shows the evolution of prices, in levels, in the financial markets of Brazil (BOVESPA), China (Shanghai), South Korea (KOSPI), USA (DOW JONES), Spain (IBEX35) and Italy (FTSE MIB), in

Do the Stock Market Indices Follow a Random Walk?

the period from January 1, 2015 to January 11, 2021, and we can see the existence of extreme volatility in the stock markets in 2015 and 2016, resulting from the stock market crash in China, but we found that the breaks are not synchronized. However, when we look at the global pandemic period (Covid) we found that the declines are synchronized between markets in the first quarter of 2020.

Figure 1. Evolution, in levels, of the 6 stock markets, in the period from January 1, 2015 to January 11, 2021.

Source: Own elaboration.

Note: Thomson Reuters: January 2015 to January 2021 (1573 time data).



Figure 2 shows the evolution of the 6 stock markets, year differenced, and the graphical analysis of the stock indices evidence that these present very similar patterns of behavior during the sampling period, and that these patterns were strongly marked by the occurrence of two episodes, the stock market crash of China in 2015-2016, and the global pandemic of 2020. The Brazilian stock index shows the sharpest volatility, and to a lesser extent the stock markets of Italy, USA, Spain, South Korea and China, respectively.

Figure 2. Evolution, year differenced, of the 6 stock markets, from January 1, 2015 to January 11, 2021.

Source: Own elaboration.

Note: Thomson Reuters: January 2015 to January 2021 (1572 time data).

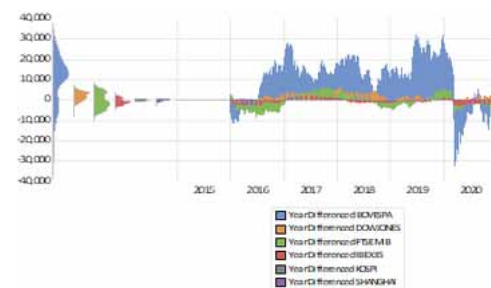


Figure 3 shows the period from January 1, 2020 to January 11, 2021, i.e., the most pronounced period of the global pandemic of 2020, and we can observe that in January and February markets began

to react negatively to the evolution of the pandemic. However, we found that March is the month with more marked structural breakdowns, that is, the uncertainty and pessimism experienced in the global economy has had harmful effects on financial markets. When we compared the first wave to the second wave of the global pandemic, we found that extreme volatility has decreased over time, suggesting that confidence is being recovered by international investors.

Figure 3. Evolution, log differenced, of the 6 stock markets, in the period from January 1, 2020 to January 11, 2021.

Source: Own elaboration.

Note: Thomson Reuters: January 1, 2020 to January 11, 2021 (269 time data).

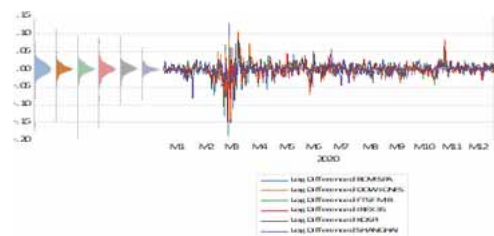


Table 3 shows the descriptive statistics of the logarithmic returns, of the 6 stock markets under analysis, from January 1, 2015 to January 11, 2021. We can observe that the mean of returns is positive, with the exception of the IBEX 35 stock index (-0.000128). The sharpest standard deviation is showed by the Brazilian stock market (0.016769), and to a lesser extent in the KOSPI stock index (0.009956). In relation to asymmetries and short sits, we found that they present different values to those as reference (0; 3), which induces that we are dealing with data that do not follow a normal distribution. To validate results, we used the Jarque and Bera test (1980) which demonstrates that all time series do not present normal distributions, since the null hypothesis was rejected with a significance of 1%.

Table 3. Descriptive statistics of logarithmic returns, of the 6 stock markets, from January1, 2015 to January 11, 2021.

	BOVESPA	DOW JONES	FTSE MIB	IBEX 35	KOSPI	Shanghai
Mean	0.000583	0.000354	0.000115	-0.000128	0.000316	5.60E-05
Std. Dev.	0.016769	0.012078	0.015268	0.013503	0.009956	0.014284
Skewness	-1.205321	-1.115444	-1.869569	-1.593276	-0.316751	-1.218111
Kurtosis	19.50217	28.28650	24.02402	22.20272	14.85433	10.76441
Jarque-Bera	18229.29***	42233.99***	29886.38***	24833.64***	9236,554***	4340.247***
Sum	0.916755	0.556649	0.181426	-0.201004	0.496885	0.088146
Sum Sq. Dev.	0.442037	0.229338	0.366470	0.286643	0.155831	0.320730
Observations	1573	1573	1573	1573	1573	1573

Source: Own elaboration.

Note: ***, ** represents significance at 1% and 5%, respectively.

Do the Stock Market Indices Follow a Random Walk?

Table 4. Breitung panel root tests (2000) for the 6 stock markets from January 1, 2015 to January 11, 2021.

Null Hypothesis: Unit root (common unit root process)				
Method			Statistic	Prob.**
Breitung t-stat			-37.3632	0.0000
	S.E. of			
Series	Regression	Lag	Max Lag	Note
D(BOVESPA)	1930.49	0	23	1571
D(DOW JONES)	270.973	8	23	1563
D(FTSE MIB)	427.806	0	23	1571
D(IBEX 35)	162.540	0	23	1571
D(KOSPI)	23.9873	1	23	1570
D(SHANGHAI)	69.1754	0	23	1571
	Coefficient	T-Stat	SE Reg	Note
Pooled	-0.32608	-37.363	0.009	9411

Source: Own elaboration.

Note: ***, ** represents significance at 1% and 5%. respectively.

As we are estimating time series, we should examine the stationary nature of the data series of the 6 stock markets. The unit roots panel tests of Breitung (2000), Levin, Lin, and Chu (2002) stated as null hypothesis, that all panels contain a unit root, and we found that the intersection of the tests show the stationarity of the time series, in the first differences (see tables 4 and 5).

Table 5. Panel unitary root tests by Levin, Lin, and Chu (2002) for the 6 stock markets from January 1, 2015 to January 11, 2021.

Null Hypothesis: Unit root (common unit root process)						
Method			Statistic		Prob.**	
Levin, Lin & Chu t*			-100.292		0.0000	
	2nd stage	Variance	HAC of		Max	Band-
Series	Coefficient	Of Reg	Dep.	Lag	Lag	Width
D(BOVESPA)	-1.13217	2.E+06	279944	0	23	10.0
D(DOW JONES)	-0.91705	67321.	3901.0	8	23	38.0
D(FTSE MIB)	-1.05108	86775.	4122.6	0	23	39.0
D(IBEX 35)	-0.98224	13434.	635.86	0	23	41.0
D(KOSPI)	-0.81542	411.88	10.480	2	23	81.0
D(SHANGHAI)	-0.92257	2576.7	63.419	0	23	84.0
	Coefficient	T-Stat	SE Reg	mu*	sig*	Note
Pooled	-1.00332	-84.028	1.003	-0.500	0.707	9416

Source: Own elaboration.

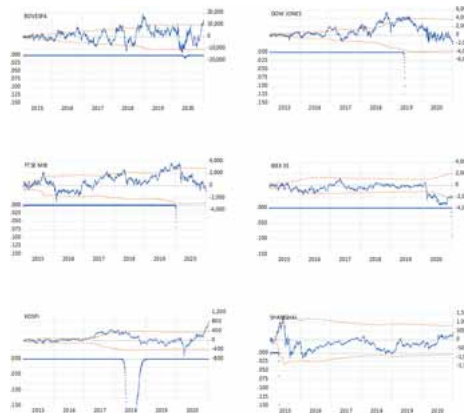
Note: ***, ** represents significance at 1% and 5%. respectively.

Figure 4 shows the stability tests performed on the residues of the 6 stock markets, and we can verify the existence of disturbances in variance. Additionally, when examining the graphs and the probability limits of 95% we verified the existence of violation of probability limits, therefore, the time series show an unstable behavior and accentuated structural breaks.

Figure 4. Stability tests carried out on residues for the 6 stock markets from January 1, 2015 to January 11, 2021.

Source: Own elaboration

Note: Thomson Reuters: January 2015 to January 2021 (1572 time data).



The Clemente, Montañés, and Reyes (1998) test identified several structural breakdowns in the 6 stock markets from January 1, 2015 to January 31, 2019. Table 6 shows the most significant structure breaks in the pre-Covid subperiod and we easily observe that the structural breaks do not present synchronizations, i.e., each stock market breaks in isolation, with the exception of the Spanish stock indices (IBEX 35), and Italy (FTSE MID) that broke on June 24, 2016.

Table 6. Unit root tests with structural breaks by Clemente, Montañés, and Reyes (1998), logarithmic returns, relating to the 6 stock markets, from January 1, 2015 to January 31, 2019.

Index	T-stat	Break Date
Bovespa	-33.51(0)***	18/05/2017
DOW JONES	-33.23(0)***	05/02/2018
FTSE MIB	-35.76(0)***	24/06/2016
IBEX 35	-33.48(0)***	24/06/2016
KOSPI	-33.68(0)***	11/10/2018
Shanghai	-31.81(0)***	24/08/2015

Source: Own elaboration.

Note: Lag Length (Automatic Length based on SIC). Break Selection: Minimize Dickey-Fuller t-statistic. The lateral values in parentheses refer to lags. ***, **, *, represent significance at 1%, 5% and 10%, respectively.

Do the Stock Market Indices Follow a Random Walk?

Table 7 shows the results of the unitary root test by Clemente, Montañés, and Reyes (1998), which postulates structural breaks. Based on the results, we can show that the declines were accentuated in March 2020, which is in line with the evolution of the global pandemic of 2020 and the war in oil prices between Saudi Arabia and Russia. Brazil's stock markets fell the sharpest on February 28, 2020, while China's stock index declined on January 22, 2020.

Table 7. Unit root tests with structural breakdowns by Clemente, Montañés, and Reyes (1998), logarithmic returns, relating to the 6 stock markets, from February 1, 2019 to January 11, 2021.

Index	T-stat	Break Date
Bovespa	-30.45(0)***	28/02/20
DOW JONES	-30.10(0)***	05/03/2020
FTSE MIB	-23.97(0)***	02/03/2020
IBEX 35	-23.18(0)***	04/03/2020
KOSPI	-22.78(0)***	04/03/2020
Shanghai	-23.17(0)***	22/01/2020

Source: Own elaboration.

Note: Lag Length (Automatic Length based on SIC). Break Selection: Minimize Dickey-Fuller t-statistic. The lateral values in parentheses refer to lags. ***, **, *. represent significance at 1%, 5% and 10%, respectively.

Table 8 shows the results of the non-parametric version of the Wright (2000) variance test, which includes the Rankings and Signals Variance Ratios tests in the Pre-Covid period, from January 1, 2015 to January 31, 2019 (1067 time data). In both cases, statistics were calculated for 2, 4, 8 and 16 days. Taking into account the results of the variance test by Rankings and Signs of Wright (2000), the random walk hypothesis is not rejected, except in the Brazilian stock market (0.55). In relation to the Italian market, the Rankings test (homoscedastic) rejects the random walk hypothesis for the 2 and 4 day lags, while for the Signals test (heteroscedasticity) there is rejection of the hypothesis for the 2-day lag. The results show that the time series, for the most part, do not present autocorrelation in series being independent, that is, they do not present memory.

Table 9 shows the results of the non-parametric version of the Wright variance test (2000), which includes the Rankings and Signs Variance Ratios tests in the Covid period, from February 1, 2019 to January 11, 2021 (507 time data). In both cases, statistics were calculated for 2, 4, 8 and 16 days. Taking into account the results of the Rankings and Signs Variance test by Wright (2000), the random walk hypothesis is rejected in all stock indexes. The results therefore support the conclusion that the random walk hypothesis is not confirmed in the analyzed financial markets, in this period of global pandemic. The values of variance ratios are lower than a unit, particularly in February and with greater significance in March 2020, which implies that returns is self-correlated over time and, there is mean reversion, and no differences between financial markets have been identified. In addition, the hypothesis of informational efficiency of financial markets could be questioned. These results are corroborated by the studies of the Aggarwal (2018), Sadat and Hasan (2019) and partially, with those of Ngene, Tah, and Darrat (2017), Abakah, Alagidede, Mensah, and Ohene-Asare (2018), Malafeyev et al. (2019) .

Do the Stock Market Indices Follow a Random Walk?

Table 8. Wright's Ranking and Signs Variance Ratios Tests (2000) from January 1, 2015 to January 31, 2019.

Null Hypothesis: BOVESPA is a random walk (Rank Score Variance Ratio)				
Joint Tests		Value	Df	Probability
Max z (at period 2)		16.09050	1065	0.0000
Wald (Chi-Square)		258.9142	4	0.0000
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.506946	0.030643	-16.09050	0.0000
4	0.259473	0.057327	-12.91760	0.0000
8	0.131395	0.090642	-9.582819	0.0000
16	0.067469	0.134880	-6.913806	0.0000
Null Hypothesis: BOVESPA is a martingale (Sign Variance Ratio Test)				
Joint Tests		Value	Df	Probability
Max z (at period 2)		11.06197	1065	0.0000
Wald (Chi-Square)		122.4759	4	0.0000
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.661033	0.030643	-11.06197	0.0000
4	0.492019	0.057327	-8.861116	0.0000
8	0.393427	0.090642	-6.691965	0.0000
16	0.335446	0.134880	-4.927019	0.0000
Null Hypothesis: DOW JONES is a random walk (Rank Score Variance Ratio)				
Joint Tests		Value	Df	Probability
Max z (at period 16)		1.491280	1065	0.3080
Wald (Chi-Square)		2.469558	4	0.6730
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.993156	0.030643	-0.223355	0.8340
4	0.955940	0.057327	-0.768579	0.4580
8	0.892755	0.090642	-1.183176	0.2430
16	0.798857	0.134880	-1.491280	0.1410
Null Hypothesis: DOW JONES is a martingale (Sign Variance Ratio Test)				
Joint Tests		Value	Df	Probability
Max z (at period 4)		0.376720	1065	0.9540
Wald (Chi-Square)		0.733731	4	0.9470
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.000939	0.030643	0.030643	0.9800
4	1.021596	0.057327	0.376720	0.6940
8	1.019249	0.090642	0.212361	0.8230
16	1.042723	0.134880	0.316749	0.7590
Null Hypothesis: FTSE MIB is a random walk (Rank Score Variance Ratio)				
Joint Tests		Value	Df	Probability
Max z (at period 2)		2.758842	1065	0.0110
Wald (Chi-Square)		8.202316	4	0.0830
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.915462	0.030643	-2.758842	0.0030
4	0.882237	0.057327	-2.054225	0.0300
8	0.839813	0.090642	-1.767253	0.0820
16	0.788548	0.134880	-1.567710	0.1090
Null Hypothesis: FTSE MIB is a martingale (Sign Variance Ratio Test)				
Joint Tests		Value	Df	Probability
Max z (at period 2)		1.930482	1065	0.1190
Wald (Chi-Square)		8.184179	4	0.0790
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.940845	0.030643	-1.930482	0.0490
4	0.953991	0.057327	-0.802578	0.4090
8	0.983568	0.090642	-0.181284	0.8650
16	0.901878	0.134880	-0.727479	0.4570
Null Hypothesis: IBEX 35 is a random walk (Rank Score Variance Ratio)				
Joint Tests		Value	Df	Probability
Max z (at period 16)		1.162203	1065	0.4800

continued on following page

Do the Stock Market Indices Follow a Random Walk?

Table 8. Continued

Wald (Chi-Square)		3.900187	4	0.4170
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.013761	0.030643	0.449076	0.6710
4	1.023763	0.057327	0.414513	0.6540
8	0.971445	0.090642	-0.315030	0.7430
16	0.843243	0.134880	-1.162203	0.2440
Null Hypothesis: IBEX 35 is a martingale (Sign Variance Ratio Test)				
Joint Tests		Value	Df	Probability
Max z (at period 16)		0.833643	1065	0.7150
Wald (Chi-Square)		1.986686	4	0.7470
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.993427	0.030643	-0.214498	0.7730
4	1.000939	0.057327	0.016379	0.9870
8	0.979343	0.090642	-0.227900	0.8020
16	0.887559	0.134880	-0.833643	0.3980
Null Hypothesis: KOSPI is a random walk (Rank Score Variance Ratio)				
Joint Tests		Value	Df	Probability
Max z (at period 16)		1.341548	1065	0.3690
Wald (Chi-Square)		10.66410	4	0.0320
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.976229	0.030643	-0.775749	0.4400
4	1.022860	0.057327	0.398766	0.7190
8	0.947819	0.090642	-0.575685	0.5560
16	0.819053	0.134880	-1.341548	0.1780
Null Hypothesis: KOSPI is a martingale (Sign Variance Ratio Test)				
Joint Tests		Value	Df	Probability
Max z (at period 16)		0.744883	1065	0.8020
Wald (Chi-Square)		3.086407	4	0.5690
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.982160	0.030643	-0.582209	0.5550
4	0.980282	0.057327	-0.343962	0.7390
8	0.990141	0.090642	-0.108770	0.9120
16	0.899531	0.134880	-0.744883	0.4720
Null Hypothesis: SHANGHAI is a random walk (Rank Score Variance Ratio)				
Joint Tests		Value	Df	Probability
Max z (at period 8)		0.592740	1065	0.8630
Wald (Chi-Square)		5.120351	4	0.2640
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.015683	0.030643	0.511820	0.6470
4	0.968791	0.057327	-0.544396	0.6010
8	0.946273	0.090642	-0.592740	0.5580
16	1.028731	0.134880	0.213014	0.8200
Null Hypothesis: SHANGHAI is a martingale (Sign Variance Ratio Test)				
Joint Tests		Value	Df	Probability
Max z (at period 8)		0.808008	1065	0.7250
Wald (Chi-Square)		7.517229	4	0.1160
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.997183	0.030643	-0.091928	0.9000
4	1.004695	0.057327	0.081896	0.9410
8	0.926761	0.090642	-0.808008	0.4030
16	0.981221	0.134880	-0.139230	0.9050

Source: Own elaboration.

Do the Stock Market Indices Follow a Random Walk?

Table 9. Wright's Ranking and Signs Variance Ratio (2000), from February 1, 2019 to January 11, 2021.

Null Hypothesis: BOVESPA is a random walk (Rank Score Variance Ratio)				
Joint Tests		Value	Df	Probability
Max lzl (at period 2)		12.17790	506	0.0000
Wald (Chi-Square)		150.7546	4	0.0000
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.458626	0.044455	-12.17790	0.0000
4	0.263971	0.083168	-8.849858	0.0000
8	0.170429	0.131501	-6.308483	0.0000
16	0.145215	0.195680	-4.368286	0.0000
Null Hypothesis: BOVESPA is a martingale (Sign Variance Ratio Test)				
Joint Tests		Value	Df	Probability
Max lzl (at period 2)		7.379600	506	0.0000
Wald (Chi-Square)		55.68820	4	0.0000
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.671937	0.044455	-7.379600	0.0000
4	0.454545	0.083168	-6.558429	0.0000
8	0.352767	0.131501	-4.921891	0.0000
16	0.310771	0.195680	-3.522233	0.0000
Null Hypothesis: DOW JONES is a random walk (Rank Score Variance Ratio)				
Joint Tests		Value	Df	Probability
Max lzl (at period 2)		13.58340	506	0.0000
Wald (Chi-Square)		195.9752	4	0.0000
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.396144	0.044455	-13.58340	0.0000
4	0.254977	0.083168	-8.958003	0.0000
8	0.152516	0.131501	-6.444702	0.0000
16	0.075731	0.195680	-4.723379	0.0000
Null Hypothesis: DOW JONES is a martingale (Sign Variance Ratio Test)				
Joint Tests		Value	Df	Probability
Max lzl (at period 2)		8.624352	506	0.0000
Wald (Chi-Square)		76.62463	4	0.0000
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.616601	0.044455	-8.624352	0.0000
4	0.480237	0.083168	-6.249517	0.0000
8	0.361660	0.131501	-4.854262	0.0000
16	0.309289	0.195680	-3.529808	0.0010
Null Hypothesis: FTSE MIB is a random walk (Rank Score Variance Ratio)				
Joint Tests		Value	Df	Probability
Max lzl (at period 2)		11.72616	506	0.0000
Wald (Chi-Square)		138.4413	4	0.0000
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.478708	0.044455	-11.72616	0.0000
4	0.262535	0.083168	-8.867123	0.0000
8	0.167522	0.131501	-6.330586	0.0000
16	0.089306	0.195680	-4.654004	0.0000
Null Hypothesis: FTSE MIB is a martingale (Sign Variance Ratio Test)				
Joint Tests		Value	Df	Probability
Max lzl (at period 2)		7.379600	506	0.0000
Wald (Chi-Square)		54.90688	4	0.0000
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.671937	0.044455	-7.379600	0.0000
4	0.531621	0.083168	-5.631694	0.0000
8	0.436759	0.131501	-4.283173	0.0010
16	0.372036	0.195680	-3.209146	0.0010
Null Hypothesis: IBEX 35 is a random walk (Rank Score Variance Ratio)				
Joint Tests		Value	Df	Probability
Max lzl (at period 2)		10.65077	506	0.0000

continued on following page

Do the Stock Market Indices Follow a Random Walk?

Table 9. Continued

Wald (Chi-Square)		113.5581	4	0.0000
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.526516	0.044455	-10.65077	0.0000
4	0.290449	0.083168	-8.531486	0.0000
8	0.173556	0.131501	-6.284700	0.0000
16	0.085252	0.195680	-4.674721	0.0000
Null Hypothesis: IBEX 35 is a martingale (Sign Variance Ratio Test)				
Joint Tests		Value	Df	Probability
Max z (at period 2)		6.401581	506	0.0000
Wald (Chi-Square)		41.22455	4	0.0000
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.715415	0.044455	-6.401581	0.0000
4	0.553360	0.083168	-5.370308	0.0000
8	0.476285	0.131501	-3.982599	0.0000
16	0.463439	0.195680	-2.742040	0.0030
Null Hypothesis: KOSPI is a random walk (Rank Score Variance Ratio)				
Joint Tests		Value	Df	Probability
Max z (at period 2)		12.27317	506	0.0000
Wald (Chi-Square)		154.0588	4	0.0000
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.454391	0.044455	-12.27317	0.0000
4	0.272537	0.083168	-8.746855	0.0000
8	0.185830	0.131501	-6.191367	0.0000
16	0.153936	0.195680	-4.323722	0.0000
Null Hypothesis: KOSPI is a martingale (Sign Variance Ratio Test)				
Joint Tests		Value	Df	Probability
Max z (at period 2)		7.735244	506	0.0000
Wald (Chi-Square)		60.68185	4	0.0000
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.656126	0.044455	-7.735244	0.0000
4	0.482213	0.083168	-6.225755	0.0000
8	0.342885	0.131501	-4.997035	0.0000
16	0.295455	0.195680	-3.600505	0.0000
Null Hypothesis: SHANGHAI is a random walk (Rank Score Variance Ratio)				
Joint Tests		Value	Df	Probability
Max z (at period 4)		1.072190	506	0.5500
Wald (Chi-Square)		3.684526	4	0.4380
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.027644	0.044455	0.621835	0.5140
4	1.089172	0.083168	1.072190	0.2860
8	1.030773	0.131501	0.234017	0.8410
16	0.969407	0.195680	-0.156344	0.9030
Null Hypothesis: SHANGHAI is a martingale (Sign Variance Ratio Test)				
Joint Tests		Value	Df	Probability
Max z (at period 2)		6.401581	506	0.0000
Wald (Chi-Square)		43.08232	4	0.0000
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.715415	0.044455	-6.401581	0.0000
4	0.618577	0.083168	-4.586148	0.0000
8	0.508893	0.131501	-3.734626	0.0000
16	0.454051	0.195680	-2.790013	0.0090

Source: Own elaboration.

Table 10 shows the exponents referring to the stock markets of Brazil *DFA* (BOVESPA), China (Shanghai), South Korea (KOSPI), USA (DOW JONES), Spain (IBEX 35) and Italy (FTSE MIB), in the pre-Covid subperiods, from January 1, 2015 to January 2019, and Covid, from February 1, 2019 to January 2021. In the period before Covid, we observed that there is a rejection of the random walk hypothesis in the BOVESPA stock index (0.55). With regard to the stock markets of SHANGHAI (0.53), KOSPI

(0.48), DOW JONES (0.49), IBEX 35 (0.47), FTSE MID (0.52), we found that there is no rejection of the null hypothesis, which shows that the changes in prices are independent and identically distributed, validating the results of the Wright's model (2000). In the Covid period we found the presence of long memories. The α DFA of the stock indices FTSE MIB (0.65), IBEX 35 (0.64), BOVESPA (0.63), KOSPI (0.62), DOW JONES (0.56) suggest the presence of persistence in returns, with the exception being the Stock Market of Shanghai (0.49) which shows balance. These results show that the assumption of the market efficiency hypothesis may be questionable, since the prediction of market comovement can be improved if the out-of-lag comovements of the other markets are considered, which enables the occurrence of arbitrage transactions. These findings corroborate the Ranking and Signs test of Wright (2000), and validate the main research question, that is, the presence of serial autocorrelation puts into question the efficiency of analyzed markets, in its weak form. This evidence is validated by the authors Dias, Heliodoro, and Alexandre (2020) who demonstrate the presence of long memories in the ASEAN-5 stock markets during the global pandemic of 2020.

Table 10. DFA exponent for index and returns. The values of the linear adjustments for α DFA always had $R^2 > 0.99$.

Stock market	DFA exponent (Before Covid)	Exponent DFA (Covid-19)
BOVESPA	0.55*** $\pm$ 0.0017	0.63*** $\pm$ 0.0010
SHANGAI	0.53 $\pm$ 0.0109	0.49 $\pm$ 0.0082
KOSPI	0.48 $\pm$ 0.0148	0.62*** $\pm$ 0.0011
DOW JONES	0.49 $\pm$ 0.0543	0.56*** $\pm$ 0.0018
IBEX 35	0.47 $\pm$ 0.0851	0.64*** $\pm$ 0.0012
FTSE MIB	0.52 $\pm$ 0.0168	0.65*** $\pm$ 0.0016

Source: Own elaboration.

Note: The hypotheses are: $H_0\alpha = 0.5$ and: $H_1\alpha \neq 0.5$. The period before Covid (1067 time data), the Covid subperiod (507 time data). ***, rejection of the null hypothesis with a mean of 1%

CONCLUSION

This chapter aims to test the efficient market hypothesis, in its weak form, in the stock markets of Brazil (BOVESPA), China (SHANGAI), South Korea (KOSPI), USA (DOW JONES), Spain (IBEX35) and Italy (FTSE MIB), in the period from January 1, 2015 to January 11, 2021. In order to perform this analysis, we intended to answer if the global pandemic (Covid-19) decreased the efficiency, in its weak form, of the stock markets under analysis? For this purpose, we divided the sample into two sub-periods: pre-Covid, January 2015 to January 2019; Covid, February 2019 to January 2021. In order to show robustness in the results, we opted for the use of two tests. First, the nonparametric test developed by Wright, because it is a more resilient test for time series that do not show normality, and is quite consistent when they present correlation in series. Secondly, we performed the Detrended Fluctuation Analysis (DFA) model to validate and measure autocorrelation in non-stationary time series.

The test of Clemente, Montañés, and Reyes identified severe structural breaks in the two subperiods. In the period before Covid, the structural breaks do not show, for the most part, synchronization between

Do the Stock Market Indices Follow a Random Walk?

markets, that is, the breaks have different dates. In relation to the Covid period, the declines are related to the increase in the global pandemic in the first quarter of 2020.

In Wright's model, and during the period before Covid we verified that the markets are in equilibrium and there is no rejection of the random walk hypothesis, which means that the markets do not present autocorrelation in series, with the exception of Brazil (0.55). In relation to the Italian market, the Rankings test (homocedastic) rejects the random walk hypothesis for the 2 and 4 day lags, while for the Signals test (heteroscedasticity) there is rejection of the hypothesis for the 2-day lag. However, the results of the DFA exponent show an α of 0.52, despite not being significant, which induces that this stock market is in balance. In the Covid subperiod, we found that all markets have serial autocorrelation, variance ratios are lower than the unit, which implies that returns are auto-correlated over time and, there is mean reversion, and no differences between financial markets have been identified.

The DFA exponents, in the subperiod before Covid, evidenced that there is no rejection of the null hypothesis, except for the Brazilian stock index, which shows that the changes in prices are independent and identically distributed, thus validating the results of Wright's model. In the Covid period we found that the α DFA shows presence of long memories. The results for the stock indices of FTSE MIB (0.65), IBEX 35 (0.64), BOVESPA (0.63), KOSPI (0.62), DOW JONES (0.56) suggest the presence of persistence in returns, with the exception being the Stock Market of Shanghai (0.49) which shows balance. These findings corroborate Wright's Ranking and Signs test, and validate the research question, that is, the presence of serial autocorrelation jeopardize the hypothesis of market efficiency, in its weak form.

The general conclusion to be withheld and sustained in the results obtained through econometric models and econophysical models, is that the current global pandemic of 2020 had a significant impact on memory properties in the analyzed stock markets. When comparing the two subperiods we see significant changes. In the pre-Covid period, there is no serial autocorrelation, that is, the markets have no memory, and the data are generated randomly. Otherwise, in the Covid period there was the rejection of the random walk hypothesis, which is an inverse result, compared to the previous subperiod. Thus, in the Covid period, the stock markets presented persistence and their returns showed predictability. Prices do not fully reflect the information available and changes in prices are not independently and identically distributed. This has consequences for investors, as income can be predictable, creating opportunities for arbitrage and the possibility of abnormal returns, as opposed to random walk assumptions and information efficiency. These findings are also relevant for market regulators, in order to develop regulation that ensure better information among international financial markets. In conclusion, we believe that investors should avoid investments in stock markets, at least, as long as this pandemic lasts, and invest in less risky markets, with the purpose of mitigating risk and improving the efficiency of their portfolios.

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Chapter 23

Using Mutual Information to Analyse Serial Dependence: The Effects of COVID-19

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ABSTRACT

The main objective of this research is to analyse the serial dependence of high frequency data for G7 stock indices. The authors use two different periodicities, and with linear and nonlinear approaches, they evaluate the stock markets' behaviour and conclude about the higher or lower dependence levels of the stock markets in the periods before and after the COVID-19 pandemic declaration. They use mutual information and the global correlation coefficient based on that measure, comparing results with the linear coefficient. The results are clear, showing that nonlinear dependence exists and could be an important factor in terms of historical information, especially for very high frequency data. Results are mixed in regard to the effect of the pandemic declaration in the dependence of stock markets.

INTRODUCTION

In the current health crisis, we are witnessing a world that changes its behavior in all areas of citizens' lives. At the social and economic level, the impact of the pandemic is evident and dramatic. Accompanying this anomalous behavior, financial markets also showed abrupt reactions, with investor distrust taking root. It is in this context of crisis and attempted recovery that we consider it essential to understand the individual behavior of financial markets that are fundamental to the world economy.

The main objective of this research is to analyze the effect of Covid-19 on the serial dependence of high frequency data for G7 stock indices. In this data, we will use two different frequencies: 5 and 30

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minutes, and through linear and nonlinear approaches we will try to evaluate the stock markets' behavior and conclude on each market's greater or lesser proximity to efficiency in different sub-periods.

In order to evaluate the effects of the Covid-19 crisis, we split the period under analysis in 2 sub-periods: pre-pandemic (from 1 August 2019 till 31 March 2020) and post-pandemic (from 12 March 2020 till 1 June 2020).

Most prior studies generally found that financial markets could be described by random walks (see, for example, Fama 1963, Osborne 1964 or Granger and Morgenstein 1963, among others). One possible explanation could be related to the use of linear methodologies to analyze dependence, which could fail to detect other kinds of dependence, such as nonlinear ones. In this case, the use of linear approaches is not sufficient (see, for example, Granger et al., 2004 and Krause et al. 2018). According to Campbell (1987), Wen et al. (2018) and Nam and Seong (2019), linear serial dependence can quickly disappear, while other kinds of dependence could be present in data and not detected by those linear methodologies.

In order to achieve our goal, we will use mutual information and the global correlation coefficient, comparing results with the linear coefficient.

The concept of mutual information (MI) used in this research is based on entropy differences from the theory of communication (Shannon, 1948). The main feature of MI is the capacity to measure common information in a global way between two or more random variables, as used in several studies to examine dependence structures or global correlation (see for example Darbellay and Wuertz, 2000; Menezes et al., 2012; Ferreira and Dionísio, 2014, 2017; Mothi et al., 2019, Nam and Seong, 2019).

In the context of the Covid-19 crisis, the literature contains several studies analyzing the effects of the pandemic on financial markets, including the effects on stock markets (see, for example, Zhang et al. 2020; Aslam, Nogueiro, Brasil, Ferreira, Mughal, Bashir & Latif, 2020; Haroon & Rizvi, 2020) but also in other financial assets such as exchange rates (Iyke, 2020), commodities (Apergis & Apergis, 2020; or Devpura & Narayan 2020) or even insurance (see Wang, Zhang, Wang & Fu, 2020), among others.

Our results point to high and significant levels of global autocorrelation in the 5-minute frequency, with these autocorrelations increasing in the post-pandemic period. For the 30-minute frequency, the results are somewhat ambiguous, showing some similar patterns in European stock markets and NYSE.

Background

A great amount of literature analyzes dependence in financial stock markets in general and stock markets in particular. This continued interest is related to the dynamics of those markets and to seeking a better explanation of those dynamics. The analysis is not new, going back at least to the work of Bachelier (1900), who analyzed French government bonds' prices and concluded that those prices could be described as random variables. Over time, the analysis of financial markets has been highly scrutinized, with prior studies corroborating the fact that asset prices could be described by random walks and considering that processes are independent and identically distributed (Osborne 1962, 1964; Granger and Morgenstein 1963). In fact, these first studies about the behavior of stock markets, namely the fact that they are independent and identically distributed (iid) processes, jointly with the presence of temporal independence, were related to stock market efficiency. However, the literature started to identify some features in financial markets, designated by authors as stylized facts, such as return rates being leptokurtic (Mandelbrot 1963) or volatility clustering (Mandelbrot & Wallis, 1969), among others (see, for example, Cont 2001 for a review of stylized facts). Based on the existent literature, Fama (1970) revises this topic theoretically and empirically, identifying the efficient market hypothesis (EMH) as the impossibility of

predicting any future pattern based on past information. In particular, Fama (1970) identifies an efficient market as one “in which prices always ‘fully reflect’ available information [...]” (Fama 1970, p. 383). This important cornerstone of the financial literature identifies the Efficient Market Hypothesis (EMH) at three different levels: weak, semi-strong and strong.

At this stage, it is important to clarify some issues about the EMH, namely the fact that some work found that market efficiency could not be hit even when processes are not iid (see, for example, Mandelbrot 1963; Mandelbrot & Wallis 1969 or Samuelson 1965). This was why random walks were substituted by martingales, which are less restrictive models, when modeling stock market behavior. In fact, martingales just require the independence of the mean of the time series, regarding the available information, i.e., $E(r_{t+1} - 1, \dots, r_1) = 0$. Other higher moments of the distributions could have some predictability using past information without violating the EMH, implying that non-linearities or some kinds of time dependence could not be responsible for non-verification of the EMH.

The literature contains an extensive body of work studying the possibility of financial market efficiency using a wide set of assets (for example indices, bonds, exchange rates or cryptocurrencies), markets (developed or emerging), time samples or even methodologies. Literature reviews such as those by Sewell (2012), Titan (2015) or Fakhry (2016) generally corroborate that the use different methodologies could result in different results (as Fama 1998 also identified earlier). In fact, linear methodologies, often analyzing autocorrelation patterns of financial markets, conclude on the evidence of efficiency. However, methodologies able to capture non-linearities could detect the existence of dependence in time series, although not necessarily implying that markets are not efficient (see, for example, Andreou, Pittis & Spanos 2001; Granger, Maasoumi & Racine 2004; McCauley 2008).

The existence of contradictory results about the existence of dependence in financial markets makes this research area challenging, and although it is not possible to prove that serial dependence implies the possibility of obtaining abnormal returns, continuous monitoring of financial markets remains crucial to have better knowledge about their behavior.

In this chapter, to analyze serial dependence we will use mutual information (MI), which will be described in the next section. According to Darbellay and Wuertz (2000), this method has the advantage of studying not only linear serial dependence but also other nonlinear features. We will use MI to analyze the G7 stock markets in a high frequency sample, considering intraday data. With this sample, we will analyze the dependence of return rates for different time spans, 5 and 30 minutes. With this methodology, we expect to compare the dependence level in several time horizons, in order to understand the process and behavior of each market and the importance of the respective historical information. Moreover, as we are using information before and after declaration of the pandemic, we can evaluate whether that declaration had any impact on the dependence of stock markets.

This chapter contributes to the existing literature since it extends the analysis to the impact of Covid-19 on G7 stock markets. Recent works have analyzed this impact. For example, Baker et al. (2020) and Nicola et al. (2020) showed the destructive impact of the disease on the US stock market; Ammy-Driss and Garcin (2020) and Garcin et al. (2020) concluded that the American stock market reacted more than others; Topcu and Gulal (2020) identified that the effect was greater in Asian than European stock markets and that these markets reacted more to the number of confirmed cases than to deaths. The use of different methodologies is also a feature of the analysis, but the conclusions are similar: the pandemic had a major effect on stock markets (see, for example, Sharif et al., 2020; Akhtaruzzaman et al., 2020; Ashraf, 2020; Aslam et al., 2020a, 2020b, 2020c; Zhang et al., 2020, among many others). This chapter

differs from the existing literature as it uses mutual information to compare the periods before and after declaration of the pandemic.

THE EFFECT OF COVID-19 ON THE SERIAL DEPENDENCE OF STOCK MARKETS

Data and Methodology

As previously mentioned, the concept of mutual information (MI) is based on the differences of entropy, a concept which derives from the theory of communication (Shannon, 1948).

Shannon (1948) introduced the concept and gave the entropy of a variable X with a continuous probability distribution defined by the probability density function $p(x_i)$.

$$H(X) = - \int p(x_i) \ln p(x_i) dx$$

Assuming the existence of the two continuous random variables X and Y , the joint entropy and the conditional entropies are specified as:

$$H(X, Y) = - \int p(x_i, y_i) \ln p(x_i, y_i) dx dy$$

$$H(Y|X) = - \int p(x_i, y_i) \ln \frac{p(x_i, y_i)}{p(x_i)}$$

The entropy of continuous distributions assumes almost all the properties of the entropy of discrete distribution, more specifically that of Shannon (1948) and Kraskov, Stogbauer and Grassberger (2005). For any two variables X and Y , the joint entropy is less than or equal to the sum of the individual entropies, assuming equality in the case where the variables are perfectly independent, i.e., $p(x_i, y_i) = p(x_i)p(y_i)$.

$$H(X, Y) = H(X) + H(Y|X) = H(Y) + H(X|Y)$$

i.e., $H(X) \geq H(X|Y)$ and $H(Y) \geq H(Y|X)$.

The basis for the definition of a global dependency measure is created. The mutual information between two random variables X and Y is given by:

$$I(X, Y) = -H(X, Y) + H(X) + H(Y)$$

Or more specifically:

$$I(X, Y) = \iint p(x_i, y_j) \ln \frac{p(x_i, y_j)}{p(x_i)p(y_j)} dx dy$$

Mutual information can measure the common information between different random variables, with it being possible to assess the existence of dependence and global correlation between them (Darbellay and Wuertz, 2000; Menezes et al., 2012; Ferreira and Dionísio, 2014, 2017; Mothi et al., 2019).

Since the main goal of this research is to evaluate serial dependence, the MI equation is the following:

$$I(X_t, X_{t-i}) = \iint p(X_t, X_{t-i}) \log \left(\frac{p(X_t, X_{t-i})}{p(X_t)p(X_{t-i})} \right) dX_t dX_{t-i}$$

with X being the random variable in analysis, between the moment t and the lags $t-i$ (in our case from 1 to 10) and $p(\cdot)$ representing the probability density functions of the empirical data, which are usually known and the basis for estimation of MI. Three methods are commonly used to estimate MI, namely: histogram-based, kernel-based and parametric approaches. In this research we follow Darbellay (1998), more specifically, a histogram-based estimator with equiprobable cells (marginal equiquantization). For greater detail, see Kraskov et al. (2005), Darbellay (1998) and Moddemeijer (1999).

The definition of mutual information is expressed in an abstract way and based on space partitions. To simplify, let us consider a finite dimension Euclidian space, $\mathbb{R}^d = \mathbb{R}^{d_A} \times \mathbb{R}^{d_B}$, and let “ $_X = \{A_i\}_{i=1}^{n_1}$ ” “ $_Y = \{B_j\}_{j=1}^{n_2}$ ” represent two generic partitions of the subspaces $\mathbb{R}^{d_X}$ and $\mathbb{R}^{d_Y}$. Then, the mutual information is a positive number defined as:

$$I(X, Y) = \sup_{\{A_i\}\{B_j\}} \sum_{i,j} P_{X,Y}(A_i \times B_j) \log \left(\frac{P_{X,Y}(A_i \times B_j)}{P_X(A_i)P_Y(B_j)} \right)$$

The supremum is taken over all finite partitions $\mathbb{R}^{d_X}$ and $\mathbb{R}^{d_Y}$. The conventions $0 \ln \left(\frac{0}{z} \right) = 0$ for $z^3 0$ and $z \ln \left(\frac{0}{z} \right) = +\infty$ were used. Darbellay (1998) shows that mutual information is finite iff and the measure $p_{X,Y}$ is absolutely continuous with respect to the product measure $P_X(A_i) \times P_Y(B_j)$. The system $\Gamma = \Gamma_X \times \Gamma_Y$ is a partition of $\mathbb{R}^d = \mathbb{R}^{d_A} \times \mathbb{R}^{d_B}$, and is the product of two marginal partitions, one of $\mathbb{R}^{d_X}$, and the other of $\mathbb{R}^{d_Y}$. Marginal equiquantization consists of dividing each edge of a cell into α (usually $\alpha=2$) intervals with approximately the same number of points. The approximateness of the division has two causes: the number of points in a cell may not be exactly divisible by α , or some X may take repeating values (for more details see for example Darbellay, 1998).

Dionísio et al. (2004, 2006) proposed MI as a global approach to test global dependence, defining the following test:

$$H_0: I(X_t, X_{t-i}) = 0$$

$$H_1: I(X_t, X_{t-i}) > 0$$

Rejection of the null hypothesis indicates there is significant global dependence between the variables studied, more specifically between lags. To test independence between variables (or vectors of variables) appropriately, we use the critical values provided by Dionísio et al. (2006), namely those presented in Table 1

If serial independence, $I(X_t, X_{t-i})$ is zero, this means there is no common information between the lags. In the case of serial dependence, MI will have a positive value. Despite the simplicity of interpretation, there has been some criticism of MI, for example by Granger et al. (2004), who stated that it does not produce absolute values between 0 and 1. Therefore, we will use the global correlation coefficient proposed by Granger and Lin (1994) given by

$$\lambda(X_t, X_{t-i}) = \sqrt{1 - e^{-2I(X_t, X_{t-i})}}$$

where λ indicates global correlation (linear and non-linear) between two variables (or lags of the same variable) and its value is bounded between 0 and 1. In the first case, there is no evidence of global dependence; in the second, there is a perfect relationship between those variables.

Table 1. Critical values for testing serial independence through mutual information for $N(0,1)$ data. 5000 replications were computed. D.F. are the degrees of freedom for the mutual information, which correspond to the dimension (d) of the analyzed vectors

N=1000				N=2000			
	Percentiles				Percentiles		
D.F	90	95	99	D.F	90	95	99
2	0.0019	0.0041	0.0071	2	0.0009	0.0019	0.0033
3	0.0133	0.0191	0.0311	3	0.0061	0.0094	0.0147
4	0.0340	0.0399	0.0568	4	0.0169	0.0203	0.0278
5	0.0708	0.0865	0.1128	5	0.0701	0.0804	0.1030
6	0.2119	0.2430	0.3046	6	0.1370	0.1549	0.1940
7	0.3635	0.3954	0.4688	7	0.2496	0.2733	0.3224
8	0.4041	0.4414	0.5252	8	0.4497	0.4864	0.5508
9	0.3865	0.4114	0.4640	9	0.3036	0.3298	0.3858
10	0.6418	0.6585	0.6942	10	0.3530	0.3669	0.3996

In order to evaluate serial dependence in the G7 stock markets, we use intraday data from 01/08/2019 to 29/05/2020 (the moment of data retrieval) collected from DataStream. The indices used are the following: NYSE (United States), CAC40 (France), S&P TSX Composite (Canada), DAX 30 (Germany), FTSE 100 (United Kingdom), MIB (Italy) and NIKKEI 400 (Japan). The periodicity used was 5 minutes and 30 minutes.

The use of different time spans is related to the objective of understanding the dependence behavior and the possibility of exploring speculative positions in the short term. Data samples are different not

Using Mutual Information to Analyse Serial Dependence

only because of the different periodicity used, but also because the transaction times of the indices used are different, ranging from 533 observations (Nikkei, for 30-minute time span in the second period) to 15906 observations (CAC, 5-minute time span, in the first period). We calculated the respective returns, using the difference of logarithms of consecutive observations. The descriptive statistics of the return series are presented in Table 2, identifying some regularities. Firstly, as expected, the mean values of the return rates are always close to zero. However, the results of the pre-pandemic period show negative means and those of the post-pandemic period have positive signs, meaning that in this period, stock markets recovered from the decreases of the previous period. Secondly, most of the indices analyzed show negative skewness, meaning that negative values are more probable than positive ones (although in the 5-minute time span after declaration of the pandemic, several indices have positive skewness). Interestingly, the exceptions are the North American indices, with NYSE always showing positive skewness while TSX has mixed results, depending on the time span. Finally, kurtosis levels are high when compared with normal distribution levels, meaning that the distributions are leptokurtic (which is a stylized fact found in the literature).

The results of evaluating global serial dependence are presented in the next section.

Results

In a first phase, we calculated the mutual information for the first 10 lags of each time series prior to declaring the pandemic. These estimates were performed for the 7 indices under study, for the periodicities of 5 and 30 minutes. According to the results presented in Figure 1, it appears that for all indices, the correlations measured by the global correlation coefficient are higher in the 5-minute periodicity compared to the 30-minute periodicity, although overall, they are mostly statistically significant. These results are as expected, considering that in very short periods the level of incorporation of information about the evolution of prices is substantially higher.

When estimating mutual information, and consequently the global correlation coefficient, for the period following declaration of the pandemic, we find that in the 5-minute periodicity the global autocorrelation is higher in this period (even though differences are not substantial) and that in the 30-minute periodicity the results are somewhat ambiguous. For example, the CAC40, DAX30 and MIB35 indices show a level of post-pandemic correlation very similar to, or even lower than that recorded in the pre-pandemic period. The NYSE, TSX and NIKKEY indices tend to show higher global autocorrelation after the beginning of the pandemic, with highlights being more distant from the NYSE and the TSX index globally.

In order to have a better perception of the magnitude of the global autocorrelation, compared to the merely linear autocorrelation, we also considered the calculation of Pearson's correlation coefficient between the pre and post-declaration period for the first 10 lags of each of the series (see Figure 2). It is easily seen that the levels of linear correlation are extremely low, not providing information about the informational magnitude existing in these time series. In this context, it is concluded that it is indeed important to use global measures, which include the correlation as a whole, linear and non-linear.

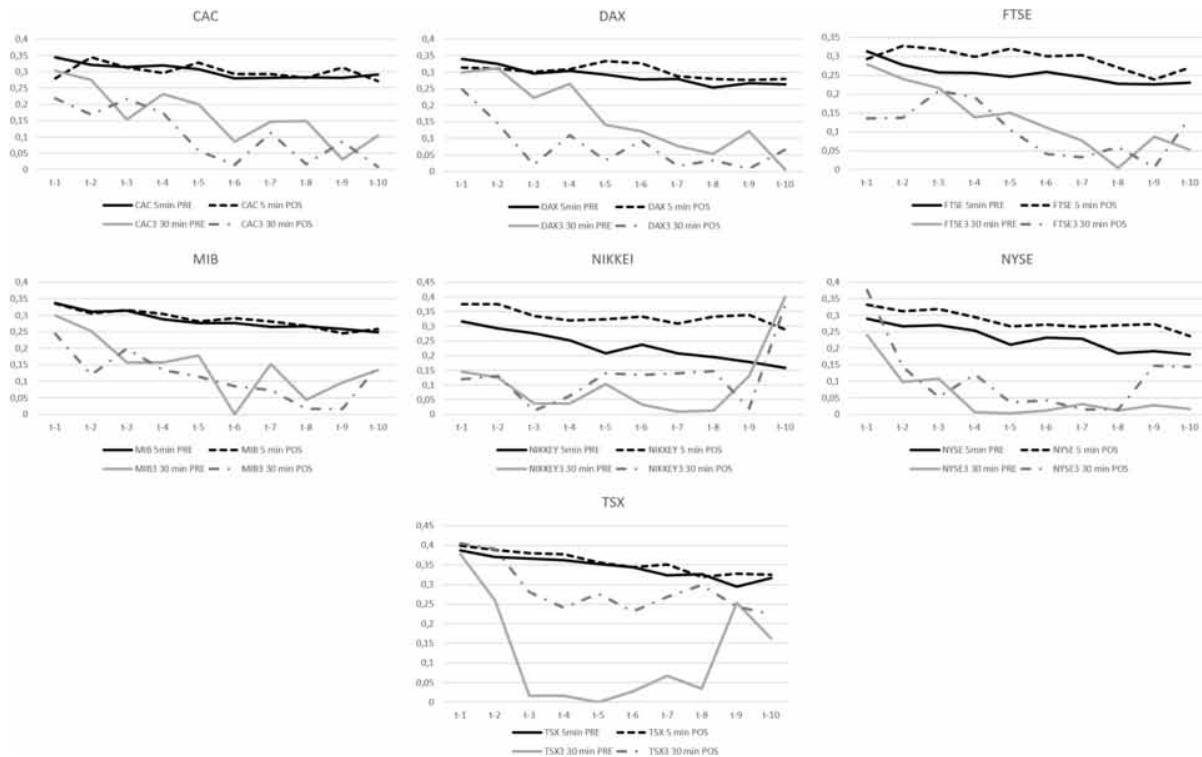
Table 2. Descriptive statistics

5 min (Pre)	NYSE	CAC	TSX	DAX	FTSE	MIB	NIKKEI
Mean	-0.00003	-0.00001	-0.00001	-0.00001	-0.00002	-0.00001	-0.00001
SD	0.0017	0.0012	0.0012	0.0013	0.0011	0.0012	0.0013
Kurtosis	3416.25	514.70	2098.98	1125.01	812.14	137.65	157.94
Skewness	-42.43	-11.51	-28.92	-18.43	-14.84	-4.28	-6.41
Minimum	-0.1381	-0.0605	-0.0846	-0.0849	-0.0659	-0.0339	-0.0360
Maximum	0.0393	0.0173	0.0353	0.0202	0.0170	0.0186	0.0139
N	11892	15906	11877	15613	15732	15700	8857
5 min (Post)	NYSE	CAC	TSX	DAX	FTSE	MIB	NIKKEI
Mean	0.00002	0.00000	0.00001	0.00002	0.00001	0.00000	0.00004
SD	0.0045	0.0031	0.0037	0.0032	0.0026	0.0029	0.0026
Kurtosis	171.69	81.28	299.10	93.85	40.69	31.72	36.18
Skewness	-4.63	1.12	-7.88	1.70	0.75	1.36	0.19
Minimum	-0.1178	-0.0506	-0.1126	-0.0500	-0.0299	-0.0317	-0.0363
Maximum	0.0673	0.0613	0.0615	0.0634	0.0376	0.0388	0.0321
N	4299	5531	4330	5442	5411	5535	3199
30 min (Pre)	NYSE	CAC	TSX	DAX	FTSE	MIB	NIKKEI
Mean	-0.00018	-0.00007	-0.00007	-0.00006	-0.00010	-0.00007	-0.00007
SD	0.0040	0.0029	0.0026	0.0031	0.0030	0.0033	0.0035
Kurtosis	359.17	109.29	253.40	167.91	311.43	111.49	35.35
Skewness	-12.63	-5.30	-10.86	-7.10	-10.09	-5.19	-3.38
Minimum	-0.1152	-0.0650	-0.0691	-0.0785	-0.0909	-0.0732	-0.0408
Maximum	0.0339	0.0218	0.0157	0.0244	0.0324	0.0251	0.0170
N	1982	2651	1979	2602	2622	2616	1476
30 min (Post)	NYSE	CAC	TSX	DAX	FTSE	MIB	NIKKEI
Mean	0.00011	0.00004	0.00008	0.00012	0.00005	0.00002	0.00024
SD	0.0105	0.0080	0.0094	0.0080	0.0068	0.0071	0.0071
Kurtosis	33.48	17.01	60.29	24.28	17.49	9.62	14.16
Skewness	-2.62	0.22	-3.91	-0.26	-0.75	-0.31	-0.40
Minimum	-0.1120	-0.0571	-0.1232	-0.0765	-0.0578	-0.0583	-0.0569
Maximum	0.0602	0.0688	0.0656	0.0640	0.0388	0.0383	0.0425
N	716	921	722	907	901	923	533

To clarify whether the levels of global autocorrelation changed from the pre-declaration period to the post-declaration period (for both periodicities under study), the difference between them was calculated for all the global correlation coefficients, with Figure 3 presenting the results. For the 5-minute periodicity, the great majority of the differences are positive, although there is a drop in the difference after the 5th lag for the FTSE and NYSE indices. It is not a fast decline, but there is decline in the level

of information of lags. Even so, the difference values are mostly positive, which indicates an increase in the level of historical information after the beginning and during the period of the health crisis.

Figure 1. Global correlation coefficients for the 10 first lags of the G7 stock market indices

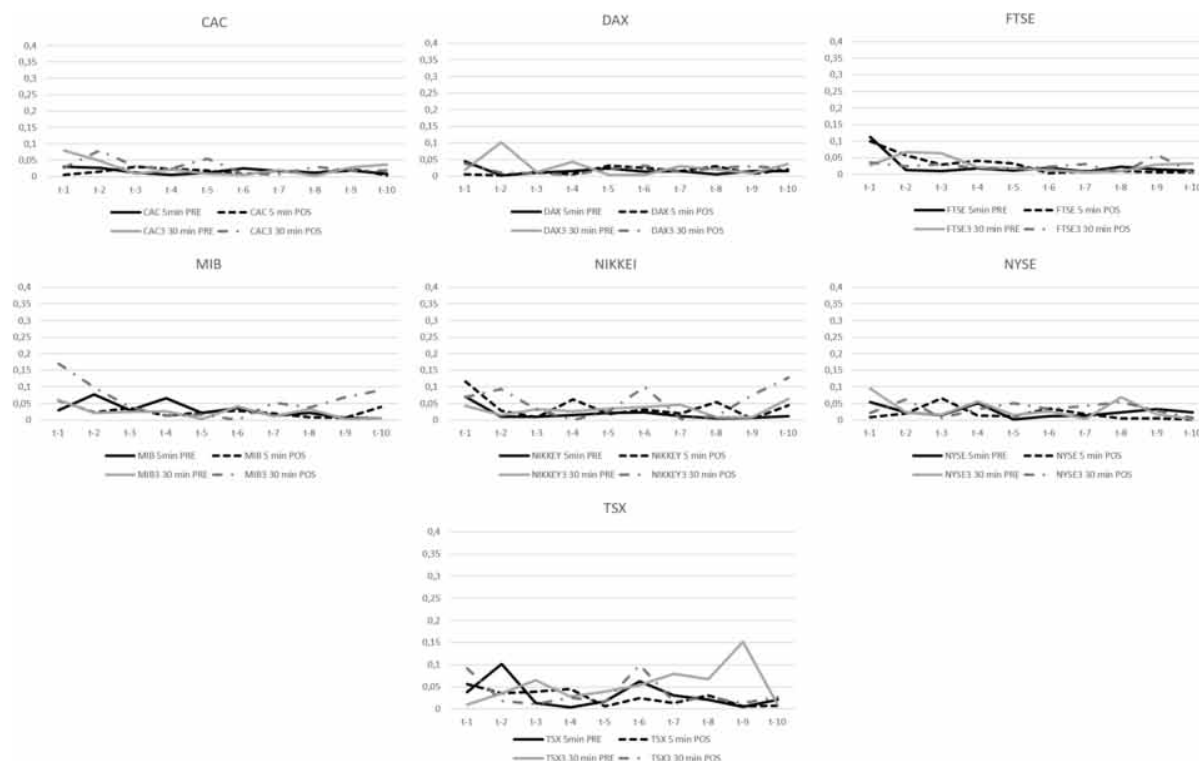


At 30-minute intervals, the results show that in Europe the global autocorrelation showed a downward trend in the post-declaration period, while the TSX, NIKKEY and NYSE indices show a higher level of global autocorrelation after the onset and during the health crisis.

In addition to the individual analysis of the indices and their respective behaviors, it is worth highlighting the similar behavior among the European indices, and of these (especially the FTSE) with the NYSE. A very similar behavior is evident, especially at 5-minute intervals, which could indicate the possibility of contagion between indices, markets and their economies. This could be very relevant information for market agents, as it implies that on a 5-minute basis it is possible to make predictions about the evolution of markets.

The results suggest evidence of a failure in efficiency in the weak form of the markets under study. It should be noted that at the European level, there are similar behaviors with regard to time dependence, leading us to believe there may be signs of comovements and eventual contagion between these markets and from these to the NYSE. Obviously, we cannot conclude that the markets are inefficient, as there is no evidence of the possibility of systematic gains. Even so, the time dependencies are significant, and in some markets they grow in the post-declaration period, leading us to believe there may be ways of using this information, namely in speculation actions.

Figure 2. Pearson correlation coefficients for the 10 first lags of the G7 stock market indices (in order to make a direct comparison with the global correlation coefficients, absolute values were considered)



SOLUTIONS AND RECOMMENDATIONS

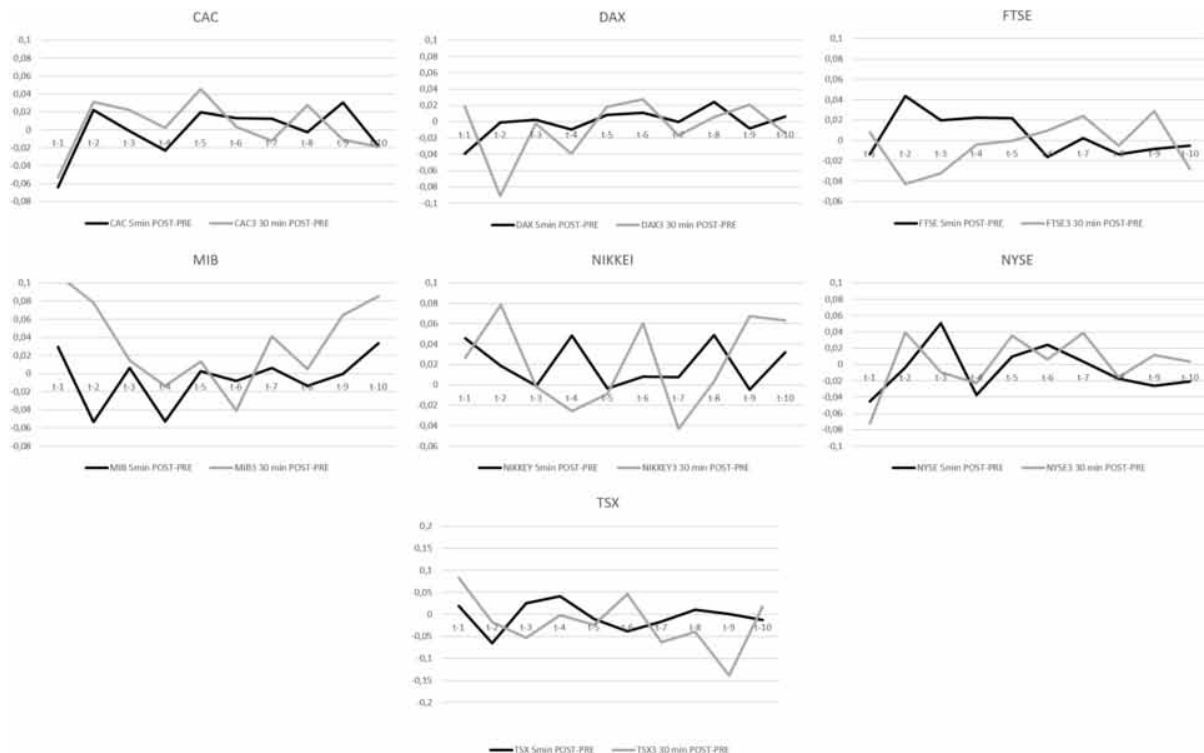
The emergence of an epidemic crisis is not predictable, meaning that it is difficult to take lessons from this problem for the future. However, studying the similarities with other situations could give interesting insights into stock markets' behavior in stressful moments and what to expect after recovery. Therefore, the main recommendation is the continuous monitoring of financial markets, at least so that markets can be prepared for new epidemics or similar events. In fact, we believe that continuous monitoring of financial markets is the key to understanding stock market behavior and, at the same time, to using historical information to increase gains. The way financial markets react to crashes, crises and other events is important, as mentioned in the previous section, for different agents, who need to be informed in order to take their decisions.

FUTURE RESEARCH DIRECTIONS

As the pandemic is not over, in the future it will be important to study financial markets' behavior after it ends or is at least totally controlled. Although the results seem to indicate that the market reacted quickly, it is important to understand markets' behavior in calm moments. Another possible research direction is to explore the possible contagion among stock markets, in order to evaluate the level of dependence

and leadership of some stock markets. This analysis could be performed using mutual information and also the Detrended Cross-Correlation Analysis (DCCA), which complements the DFA, measuring the cross-correlation between markets.

Figure 3. Difference between the global correlation coefficients in the periods before and after declaration of the pandemic (POST-PRE)



We consider that the analysis of contagion among markets could be an interesting direction for future research. However, in the context of intraday data, we must take into consideration the fact that data (markets) should be synchronized, and in the case of using international stock markets it can reduce the number of observations. Another possibility could be to investigate the influence of other variables linked with Covid-19 in the efficiency pattern, such as the number of new infections, deaths or investment in health systems. The impact of Covid-19 on stock markets could be analyzed from different perspectives, depending on the objectives, data available and methods. The main question is: (i) Does Covid-19 influence stock markets' behavior? (ii) If so, what kind of influence and how can it be measured? (iii) Did Covid-19 promote any type of contagion? And how did it spread?

In particular, we believe that analysis of the contagion effect, caused by Covid-19, could be relevant in the future. Although some analyses about contagion in the context of the pandemic are already published (see, for example, Akhtaruzzaman, Boubaker & Sensoy 2020, Corbet, Larkin & Lucey 2020 or Gharib, Mefteh-Wali & Jabeur 2020, among others), the fact that the pandemic is not over and the need for larger samples imply that in the future this issue will remain relevant. Moreover, the analysis of dynamic contagion, as applied in Tilfani, Ferreira and El Boukfaoui (2019) could be extended on this topic,

enriching the existing literature because using intraday data is a very relevant challenge. Additionally, the analysis of mutual information could be combined with other methodologies based on information theory, such as the Detrended Cross-Correlation Analysis (DCCA) proposed by Podobnik and Stanley (2008), which was already used in the literature to analyze the cross-correlation between lagged variables (Ferreira & Dionísio 2016a; 2016b) or also between different markets.

All efforts to answer these questions based on robust scientific criteria would be important to promote the recovery of economies, investment and global growth.

CONCLUSION

This research aims to analyze time serial dependence in the G7 stock markets, using mutual information and applying it to high frequency data, using time horizons of 5 and 30 minutes. The analysis is performed using the log returns and analyzing the correlation of the returns until the 10th lag, comparing with the Pearson correlation, for data of different frequencies, and considering the periods before and after the declaration of the Covid-19 pandemic by the World Health Organization.

The results show that the linear correlation is relatively small for the first lag with a generally fast decline for the following lags. However, the global correlation coefficient, calculated based on the mutual information, shows different behavior, with relevant levels of correlation for the different time spans, mainly in the highest data frequency (5-minute). In some cases, the 30-minute frequency also shows high correlations and without evidence of a fast decline.

Our results point to high and significant levels of global autocorrelation in the 5-minute frequency, with these autocorrelations increasing in the post-declaration period. For the 30-minute frequency, the results are somewhat ambiguous, showing some similar patterns in European stock markets and NYSE.

Finally, we should highlight the marked differences between the global and linear correlation coefficients. This could be a sign of nonlinear dependence among the series under analysis and to some extent a sign of possible non-efficiency of the respective stock markets. The results seem to show the presence of contagion among countries and respective stock markets, this feature being one of the most important directions for future research for better understanding of stock markets' behavior in a pandemic crisis.

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KEY TERMS AND DEFINITIONS

Dependence: Pattern of the financial market which could be related with the possibility of predicting its future behavior.

Efficiency: Behavior of financial time series consistent with randomness.

G7: Group of the seven most industrialized countries.

Global Correlation Coefficient: Correlation coefficient, calculated based on the mutual information, which characterizes globally (linearly and non-linearly) the correlation between variables.

High-Frequent Data: Type of data which, associated with financial time series analysis, means that data is intraday.

Mutual Information: Methodology used to analyze dependence of time series, which in the case of financial time series could be used to analyze their efficiency.

Pearson Correlation Coefficient: Correlation coefficient, used to measure the linear correlation between variables.

Chapter 24

A Study on the Performance of Indian Mutual Funds in Recent Years

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ABSTRACT

The Indian mutual fund industry is an integral part of the Indian financial industry. The mutual fund industry has a significant impact on the Indian economy. This study aims at understanding the growth and performance of mutual fund industry and understanding the cause and effect through empirical research. For this research, published papers have been studied and analysed to give a better understanding of the industry. This study records the performance of Indian mutual funds from the year 2015-2020. It analyses the performance of the debt, equity, and ETF mutual funds. The challenges are huge, but the investors have shown a matured behaviour. The 2020 pandemic has allowed investors to balance their portfolios by removing poor performing mutual fund holdings.

INTRODUCTION

The Indian mutual industry values INR 28.23 trillion as of 2020 which is almost 4 times of 2010 and more than double of 2016, that is INR12.74 trillion. This shows that the industry has potential to grow further. The entire concept of mutual funds (MF) in India has evolved from the establishment of Unit Trust of India as an institution for savings in the early 1960's. The entry of public sector funds in second

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phase in 1987 -1993 to entry of private sector funds in 1993-2003 made the industry grow significantly. In December 2015, investors in India had an option to choose from more than a thousand Mutual Fund schemes spread across 44 Mutual Funds with a total AUM (Asset Under Management) value of Rs. 13.46 lakh Cr. Afterwards there was a sluggish growth due the financial crisis of 2009. Mutual Fund industry has been seeing double digit growth since 2012. The AUM for Mutual Fund industry in India has seen a year-on-year growth since then. The growth hasn't been at the pace as the Indian economy would like, but there has been a slow and steady growth over the past two decades.

To know how the industry has grown we need to first understand what a mutual fund is and how it works. A mutual fund is a type of financial vehicle made up of a pool of money collected from many investors to invest in securities like stocks, bonds, money market instruments, and other assets. They are managed by an authorised person called as a professional fund manager appointed by the entity called Trust. The money managers, or a firm manages the portfolios of the investors. These managers select the schemes, monitor the market and decide when to sell the assets if need be. These managers usually make money according to the percentage of assets under management. When an investor participates in a mutual fund they lose or gain money proportionally according to the profits of the funds. The mutual funds derive its value from its underlying assets. The performance is tracked using the market capital of the fund, which is by aggregating the performance of its underlying assets. Investors make money from the dividends and interest earned by the mutual fund schemes. The distribution of profits is done according to the NAV. The Net Asset Value is the market value of the securities of scheme. It is derived by dividing the total value of the securities in the portfolio by the total amount of shares outstanding. Mutual fund shares can typically be purchased or redeemed as needed at the fund's current NAV, which—unlike a stock price—does not fluctuate during market hours, but it is settled at the end of each trading day. Since these funds contain a variety of securities, investors can easily diversify their portfolios. Suppose an investor A holds stocks of a company and another investor B buys a mutual fund which holds a part of the company's shares. When the company has a bad quarter and makes losses, investor A loses more money than Investor B. An investor can sell the mutual funds in market if they wish to provided, they are close end.

There are two major categories of mutual fund investments: open-ended and closed-ended funds. In an open-end mutual fund, investors pool capital together and are issued shares based on the amount of capital pooled. Investors can provide capital to fund managers who then issue them new shares. They can also sell their shares at any time to the fund manager, who then redeems the shares and decreases the number of shares outstanding in the mutual fund. In a closed-end mutual fund, the fund manager initiates an initial public offering (IPO) and determines the amount of capital required for the fund and the resulting shares that are to be issued to investors who provide capital through the initial issue. Afterward, a closed-end mutual fund trades on a stock exchange where shares of the closed-end mutual fund would trade based on supply and demand. Such a method of buying and selling shares in a closed-end mutual fund results in the share price of the fund to trade at a premium or discount to the net asset value per share.

Mutual funds can further be divided into equity-based, debt-based, gilts, ETF, etc. Equity mutual funds: These are most popular type of mutual funds. In this type, the investments are done in stocks of companies. Its value is derived from the difference between its NAV and its liabilities. A more diversified mutual fund is always better as it does not have an adverse effect on the overall portfolio. Debt mutual funds: in this type of mutual funds the investments are made in fixed income securities like bonds and treasury bills. Exchange Traded Funds: These are investment trusts that are traded on stock exchanges and have the added benefits of the features of stocks. ETFs can be bought and sold at any

point throughout the trading day. Compared to normal mutual funds, ETFs carry lower fees, are more liquid and cost efficient too.

This study on mutual funds will help in understanding the growth of the mutual fund industry and to understand whether the growth is due a particular type of mutual fund such as debt oriented mutual or was the growth uniform throughout the different types of mutual funds. For the better understanding of the growth, parameters such as Asset Under Management (AUM), Number of Folios, Number of schemes and deployments of funds have been made. The research also depends upon historical data provided by RBI (Reserve Bank of India), AMFI (Association of Mutual Funds in India) and various other research papers written over the years.

REVIEW OF LITERATURE

Agrawal (2007) found that past performance influences the future performance of the funds. Performance of the fund depends on the incentives provided to the fund manager. High levels of domestic savings and an economy that is liberalizing at a fast pace can be factors in the growth of MF Sector in India. Kushwaha (2009) found that some funds do not perform well due to bad professional management and sometimes dilution of funds can happen, that is, when huge amount of money flows into the fund and managers can not find a good investment with higher returns. Hence a good portfolio manager and scheme are important to make higher profits. Goel (2013) has found that investors prefer to invest more in balanced and growth schemes. The paper highlights the issues of Indian mutual fund industry saying that it is quite volatile. The policy makers have to remove poor performing schemes. It suggests the investors can try out new options of investment like, ELSS, international funds, etc. Goyal and Bansal (2013) have concluded using their research that equity funds outperform income funds. The study concluded that equity and institutional fund managers had the ability to time their investments, unlike the funds operated by brokers. Fund managers claim that they beat the market using their timing and selectivity skills. Chaudhary and Verma (2014) have found that there is little evidence for superior performance by mutual funds or their managers on average. Investors, therefore, should invest in mutual funds for reasons of diversification and not necessarily for superior performance. Arathy et al. (2015) found that the major factors affecting the investment decision of retail investors are tax benefits, price and high returns and capital appreciation. Equity based schemes are the most preferred. Bitter past experience is the major preventing factor while considering investment decisions. The study provided insights on mutual fund performance which assisted the investors to take rational investment decisions while allocating their funds in the right mutual fund scheme. Sharma et al. (2016) have found that many people want to invest in mutual funds because of its cost-effective method of obtaining a diversified portfolio which is managed professionally. It also found that ELSS (Equity-Linked Saving Scheme) mutual funds eliminated the problems of waiting for a broker and uncertain purchase prices. Here investors can do their own research before making an investment using the net.

Bhagyasree and Kishori (2016) found that the mutual funds were safe and investors preferred investing in them. Although they were giving good returns, the industry still needs better supervision to allow an investor to make better decisions. It was observed by Bhayani (2017) that MF sector might be growing but the growth is concentrated with respect to investor category and geographical location. The growth is dominated by Institutional investors, T- 15 cities and debt-oriented schemes leaving huge scope for growth. One possible solution to reach different segments could be increasing financial knowledge and

awareness to stimulate and motivate investors in mutual fund investment. The current distribution network is limited which can be enhanced to reach a wider segment of the society both category wise and location wise. Sanjay and Raj (2019) found that AUM is growing positively expect for Gold ETF. They have also found that the HNI investor accounts are growing more than retail investors yearly. Investment in equity fund was growing more than equity index (compared CRISIL and AMFI Equity fund performance and index of S&P BSE SENSEX (TRI), NIFTY 50 (TRI), NIFTY 500 (TRI)). Indian mutual fund industry growth rate is higher than Europe and Asian Pacific regions, but it is equal with America and has higher growth rate from 2017.

RESEARCH METHODOLOGY

The research design consists of a method and system of a statistical analysis based on the past performance of Indian debt, equity and Exchange traded funds. The data used for the purpose of this study is secondary data from various research papers and from SEBI (Securities and Exchange Board of India) & AMFI publications. The growth is measured in terms of the amount of investments made in each year from March 2015-March 2020. This research methodology helps us to analyse about the growth of mutual funds investment. It will help to study the market of mutual funds better. Debt, equity and ETF mutual funds growth, AUM, age wise analysis, number of folios, and deployment of funds for five years has been taken. The Data is to be collected from secondary sources such as papers, annual reports and Internet sites. The data will be analysed and interpreted using necessary graphs, tables and charts.

Parameters Used

Assets under management (AUM) is the total market value of the investments a company holds, but in this case the mutual fund industry of India holds.

AUM is important for the MF's industry. AUM gives us an insight into the performance of the fund house compared to other fund houses. It also shows the size of the funds. Using AUM we get an idea of the returns earned by the mutual fund. The earnings can be in the form of dividends, holdings as per investment and reinvestment in securities for future earnings.

For equity mutual funds, the AUM consistency of returns is an important factor. The equity mutual fund is considered good if it generates a consistent and appreciable positive return irrespective of the AUM.

For debt oriented mutual funds, AUM is used for providing dividends and returns to its investors. A debt fund which has a huge AUM is in a good position to give returns.

Due to a greater fund size, the expenses incurred by each investor in the fund reduces, as these expenses gets divided between a greater number of investors. The reduction in these expenses is directly reflected in the returns of the fund. A larger AUM can help in negotiating with the debt issuers.

Number of folios: More and more folios are added every year, this is due to low interest on bank deposits and higher disposable income. During the pandemic most investors got attracted to the mutual fund financial instrument.

Number of schemes: A mutual fund scheme is a combination of different kinds of securities. Each scheme has a unique objective based on the risk an investor is willing to take and their expected returns.

Deployment of funds: It indicates how the funds have been allotted or further been invested in different sectors. In other words, it tells us about the composition of the mutual fund industry.

Age-wise distribution of funds: The funds can be invested for different maturity periods such as 3-6 months or for 2 years. Different maturity periods attract investors based on their investment requirement. Age-wise analysis helps in understanding which maturity period is the most demanded and where the inflow of funds is directed to.

ANALYSIS

Assets Under Management (AUM)

Mutual Industry Overall: The table below shows the AUM data starting from 2015-16 to 2019-2020.

Table 1. Overall AUM

Year	AUM (Rs. Cr)
2020	₹ 22,26,202.82
2019	₹ 23,79,584.45
2018	₹ 21,36,035.71
2017	₹ 17,54,618.99
2016	₹ 12,32,823.51

Source: Data available on RBI website

According to Figure 1 the AUM has been the least in 2016 i.e. Rs12,32,823.51 crores when compared to other years. AUM has seen a growth over the succussing years. The years 2017, 2018, 2019 have seen steady growth. The highest AUM was in the year 2019 of about Rs23,79,584.45 crores which is almost double the AUM of 2016. The trendline is an upward curve, but there has been a drop in the year 2020 due to the pandemic. But the AUM in India is expected to grow in the coming years.

Figure 1. Yearly AUM

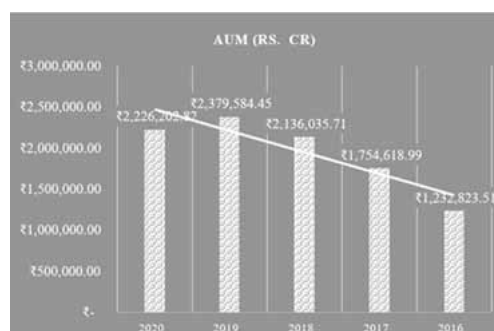


Figure 2. AUM of equity funds

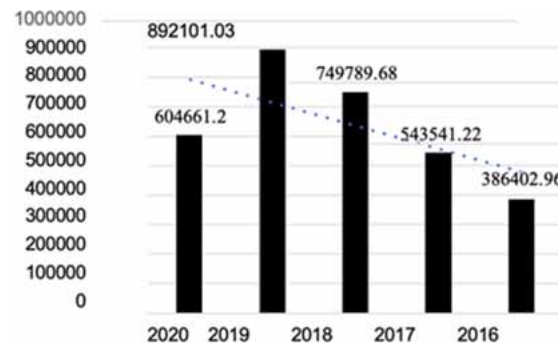
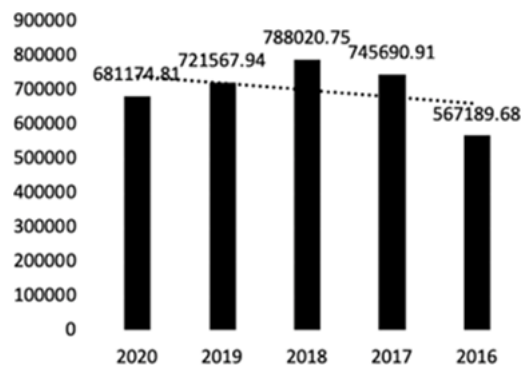


Figure 3. AUM in debt oriented mutual funds



Equity Oriented funds

According to Figure 2 the AUM has been the least in the year 2016 with Rs3,86,402.96 crores. There has been a slight increase in the year 2017 with Rs5,43,541.22 crores. In 2018 the investments have been Rs7,49,789.68 crores. The AUM has been the highest in the year 2019 with Rs8,92,101.03 crores. In 2020 there was a decline in investments, of around Rs6,04,661.2 crores.

Debt Oriented funds

According to Figure 3 the AUM was the least in the year 2016 with Rs5,67,189.68 crores. The investments have grown since then. In 2017 it was Rs7,45,690.91 crores making it the second highest. The AUM in debt mutual funds was the highest in the year 2018 with Rs7,88,020.75 crores. There was decline in AUM after 2018, in 2019 the investment was Rs7,21,567.94 crores and in 2020 it was Rs6,81,174.81 crores. The investments in 2020 were second least in the past 5 years after 2016. The trendline shows an upward trend, with its gradual inclination.

NUMBER OF FOLIOS

Mutual Industry Overall

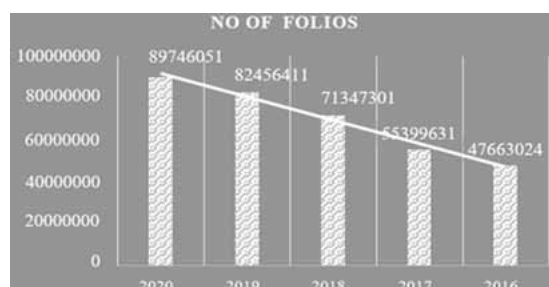
According to Figure 4, it is observed that there has been a gradual growth of number of folios from 2016 to 2020. The increase in the number of portfolios is 88.29% from 2016 to 2020. The number of folios almost doubled in 5 years that is from 4.77 crores in 2016 to 8.974 in 2020. The trendline shows an upward curve, indicating that number of funds participating in the market has been increasing. The Indian mutual fund industry is on the rise with the number of new funds emerging and the number of folios increasing.

Table 2. Overall number of folios

Year	n. of Folios
2020	89 746 051
2019	82 456 411
2018	71 347 301
2017	55 399 631
2016	47 663 024

Source: Data available on RBI website

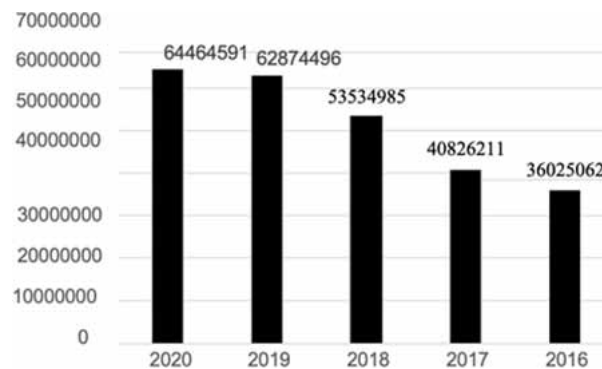
Figure 4. Yearly number of portfolios



Equity Oriented Funds

According to Figure 5 the number of folios has been the least in the year 2016, with 36,025,062. It has increased to around 40,826,211 in 2017. In 2018, the folios grew to 53,534,985 and 2019 it increased to 62,874,496. The number of folios was the highest in the year 2020 with 64,464,591. So, the number of folios has been increasing yearly.

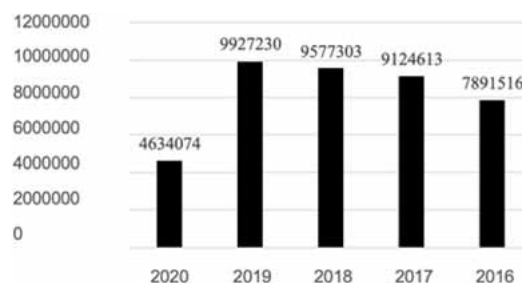
Figure 5. Number of portfolios



Debt Oriented Funds

According to Figure 6 the number of folios has been the least in the year 2020 with just 4,634,074. In 2016 the number of folios was 7,891,516 making it the second lowest in the past 5 years. In 2017 and 2018 the number of folios were 9,124,613 and 9,577,303 respectively. The folios were the highest in the year 2019 with 9,927,230.

Figure 6. Number of debt oriented mutual fund portfolios

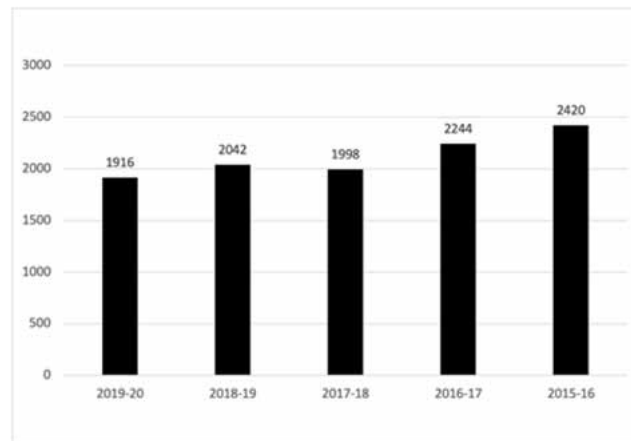


NUMBER OF SCHEMES

Mutual Industry Overall

The above data in figure 7 shows schemes of both open-ended funds and close ended funds. There has been a gradual decline in the number of schemes available to the public over the past 5 years. The maximum number of schemes that were available to the public was 2,420 in the year 2016. The number of schemes fell to 2,244 in the year 2017 and then to 1,998 in the year 2018. The year 2019 saw a small rise in the number of schemes but fell down to 1,916 in the year 2020.

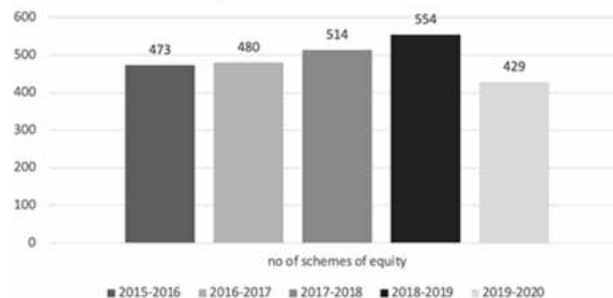
Figure 7. Number of schemes year wise



Equity Oriented Funds

According to Figure 8, the number of schemes of equity oriented mutual funds, including both open and closed-ended funds has grown over the past 5 years. The highest was in the year 2019 with 554 schemes and the lowest was in the year 2016. There has been a reduction in number of schemes from 2019-2020 that is from 554 to 429. In the year 2016 and 2017 the number of schemes has been 480 and 514 respectively.

Figure 8. Number of equity fund schemes



Debt Oriented Funds

According to figure 9, the number of schemes of debt oriented mutual funds, including both open and closed-ended funds have reduced over the past 5 years. The highest was in the year 2016 with 1,831 schemes and least in the year 2020 with only 983 schemes. There was a huge reduction from the previous year. The second highest was in 2017, with 1,642 schemes. In the year 2018 and 2019 the schemes are reduced only by a few margins that is from 1,357 to 1,354.

A Study on the Performance of Indian Mutual Funds in Recent Years

Figure 9. Number of debt schemes available

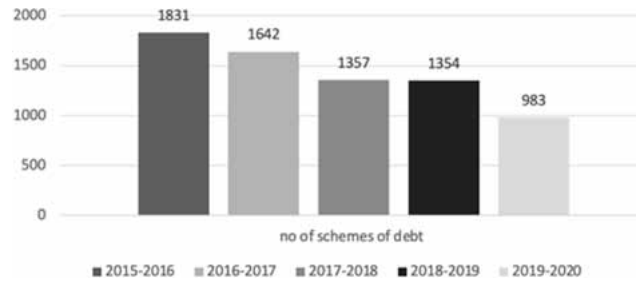
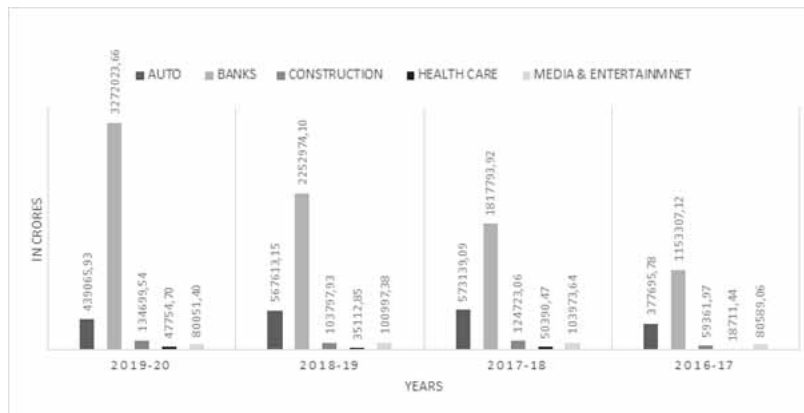


Figure 10. Deployment of Funds in Selected Sectors

Source: Data collected from SEBI and used in accordance with requirement.



DEPLOYMENT OF FUNDS

Equity Oriented Funds

For the purpose of this study 5 different sectors¹ where the equity mutual funds have invested are studied - Auto, Banks, Construction, Healthcare and Media & Entertainment. Five-year analysis from 2016-2020 is done below.

Table 3. Deployment of funds in selected sectors

	2019-20	2018-19	2017-18	2016-17
AUTO	439065.93	567613.15	573139.09	377695.78
BANKS	3272023.66	2252974.10	1817793.92	1153307.12
CONSTRUCTION	134699.54	103797.93	124723.06	59361.97
HEALTH CARE	47754.70	35112.85	50390.47	18711.44
MEDIA & ENTERTAINMENT	80051.40	100997.38	103973.64	80589.06

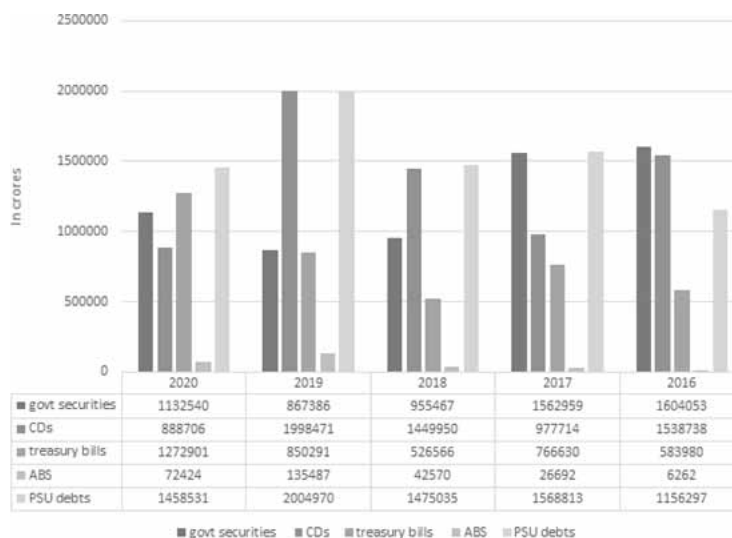
According to Figure 10 and table 3 the banking sector is one of the biggest sectors where the equity oriented mutual funds have invested across 5 years with an average investment of Rs20Lakh Crores. Banking Sector is the only sector among the 5 selected sectors to have a constant growth while all the others have faced fluctuations over the past 5 years. In the year 2020-19, Banking, construction & healthcare sector investments of equity mutual funds increased as compared to the year 2018-2019. Whereas the sectors such as auto and Media & entertainment saw a decline. The healthcare industry is among the most fluctuating investments with no constant growth or decline. The above data helps us to understand that there is no clear investment pattern in any sector and the investments are made according the fund manager and the market

Debt Oriented Funds

For this study 5 different debt mutual funds² types have been taken- Government securities, Bank Certificate of Deposits, Treasury bills, PSU bonds and Asset Backed Securities. Five-year analysis from 2016-2020 is done below.

Figure 11. Deployment of Debt Mutual Funds

Source: Data collected from SEBI and used in accordance with requirement.

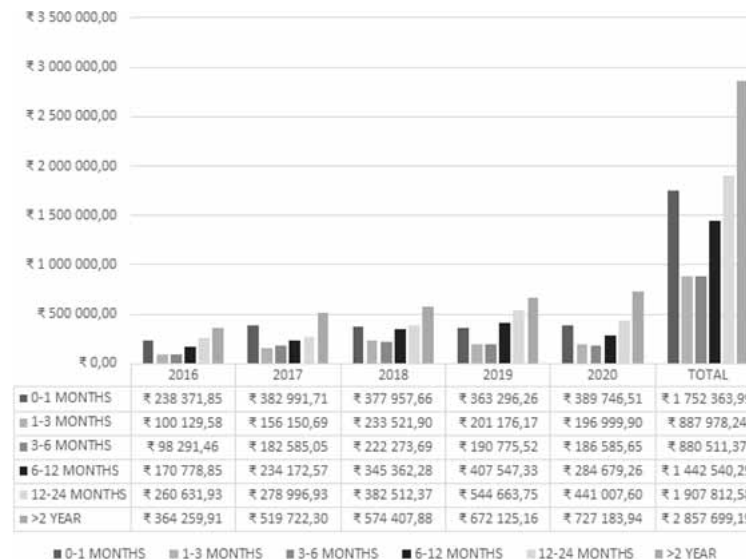


According to Figure 11 the investments in the PSU bonds have been the highest when compared to other securities, followed by the Bank Certificate of Deposits. The investments in government securities have ranked third among the 5 chosen securities. Treasury bills has seen a positive increase in the investments in the past 5 years. ABS have the least investments compared to other securities, but there has been a slow and steady growth in that sector. Investors have preferred investing in other debt mutual funds than government securities over the past few years. Overall, the investments in 2019-2020 have been the highest. The Bank CDs, PSU bonds and government securities are categories in which most investments have been made. More investments can be expected in the following years.

Age-Wise Distribution of Funds (Industry Overall)

The graph represents the comparison of investment made in different maturity periods over the years, starting from 2015-16 to 2019-2020.

Figure 12. Age-wise Analysis



In figure 12, it can be observed that the investments made in 0–1-month category has had a slow growth but in the year 2020 the same category had the highest investment of Rs389,746. The 1-3-month and 3-6-month categories has had a moderate growth in the past 5 years. The 12-24 month category has had the highest investment in 2019 and >2years category has had the most investments in the past 5 years as compared to other categories with a total of Rs2,857,699 investments. That is, every year mutual funds have invested more in securities with a maturity period of more than 2 years. It is observed that the mutual funds have preferred long-term investments like, 6-12 month, 12-24-month and >2years category than short-term investments like the 1-3 month and 3-6 month category.

EXCHANGE TRADED FUNDS

Exchange traded funds work differently when compared to debt and equity oriented mutual funds. Though exchange traded funds work differently they have the same results as the other types of mutual funds. EFTs have seen a gradual increase in their asset under management, Number of folios, number of schemes over the past five years. despite the unique nature off this type of funds they help the overall mutual fund industry grow. The data below consists of Gold ETFs and Other ETFs.

Figure 13. AUM of ETFs

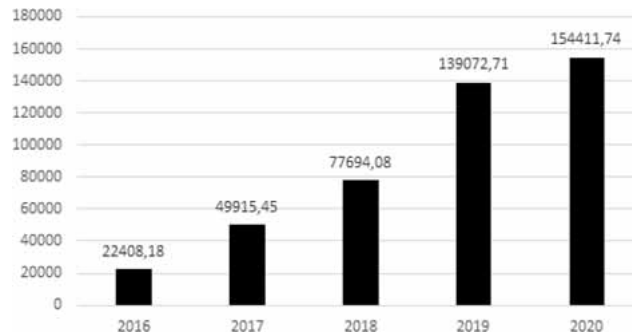


Figure 14. Number of ETFs Portfolios

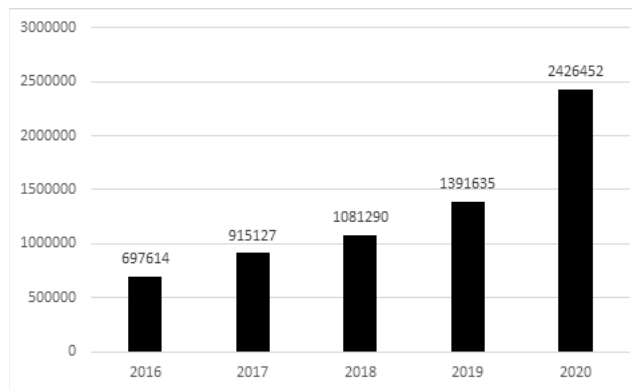
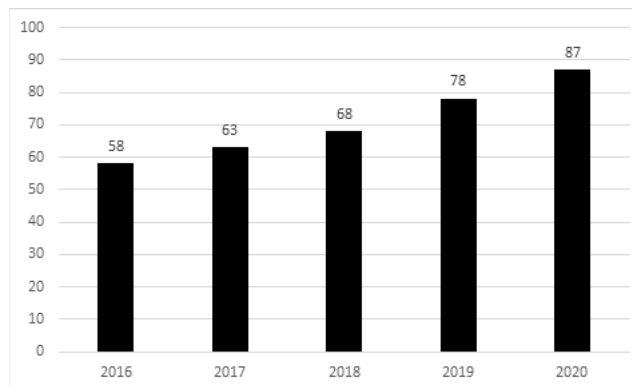


Figure 15. Number of ETFs Schemes



The ETFs contribute a small part in the total AUM in India, but the AUM in ETFs has been increasing year after year which is evident from Figure 13. In 2016 Then AUM in ETFs was the least in the selected time period at Rs 22,408.18 crores and it more than doubled in the following year (2017) and

was standing at Rs 49,915.45 crores. The AUM has seen a constant growth year after year and was the highest in 2020 at Rs 1,54,411.74 crores. The growth from 2016 to 2020 has been about 589%.

Figure 14 depicts the gradual growth in number of portfolios consisting ETFs. The year 2020 saw a jump from 13,91,635 to 24,26,452 which is the highest increase of number of portfolios in ETFs. The Number of Portfolios increased at about 12000-15000 portfolios per year until the sudden spike in 2020. The least number of Portfolios were seen in the year 2016 at 6,97,614.

The number of schemes available in electronic traded funds is very less when compared to that of debt-oriented funds and equity-oriented funds. The year 2016 had the least number of schemes that is 58 and the year 2020 had the most number of schemes that is 87. In a period of 5 years, we see that a total of only 29 new schemes in ETF have been introduced. In the years 2017 and 2018 there has been an increase of 5 schemes and in 2019 the increase is of 10 schemes.

RESEARCH FINDINGS

The Indian mutual fund industry has been doing well over the past 5 years (2016-2020). The investors are now investing in different securities and mutual funds have become quite popular among them. The increasing number of folios are proof for it. The AUM has also increased, more and more investments are being made in mutual funds. Even during the 2020 pandemic, the inflows in mutual funds have not decreased. The investors have shown a matured behaviour, even in a bearish market the investors have chosen to invest in mutual funds as they are a better investment option. The fund managers have had an opportunity to remove poor performing assets. In equity and debt mutual funds, the AUM has drastically reduced in the year 2020. The slow growth may be due to the lockdown in the first quarter of 2020 in India. The investors have invested more in equity oriented mutual funds of banking sector. This category has seen more investments in the year 2019-2020 than any other. The growth in other sectors have remained slow over the past 5 years. In debt oriented mutual funds, PSU bonds have had the most investments. They have grown drastically over the past 5 years starting from March 2015- March 2020. Government securities growth has declined and other debt mutual funds like Bank certificate of deposits and Treasury bills have picked up. In the year 2020, the investors have invested more in long term equity funds (>24 months). Short term equity funds of 12-24 months are also quite popular among Indian investors. This sector has seen growth in the past 5 years. Overall, the mutual fund industry in India is growing and making a good progress.

Factors That Influenced the Growth of Mutual Fund Industry in India

The Government of India and SEBI's rules and regulations have also attracted more and more investors into the industry. Earlier the Mutual funds were labelled in terms of its maturity, that is, long, short, medium, etc along with three colours to depict the level of risks. In 2015, product labelling was further improved by introducing a meter called "risk-o-meter" which depicted five levels of risk in any schemes, allowing more transparency for the investors.

In 2017 SEBI changed the base year from 1981 to 2001 which helped in understanding the inflated cost of assets in turn reducing capital gains. Reduction in capital gains lead to a reduction in tax burden of the investors. FACTA (Foreign Account Tax Compliance Act) compliance for all the portfolios opened between July 1st 2014 & 31st August 2015 was made mandatory. This aimed to bring transparency and

curb tax evasion by reporting on income earned by the Non-Resident Indians living in United States of America from their Non-US investments and assets. FACTA enabled easy transfer of information between India & USA. In 2017 April, Investment in MFs through e-wallets was introduced to promote digital payments and channelise household savings into the capital market.

In the year 2017-18 in order to bring a uniform and standardised category of schemes SEBI took a lot of measures for their rationalisation and categorisation.

The Indian Securities and Exchange Board (SEBI) has asked fund houses to classify their schemes accordingly. No simple guidelines for categorising mutual funds have been available for a long time. In each group, fund houses have also introduced multiple schemes, making scheme selection a challenging exercise for investors. SEBI has now requested fund houses to have only one scheme per group, with the exception of index funds, fund funds and sector or thematic schemes, in order to establish clarification. Mutual funds, which have multiple products in a category, will have to merge, close or change the fundamental attributes of their products. This policy in 2017 reduced Number of schemes in 2018.

Total expense ratio (TER) measures the total costs that are incurred in managing and operating a mutual fund. The costs incurred include management fees, trading fees, legal fees, auditor fees, and other operational expenses. In 2019 SEBI capped TER at 2.5% for equity oriented and 2% for funds other than equity, making mutual funds cheaper. SEBI has followed economies of scale to reduce TER systematically and also revised the slabs. Around 72 lakh new mutual fund folios were added in the year 2020 as compared to the 68 lakh accounts in the year 2019. The investors were attracted to the instruments low interest on bank deposits and high income.

Mutual Fund Industry During the Pandemic

During the pandemic the Indian Mutual fund industry underwent a lot of changes. The Securities Exchange Board of India made a lot of reforms, rules and regulations to improve the industry. One of the most important change is related with the calculation of NAV which will commence from February 2021. The new rule states that as soon as the investor's money goes to the AMC, the investors get their purchase NAV of that day irrespective of the size of the investment. There was huge liquidity crisis during the 2020 pandemic. To maintain liquidity many fund houses started transferring poor credit debt schemes to balanced or long-term schemes. Hence, to protect the investors SEBI came up with strict inter-scheme transfer norms. SEBI has also renamed dividend options to avoid mis-selling in the name of dividends. It is now mandatory for the fund houses to mention if the dividend is paid from their capital. It is also mandatory for the fund houses to disclose the specific yields of the instruments and the portfolio of the schemes on a daily basis as opposed to the disclosure of only indicative yield once a month. This has been done to make the debt-oriented funds more transparent and their risks a little more predictable. They introduced a new category called as 'flexi cap category' under equity schemes attracting investors who were earlier very cautious of the multi cap funds. These caps will be required to invest at least 65% of the corpus in equity but will have no restrictions on investing in large-cap, mid-cap or small-cap company stocks.

Major Issues with the Indian Mutual Fund Industry

Liquidity is a major issue with the industry, RBI released a Rs50,000 crore window to facilitate liquidity in high-risk Debt-oriented mutual funds. The Liquid Adjustment Framework setup by the Reserve

bank of India will help in limiting the capital market exposure of the industry. Another issue with Indian mutual fund industry is the lack of investor's financial literacy rate and education on personal finance. Even though, mutual funds are considered to be safe, they are subjected to market risks. There is a high chance of cognitive dissonance by clients who prefer safe investments.

CONCLUSION

The average Global AUM to GDP ratio is at 63% and for developed countries like USA it stands at 120%. The AUM to GDP ratio of India stands at 12% which is about 80% less than the average in the main countries. To reach the Global standards, the industry needs to target households from Tier 2*, Tier 3⁺ and even Tier 4⁺ cities. The current composition of investors mainly consists of Tier 1 households and high net worth individuals [HNI's].

In the next few years, typically targeted investors, i.e, metro based, men, middle aged & rich will undergo a transformation. The new target audience will be women, people from all age groups, and from around the country and not just from metropolitan cities.

The AMC's must make use of Technology for making the industry efficient and by cutting down bulky processes. Investor awareness and education must be continued to ensure that the industry keeps growing at a faster rate. Although SEBI has done a remarkable job in limiting the negative impacts of the pandemic on the mutual fund industry, they have scope for improvement as a regulator. Better regulation will not only ensure protection of the investor but will also attract new participants, in turn helping the growth of the capital market.

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ENDNOTES

* Population of 50,000 to 99,999.

† Population of 20,000 to 49,999.

‡ Population of 10,000 to 19,999.

¹ 5 sectors have been selected at random.

² 5 sectors have been selected at random.

Chapter 25

How Does COVID-19 Impact the Efficiency of the Chinese Stock Market? A Sliding Windows Approach

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ABSTRACT

The spread of COVID-19, first in China and then all over the world, has had a major impact on economic and financial systems. In this chapter, the authors focus their analysis on the Chinese stock market since it was the first to be affected with relevant time to react. They use the detrended fluctuation analysis with a sliding windows approach and with minute-based data to analyse the impact of COVID-19 on the efficiency of the Chinese stock market. The results show that the Chinese stock market suffered from some kind of turbulence with high levels of dependence, but the market reacted quickly and after that turbulence recovered the efficiency pattern. This is a very relevant result that shows that this particular stock market quickly reacts to turbulent periods, very important information for investors.

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INTRODUCTION

The outbreak of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) has already about 20.5 million confirmed cases and killed more than 743 000 people as at August 11, 2020 worldwide, with numbers increasing on a daily basis. To limit the syndrome, social isolation is recommended (Kucharski, Russell, Diamond, Liu, Edmunds, Funk, & Eggo, 2020) and this means that a relevant part of the planet has to stay at home to decrease the likelihood of contamination. This isolation is affecting the entire global production chain and several economic sectors are at a standstill. In this context, President Donald Trump has sent a package of USD 1.6 trillion to the American Congress to help the American economy, the European Central Bank has decided to buy 750 billion euros in public and private bonds, the European Commission approved in July also a total of 750 billion euros to fight the crisis and the Chinese Central Bank has distributed USD 175 billion dollars in aid, making the COVID crisis the biggest since the subprime crisis (Baldwin & di Mauro, 2020). This is affecting the global economy in general and stock markets in particular. The continuing monitoring of stock market behavior is relevant to keep investors informed. In this chapter, we analyse the Chinese stock market because China was the first country to be affected and because at present the disease seems to be controlled, which probably makes the market more stable and suitable for this analysis.

In particular, we will analyse the long-range dependence behavior of the Shanghai Stock Exchange (SSE) Composite Index, in an analysis which could be related to the Efficient Market Hypothesis (EMH), proposed by Fama (1970), stating that a market is efficient when it reflects all the available information at a given time. Identifying three types of efficiency, the weak form of efficiency indicates there is no long-term memory in return rates' financial series. Based on the hypothesis that asset prices follow a random walk, previously defended and studied by Bachelier (1900), it has been highly scrutinized since the 1970s. For extensive reviews of the study of the EMH in financial markets in general, see the work of Yen and Lee (2008) or Titan (2015).

In this chapter, we will use the Hurst exponent, an indicator often used to analyse the long-term memory of financial time series and particularly stock markets and/or assets, that exponent being identified as a good measure of dependence. We will estimate the exponent using the Detrended Fluctuation Analysis (DFA) and apply a sliding windows approach, allowing us to identify the time-varying behavior of dependence. In particular, we are interested in understanding how the COVID-19 situation affected the dependence of the Chinese stock market over time, so we will use a sliding windows approach with DFA to analyse the SSE, using high frequency data (with one minute-based data). The evolution of the Hurst exponent across time may reveal much information about markets' features such as liquidity and underdevelopment. In the case of turbulent periods, several studies found a decreasing trend in the Hurst exponent (Kristoufek, 2012 and Morales, Di Matteo, Gramatica & Aste, 2012) with the Hurst exponent less than 0.5 according to Peters (1994), and an increase in short period trading activities, while an increasing trend in the local Hurst exponent, with a value greater than 0.5, may inform about market stability.

This type of information is very relevant since it could highlight financial markets' behavior in the occurrence of pandemics, which is relevant for both investors and the authorities, in order to be prepared for similar crises in the future.

Background

In this section we briefly review the literature on the EMH and market efficiency, principally concerning periods of turmoil.

Financial markets could be described by complex laws, with several agents having divergent and even contradictory interests. For example, one market participant seeking liquidity may interpret a piece of information differently from another who is expecting to make an immediate return.

For several years, the Efficient Market Hypothesis (EMH), developed and described by Fama (1965, 1970), was the mainstream theory used to describe and study financial markets. According to Fama's theory, a market is called efficient if all available information is reflected in prices, implying that the predictability of stock markets is not possible and meaning that investors cannot have abnormal profits consistently. Fama (1970) distinguishes three types of market efficiency: weak form efficiency, which considers the information set as historical prices; semi-strong form efficiency, considering all public information about assets; and strong form efficiency, which includes the whole set of existing information in asset prices. The proposal of the EMH was supported by prior evidence that financial time series should not suffer from any kind of dependence (see, for example, Kendall & Hill, 1953; Osborne, 1959; Fama, 1963; Granger & Morgenstern, 1963; Samuelson 1965).

According to the EMH, if information is fully included in the prices, any new information will be immediately included in the new prices. As the arrival of new information is unforeseeable, any future change in prices is always unpredictable, so an efficient market can be described by a random walk (Fama, 1965). Moreover, the EMH implies that investors are rational and homogeneous and as a consequence financial returns are normally distributed, standard deviation can be used as a measure of risk and the covariance to explain the benefits from risk diversification (see, for example, Elton, Gruber, Brown & Gotzmann, 2003).

The first formal examination of EMH was the work of Fama (1965), which examined the autocorrelation of Dow Jones Industrial Indices, with the author finding a positive autocorrelation in daily returns. Later results, such as those of Lo and MacKinlay (1988), found positive autocorrelation, particularly strong in smaller portfolios. The availability of data and development of the computer industry allowed researchers to investigate the empirical implications of EMH, which was widely rejected (Jensen 1978; Burton 2003).

The use of linear autocorrelations could be one of the reasons for some studies finding no evidence of dependence in financial markets. Despite this, earlier studies find that financial markets show evidence of some stylized facts like the existence of fatter tails than the ones shown by normal distribution. Mandelbrot (1977), for example, is among the first researchers to show these findings (see, for example, Cont, 2001, for a review of stylized facts).

The use of random walk to model price movements was characterized by the non-recognition of extreme events in capital markets (Matia, Ashkenazy & Stanley, 2003). Borland, Bouchaud, Muzzy and Zumbach (2005) highlighted the following qualitative properties as stylized facts of financial returns: 1) distributions of returns are non-Gaussian, especially for short intervals of time, having stronger levels of Kurtosis; 2) volatility is intermittent and correlated, in a phenomenon called volatility clustering; 3) price changes scale anomalously with time, i.e., prices suffer from multifractal scaling. According to Craven and Islam (2007), when studying long time series from the S&P 500 and the FT30, large fluctuations could not be described by the EMH, with both extended down-phases and up-phases needing to be reconciled with the referred hypothesis. Also Cunado, Gil-Alana and Garcia (2009) studied stock market

volatility during bull and bear markets in the US markets from 1994 to 2002, and found that the degree of persistence in volatility presents a different behavior for both types of market stages, concluding also that the US stock market is more efficient before the burst of the bubble.

With the constant recognition of the failure of the EMH, the fractal market hypothesis (FMH) was proposed by Peters (1994), suggesting that investors' heterogeneity ensures liquidity and consequently market stability. The information is obtained at different times, or/and interpreted differently, according to investors' own objectives. It could be, for example, an opportunity to buy for one investor and an opportunity to sell for another. This willingness to trade ensures market liquidity, according to this market description, and so asset prices cannot be totally random, as predicted under EMH. According to the FMH, markets become unstable when one investment horizon becomes dominant, and it is necessary to recognize a wide range of investment horizons to offer stabilization in the markets (see, for example, Rachev & Weron, 1999; Weron & Weron, 2000; Kristoufek, 2013, among others). This is an important characteristic of turbulent periods to look for in the market.

According to Peters (1994), the FMH is related with fractality and multifractality when markets are stable, returns being calculated across different time scales and exhibiting the same autocorrelation structure (Onali & Goddard, 2011). The existence of multifractality is a well-known feature of complex systems, in general (Mandelbrot, 1997; Ivanov, Amaral, Goldberger, Havlin, Rosenblum, Struzik & Stanley, 1999), and financial markets in particular (see, for example, Liu, Gopikrishnan, Cizeau, Meyer, Peng & Stanley, 1999).

The study of financial markets' efficiency during periods of turmoil is a growing research topic (see for example Cajueiro and Tabak 2004a; 2004b; 2006; 2008; Kristoufek 2012; Ferreira 2018, among others). More recently, some authors have attempted to investigate this aspect during the ongoing coronavirus disease. For example, Faheem, Aziz, Nguyen, Mughal and Khan (2020), studied forex markets during the first period of the Covid-19 crisis, applying Multifractal Detrended Fluctuation Analysis (MFDFA) also with high-frequency data, finding a decline in efficiency during the outbreak. Mensi, Sensoy, Vo and Kang (2020), examined the impact of the Covid-19 crisis on gold and oil prices, also with a multifractal approach and with intraday data, and their main finding was that markets have been inefficient, particularly during the outbreak. Mnif, Jarboui and Mouakhar (2020) examined the efficiency of five cryptocurrencies, before and after the Covid-19 crisis, using the Generalized Hurst Exponent and found that Covid-19 has a positive impact on the cryptocurrency market's efficiency. Okorie and Lin (2020) studied the evidence of fractal contagion in the top 32 countries affected by coronavirus and found evidence of fractal contagion during the crisis period.

COVID-19 AND EFFICIENCY OF THE CHINESE STOCK MARKET

Data and Methodology

We use the detrended fluctuation analysis (DFA) to analyse serial dependence in the Shanghai Stock Exchange (SSE) Composite Index, with high frequency data (minute-based data) from 5th December 2019 until 1st June 2020, retrieved from Datastream. Considering only the moments when there was trading, we have a total of 28 290 prices. We use the traditional log returns, allowing for the existence of 28 289 return points.

For the analysis we use the DFA, proposed by Peng, Buldyrev, Havlin, Simons, Stanley and Goldberger (1994), used to analyse DNA behavior but commonly extended to study financial data, among other subjects (see, for example, the work of Costa & Vasconcellos 2003; Di Matteo, Aste, & Dacorogna, 2005; Wang & Wu, 2011a, 2011b; López & Contreras, 2013; Kristoufek & Vosvrda, 2013; Cao & Zhang, 2015; Anagnostidis, Varsakelis & Emmanouilides, 2016; Uquhart, 2016; Nadarajah & Chu, 2017; or Ferreira, Loures, Nunes & Dionísio, 2017, analysing different kinds of financial assets).

The DFA is applied to the time series x_k , with $k = 1, \dots, t$ equidistant observations representing the sequence of return rates and is calculated as described in the following steps:

1. integration of original time series, i.e., $X_t = \sum_{i=1}^t (x_i - \bar{x})$, with $\bar{x}$ as the observed mean value;
2. division of the time series in N/s mutually exclusive boxes of equal dimension s for which, with ordinary least squares, the local trend $z(t)$ is calculated, used to calculate the detrended series, i.e., $X_s(t) = X_t - z(t)$;
3. Calculate the DFA function given by $F(s) = \sqrt{\frac{1}{N} \sum_{t=1}^N (X_s(t))^2}$;
4. Calculate $F(s)$ for all values of s and obtain the log-log relationship between $F(s)$ and s which will be a power-law represented by $F(n) \propto n^\alpha$.

The α parameter of the power-law is the Hurst exponent, measures the long-range dependence of the original time series and is interpreted as follows: an $\alpha = 0.5$ means that the time series is described by a random walk, i.e., it has no memory (consistent with the EMH); $0.5 < \alpha < 1$ means that the time series has positive long-range dependence (it has persistent behavior); an $\alpha < 0.5$ means that it has negative long-range dependence (it is anti-persistent).

As our objective is to evaluate the evolution of this exponent over time, we used a sliding windows approach to make the desired estimations. The application of sliding windows with DFA is usual in financial data and found, for example, in Carbone, Castelli and Stanley (2004), Grech and Mazur (2004), Cajueiro and Tabak (2004a; 2004b; 2006; 2008), Grech and Pamula (2008). Czarnecki, Grech and Pamula (2008), Ferreira and Dionísio (2016) or Ferreira (2018), among others. For example, with a size window of 1.000 observations we start by calculating the α exponent for the time series ranging $t = 1, \dots, 1000$, followed by the one ranging $t = 2, \dots, 1001$, $t = 3, \dots, 1002$ and so on, resulting in a wide set of α exponents which themselves form a new time series. The evolution of this time series is where we base our analysis. We developed our main analysis considering windows of 1.000 but the results are qualitatively similar considering windows of 500 and 2.000, demonstrating the robustness of our analysis.

Results

Figure 1 shows the evolution of the SSE composite index over time, revealing that after recognizing the existence of the virus the stock market did not present any relevant effect. The figure clearly identifies the strong breakdown already in 2020, after the closure of the SSE between 23rd January and 3rd February, due to the Lunar New Year holiday. In a single day the index dropped about 8%, with a relatively solid increase since then. However, after the declaration of the pandemic by the World Health Organization (WHO), on 11th March 2020, the market also suffered a severe drop and, since then, the SSE index

has started to grow steadily. Calculating the return rates, their descriptive statistics appear in Table 1. The mean value of the return rates is very near to zero, although positive, meaning that the market has had a similar value since the beginning of the sample. The extreme values and skewness identify more extreme decreases than extreme increases, while the kurtosis level reveals that the return's distribution is leptokurtic, a usual result for financial data.

Figure 1. Evolution of the SSE index value. The first vertical bar identifies the moment when China recognized the existence of the virus (31st December 2019) and the second vertical bar identifies the moment when the World Health Organization identified Covid-19 as a pandemic (11th March 2020)

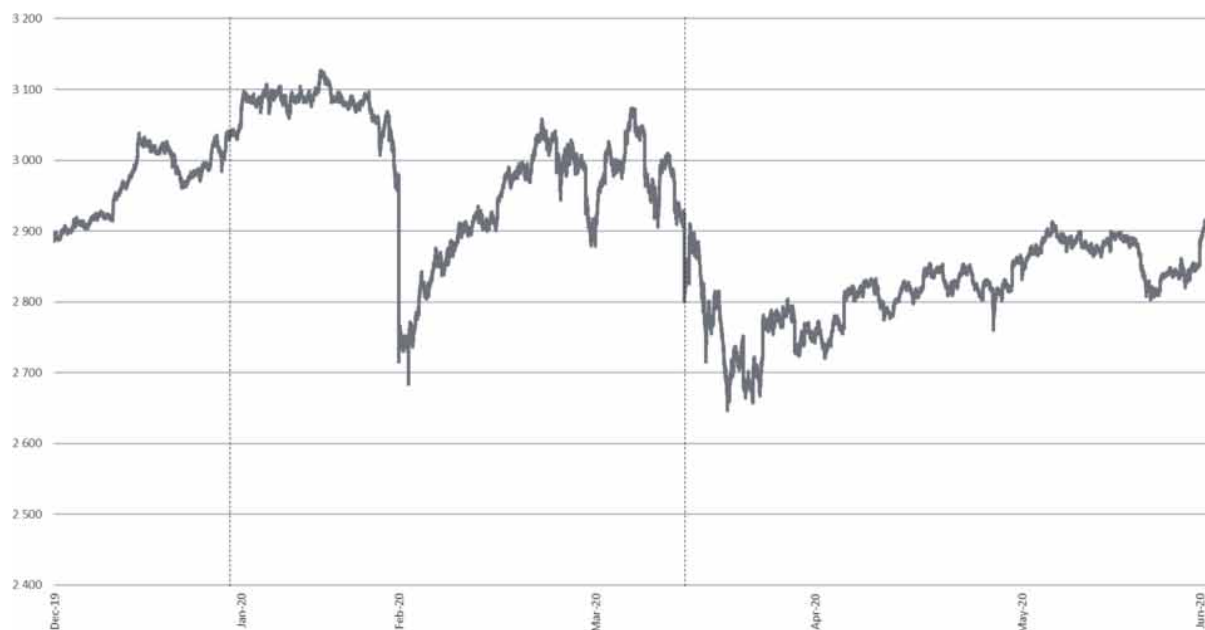


Table 1. Descriptive statistics of SSE stock returns during the sample under analysis

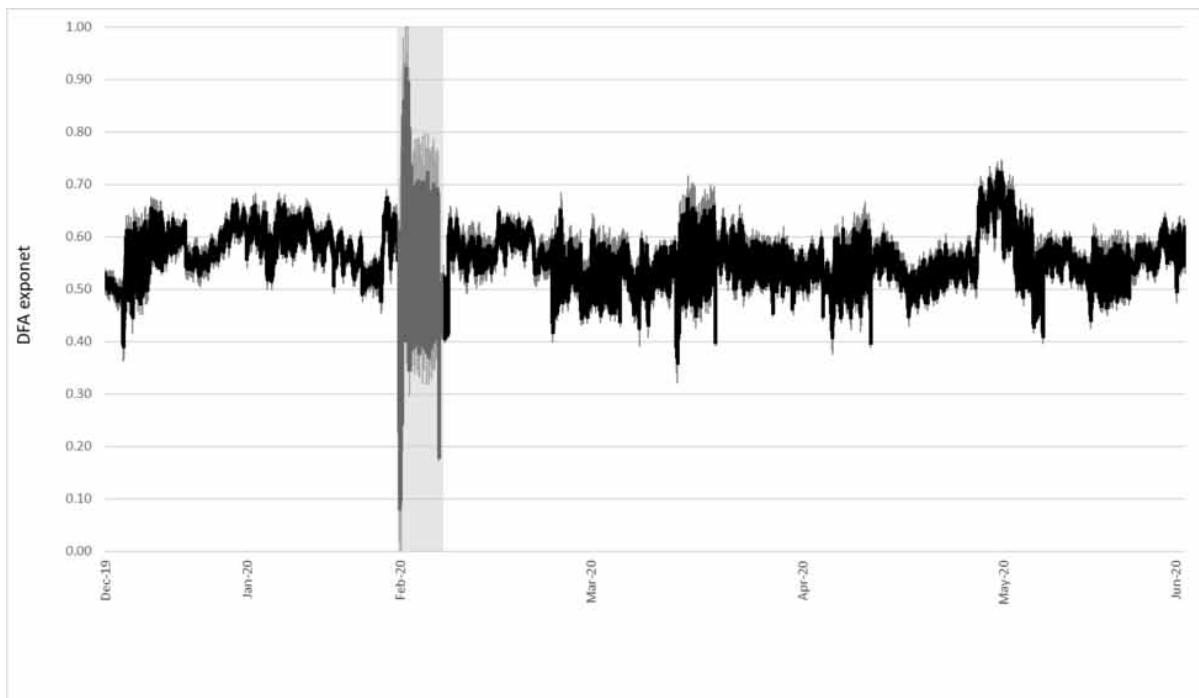
Descriptive statistic	Value
Mean	0.0000004
Std. Deviation	0.0009
Minimum	-0.0913
Maximum	0.0192
Skewness	-44.6704
Kurtosis	4 390.57

Our analysis continues with calculation of the DFA using the sliding windows approach. Figure 2 shows the evolution of the Hurst exponent in the SSE, based on sliding windows of 1000 observations. At the beginning of the sample, the time series behavior is consistent with randomness as proposed by

How Does COVID-19 Impact the Efficiency of the Chinese Stock Market?

the EMH. From 13th December, there is persistent behavior, although not far from the 0.5 level, meaning that the market is near the efficiency level. This scenario changed completely when the SSE re-opened after the holiday. The breakdown verified at the beginning of February had an effect on the long-term correlation of the Chinese stock market, causing some instability in the Hurst exponent, moving quickly from anti-persistent to persistent behavior. However, high levels of anti-persistence are noticeable, with some exponents near to zero, but also some high levels of persistence, with some exponents near to the unity. This is a very interesting result, since it means that some of the samples of $w = 1000$ under analysis are almost non-stationary, which is not expected behavior in return rates' time series. This is an evidence of the turbulence of the Chinese stock market, caused by the Covid-19.

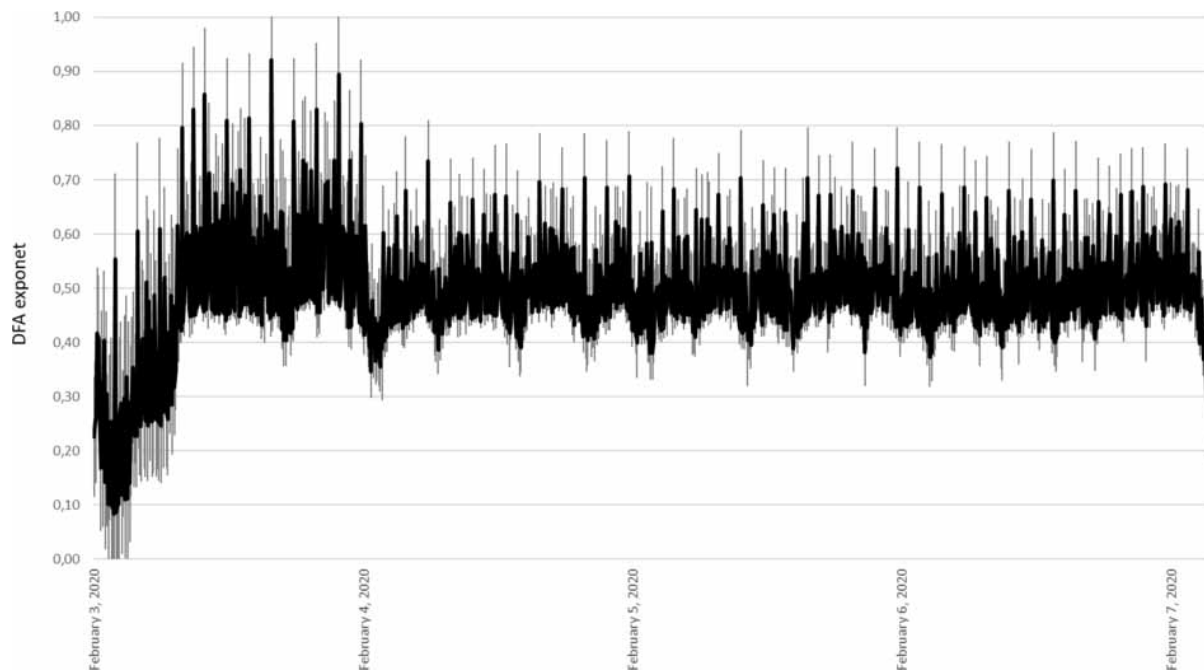
Figure 2. Evolution of the Hurst exponent of SSE, using a sliding window of $n = 1000$. In grey, the error bar of the DFA exponents. The shaded area corresponds to the period when the Hurst exponents are more unstable



We isolated the estimations of the Hurst exponents for the shaded area, with the results presented in Figure 3. Despite the instability of the Hurst exponents, it is noticeable that the market quickly recovered dependence levels consistent with randomness, as since the middle of the trading day of 3rd February the Hurst exponents are always around the 0.5 level, consistent with the efficiency. Combining Figures 2 and 3, we can see that during the remainder of the sample the Hurst exponent returns to a stable persistent behavior. The evidence is that during March and April, the SSE shows some sign of randomness in its time series. Even when the pandemic was declared by the WHO, the Hurst exponents did not have any more moments of high instability, as at the beginning of the Covid-19 crisis. In fact, at that moment, the

centre of the disease had already moved first to Europe and then to America, meaning that the Chinese stock market showed a more stable behavior in terms of dependence.

Figure 3. Evolution of the Hurst exponent of SSE, for the period between 3rd February 2020 and 7th February 2020. In grey, the error bar of the DFA exponents



For robustness purposes, we repeated the analysis considering windows of 500 and 2000 observations, with qualitatively similar results, which are presented in the Appendix (Figures 4, 5, 6 and 7).

DISCUSSION, SOLUTIONS AND RECOMMENDATIONS

Analysis of the Chinese stock market, using the DFA and the sliding windows approach, produced some interesting results, mainly the fact that the Chinese market responded quickly to the turmoil of the first impact of Covid-19, recovering the pattern of randomness. This is very relevant information for market agents, as it implies that on a one-minute basis it is difficult to make predictions about the evolution of markets. This randomness just did not happen after the turmoil caused by Covid-19.

Obviously a situation like the emergence of an epidemic is not predictable, meaning that it is difficult to take lessons from this problem for the future. However, studying the similarities with other situations could give interesting insights into stock markets' behavior in stressful moments and what to expect after recovery. Therefore, the main recommendation is the continuous monitoring of financial markets, which will be explored in the next section, at least so that markets can be prepared for new epidemics or similar events.

FUTURE RESEARCH DIRECTIONS

Continuous monitoring of financial markets remains important as highlighted by the results shown in this chapter. The way financial markets react to crashes, crises and other events is important, as mentioned in the previous section, for different agents, who need to be informed to take their decisions.

As the pandemic is not over, in the future it will be important to study financial markets' behavior after it ends or is at least totally controlled. Although the results seem to indicate that the market reacted quickly, it is important to understand markets' behavior in calm moments. Another possible research direction is to compare the financial markets' behavior caused by this crisis with other moments of turmoil, such as other diseases or crises.

Moreover, it will be important to analyse how markets are connected and how they commoved during the pandemic. This analysis could be made, for example, using the Detrended Cross-Correlation Analysis (DCCA) which complements the DFA, measuring the cross-correlation between variables. This methodology, proposed by Podobnik and Stanley (2008), is often used to study cross-correlations between time series in several research areas, including financial markets (see, for example, Filho, Silva & Zebende, 2014; Reboredo, Rivera-Castro & Zebende, 2014; Hussain, Zebende, Bashir & Donghong, 2017; or Ferreira, Loures, Nunes & Brito, 2018, among many others). Analysis between different financial assets could be used to identify, for example, the possibility of diversification or herding of different financial assets, not necessarily just in stock markets but also other financial assets. It could also be used to assess the possible existence of contagion. However, in this context intraday data should be used with caution, since it implies the use of simultaneous data for the different assets/markets under analysis, and in the case of using international stock markets it can reduce the number of observations.

Another possibility could be to investigate the influence of other variables linked with Covid-19 in the efficiency pattern, such as the number of new infections. However, in this case it is necessary to have larger samples, or alternatively, to use panel data methodologies.

Finally, regardless of the study of efficiency and detection of several kinds of dependence, which is a common result in financial markets, it is very important to study the dependencies themselves. As mentioned, the existence of dependence is a usual result but no author has proved the existence of abnormal and systematic profits. Factors like illiquidity, asymmetries of information, poor regulation or even the existence of transaction costs could imply the existence of dependencies even without inefficiency. So individual study of dependencies and their types is also important, in order to have a better framework about this issue.

CONCLUSION

In this chapter we analysed how Covid-19 affected the dependence of the Chinese stock market, as China was the first country affected by the new virus. With a minute-based sample, we applied a DFA with rolling windows to evaluate how SSE was affected.

Firstly, we conclude that the announcement of the situation in China had no relevant impact on the behavior of the SSE index or on the dependence pattern. This impact only occurred when the stock market reopened on 3rd February, after the Lunar New Year holiday. At that moment, after an SSE crash, the dependence pattern became unstable, first with some anti-persistent and then persistent behavior. However, still on 3rd February, and despite some instability, the dependence pattern returned to the 0.5

level. Even after the declaration of the pandemic by the WHO, the efficiency results remain stable, which could be related with the fact that the health situation was at least controlled in the country.

This is the most remarkable result of our chapter: despite the outbreak, the Chinese stock market quickly recovered a pattern consistent with the EMH, meaning that the market is working efficiently and without any apparent possibility of predictability. This is very important since it means that SSE works as expected, even when a crash occurs, this being very relevant information for all market agents. This is a very important information for the investors, once it means the stability of this particular stock market.

After the spread of the virus worldwide, the shock waves in many stock markets were severe, even in more developed ones. Future research on similar effects of Covid-19 on other stock markets is very relevant, to understand whether the effect is similar to the Chinese case. But one thing is sure: SSE showed that it is capable of efficiency, according to Fama (1970), even at times of turmoil. The results are in line with the FMH proposed by Peters (1994), with some evidence of a general reduction of the Hurst exponent above the 0.5 level in the first moments of the Covid-19 crisis but recovering stability over time.

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KEY TERMS AND DEFINITIONS

Anti-Persistence: Property of a time series meaning that it is more probable that in the following moment the time series will change behavior, when compared with the previous moment.

Dependence: Pattern of the financial market which could be related with the possibility of predicting its future behavior.

Detrended Fluctuation Analysis: Methodology used to analyse the behavior of time series, which in the case of financial time series could be used to analyse their efficiency.

Efficiency: Behavior of financial time series consistent with randomness

High-Frequent Data: Type of data which, associated with financial time series analysis, means that data is intraday.

Persistence: Property of a time series meaning that it is more probable that in the following moment the time series will follow the same behavior as in the previous moment.

Sliding Windows: Approach used in the context of the analysis of time series, which allows analysing the behavior of those series over time.

APPENDIX

Figure 4. Evolution of the Hurst exponent of SSE, using a sliding window of $n = 500$. In red, the error bar of the DFA exponents (coloured online). The shaded area corresponds to the period when the Hurst exponents are more unstable.

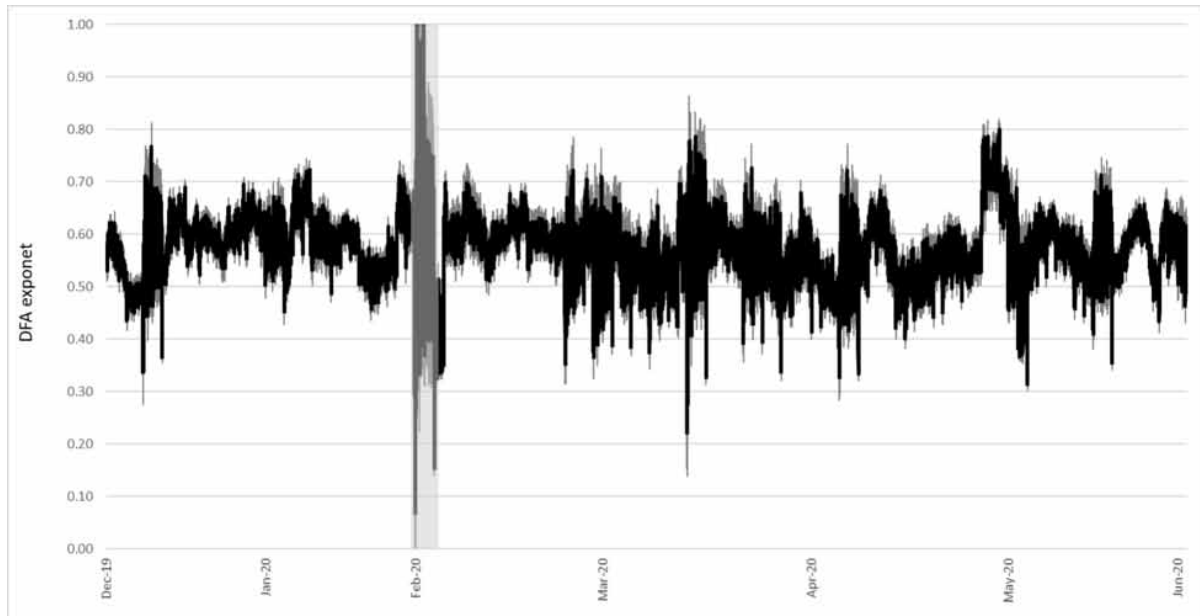
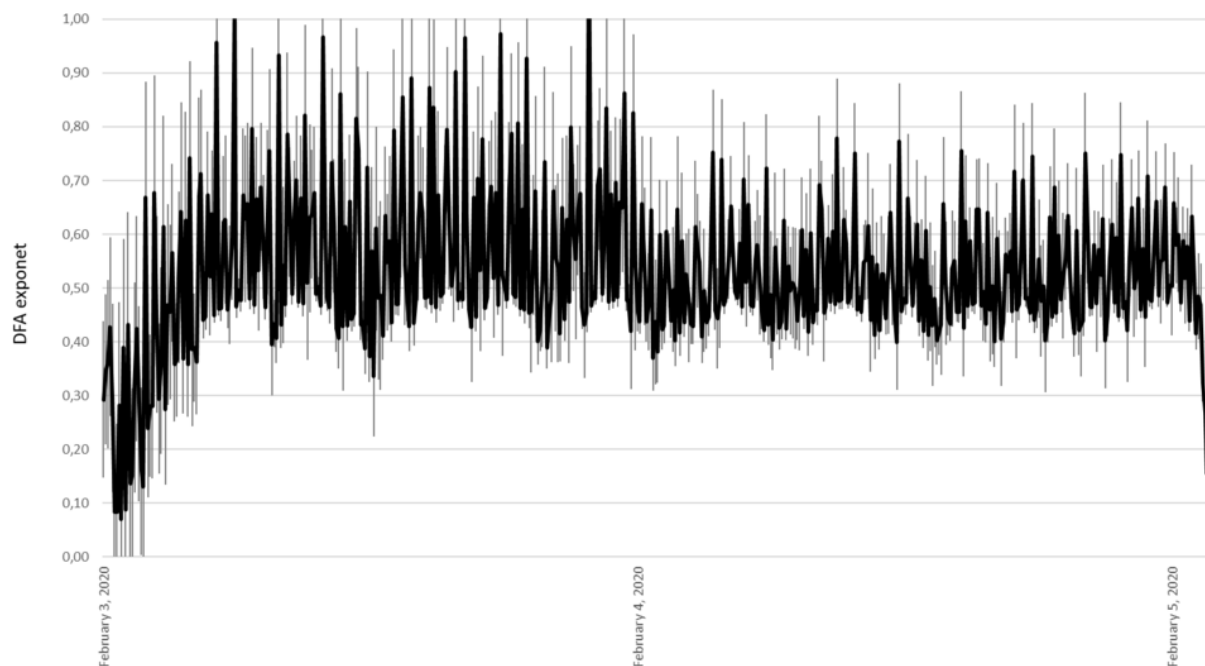


Figure 5. Evolution of the Hurst exponent of SSE, for period of unstable Hurst exponents, considering windows of $w = 500$. In grey, the error bar of the DFA exponents



How Does COVID-19 Impact the Efficiency of the Chinese Stock Market?

Figure 6. Evolution of the Hurst exponent of SSE, using a sliding window of $n = 2000$. In grey, the error bar of the DFA exponents. The shaded area corresponds to the period when the Hurst exponents are more unstable

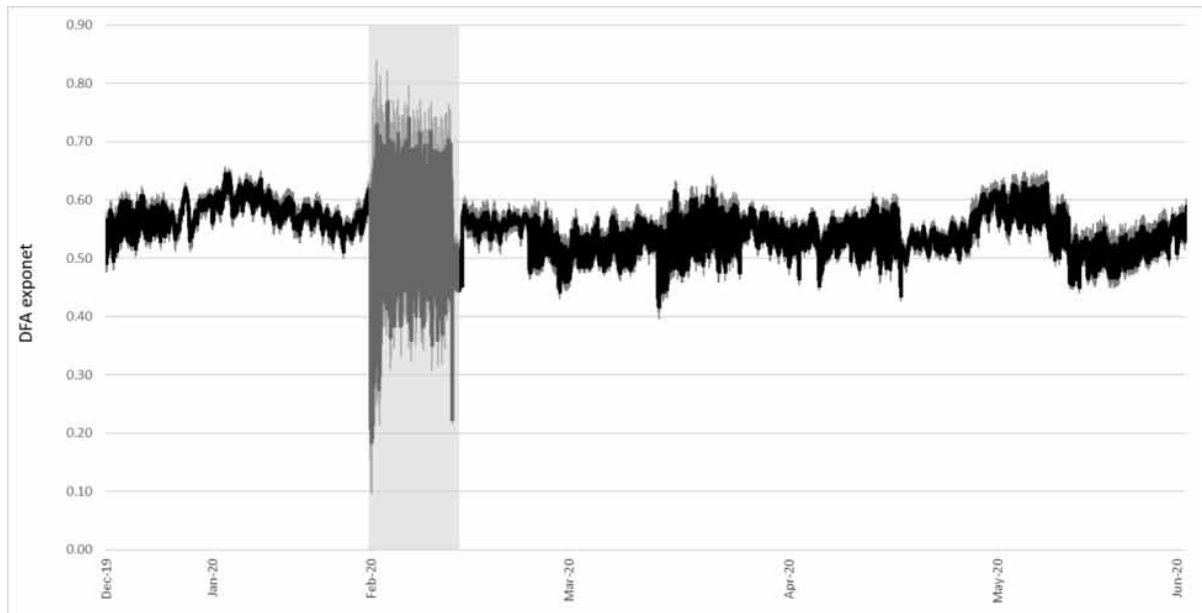
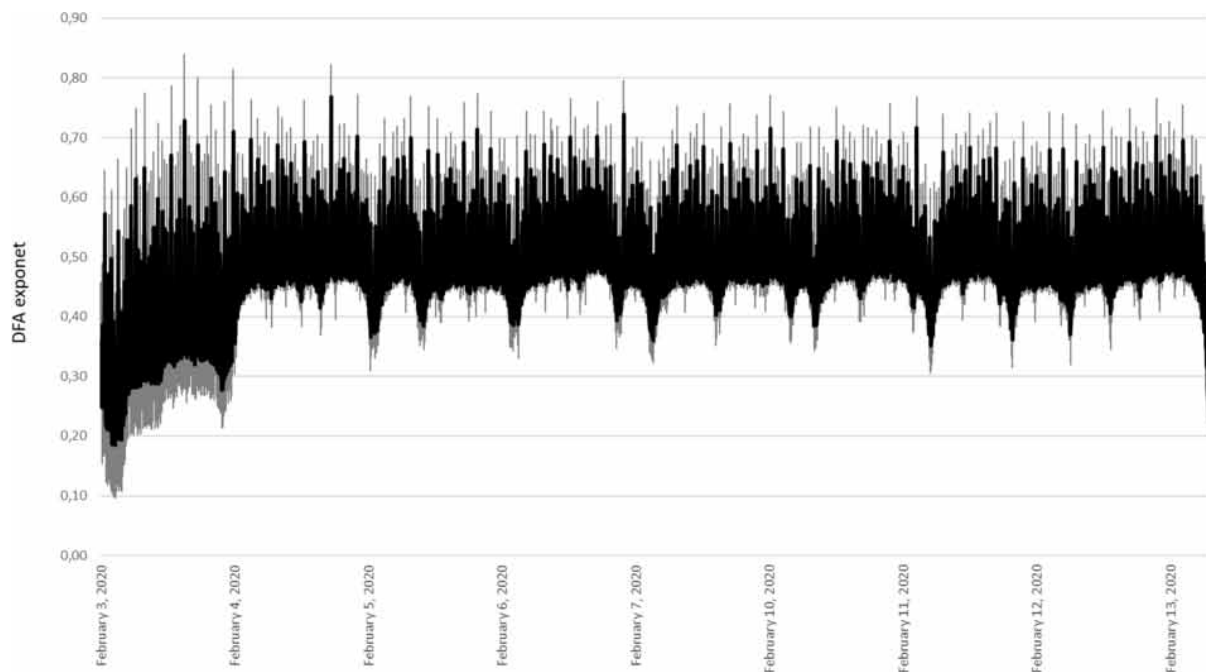


Figure 7. Evolution of the Hurst exponent of SSE, for period of unstable Hurst exponents, considering windows of $w = 2000$. In grey, the error bar of the DFA exponents



Chapter 26

The Relationship Between Gold and Stock Markets During the COVID–19 Pandemic: An Econophysical Approach

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ABSTRACT

This chapter aims to analyze portfolio diversification in the US, Europe, UK, Hong Kong, China, Japan, and the gold market (XAU) from January 2019 to July 2020. The results indicate that the markets have very significant causalities, which may call into question efficient portfolio diversification strategies. The DFA exponent coefficients suggest that the random walk hypothesis is rejected in certain markets, which has implications for investors, since some returns can be expected, creating opportunities for arbitrage and abnormal profits. These findings also open space for market regulators to take action to ensure better information among international financial markets. In conclusion, the authors believe investors should diversify their portfolios and invest in less risky markets in order to mitigate risk and improve portfolio efficiency.

INTRODUCTION

The Covid-19 pandemic affects negatively global trade, as well as social and cultural life, such as tourism, trade in goods, production and sectors such as transport. The rapid spread of coronavirus (Covid-19) has dramatic impacts on financial markets worldwide, causing significant losses to investors in a very short

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period. In line with all these negative effects, it seems inevitable that economic growth and financial markets have also been affected equally (Ashraf, 2020; Bakar and Rosbi, 2020; Ceylan, 2020; Khan, 2020; Kupferschmidt and Cohen, 2020).

The growing trend of integration and interdependence in international financial markets has increased the likelihood of risk transmission between markets. In periods of turmoil, investors must rebalance their portfolios by closing long positions in markets that present significant levels of risk. The growing uncertainty of the global economy is also transmitted to the global financial market, which makes investors tend to distribute their portfolios from high-risk markets to low risk markets (Dias, da Silva, and Dionísio, 2019; Mohammadpoor and Rezazadeh, 2019; Morales and Gassie, 2014).

The increasing uncertainty in the global economy is also transmitted to the global financial market, which makes investors tend to distribute their portfolios from high-risk markets to low risk markets. From the perspective of investors, and risk managers, gold is regularly seen as a hedge or a safe haven against stock markets, so understanding the relationship between gold and financial markets has relevant implications (Ma, Yang, Zou, and Liu, 2020; Yamaka and Maneejuk, 2020).

This chapter aims to analyze the diversification of portfolios in the financial markets of the USA (Dow Jones), Europe (Euro Stoxx 50), United Kingdom (FTSE 100), Hong Kong (Hang Seng), China (SSEC), Japan (Nikkei 225), and the Gold market (XAU), from January 2019 to July 2020. In order to carry out this analysis, different approaches will be undertaken in order to analyze two research questions, namely in knowing whether: (i) the gold market Will gold be a safe haven when financial markets crash? Could the rejection of the random walk hypothesis make the markets predictable? The results suggest significant causalities and show that the Gold market is not a safe haven when the analyzed markets break down, which calls into question the hypothesis of portfolio diversification. The results of the DFA coefficients show that some markets may be predictable, as the random walk hypothesis has been rejected.

This research adds two main contributions to the literature. The first refers to the study of risk diversification in certain international markets and the Gold market. Most of the previous studies focused on the average correlations or dependencies between gold and financial market movements, and between gold and currency depreciation. The second contribution is related to the combination of some of the most relevant financial markets in global terms and tests whether the gold market is a safe haven when these stock markets break due to high levels of risk, especially during the global pandemic (Covid-19). As far as is known, there are recent studies that have analyzed the diversification of risk, crossing the stock and gold markets, namely, the authors, Tursoy and Faisal (2018), Bildirici and Sonustun (2018), Siddiqui and Roy (2019), Singhal, Choudhary and Biswal (2019), Ma, Yang, Zou, and Liu (2020), Yamaka and Maneejuk (2020), however, the approach was quite different from that followed in this essay.

In terms of structure, this chapter is organized in 5 sections. Section 1 is represented by the current introduction. Section 2 presents a Literature Review regarding articles on integration in the financial markets. Section 3 describes the data and methodology. Section 4 contains the results. Finally, section 5 presents the general conclusions of the work.

LITERATURE REVIEW

The understanding of international connections between financial markets in periods of financial crisis is relevant for investors, fund managers and academics, in different aspects, namely in the theme of portfolio diversification (Kumar, 2017; Sheik and Banu, 2015)

Zagaglia and Marzo (2013), Balcilar, Hammoudeh, and Asaba (2015), Batten, Ciner, Kosedag, and Lucey (2017), Laily et al. (2017) studied the synchronization of the gold market with other financial markets. Zagaglia and Marzo (2013) document the ability of gold to generate stable movements with the dollar exchange rate, in the context of financial crises, argue that the increase in market uncertainty tends to produce reactions in gold prices that are more stable when compared to US dollar exchange rates. Balcilar, Hammoudeh, and Asaba (2015) prove that gold is the least volatile variable, ensuring its use as a “safe haven” asset, while silver and oil are the most volatile in the group. Understanding the price dynamics of these commodities should help investors decide how to invest during periods of high and low volatility. Batten, Ciner, Kosedag, and Lucey (2017) show that there is no causal relationship between the gold price and the stock prices used in the sample. Laily et al. (2017) showed a positive relationship between the prices of crude oil, and the price of gold, and a negative synchronization between the rate of inflation, GDP, interest rates, and exchange rates.

Tursoy and Faisal (2018), Bildirici and Sonustun (2018), Siddiqui and Roy (2019), Singhal, Choudhary and Biswal (2019) examined the importance of the gold market in a global context. Tursoy and Faisal (2018) reveal that both short and long-term results confirm a negative relationship between the price of gold, and stock prices, and a positive relationship between crude oil and stock prices. Bildirici and Sonustun (2018) reveal the importance of the volatility of gold and oil prices in economic growth, and the importance of oil prices in the countries’ turnover. Siddiqui and Roy (2019) show that Gold is a more effective hedging asset for Indian equity investors than Crude Oil. While Singhal, Choudhary and Biswal (2019) suggest that international gold prices positively affect Mexico’s stock price, while oil prices affect them negatively. Oil prices negatively influence the exchange rate in the long run and the price of gold has no significant impact on the exchange rate.

Ma, Yang, Zou, and Liu (2020), Yamaka and Maneejuk (2020) analyzed the synchronizations between the stock markets and the gold market. Ma, Yang, Zou, and Liu (2020) show that there are extreme risk negative spillovers between gold and stock markets, and between gold and US dollar exchange markets, which indicates that gold will be an effective safe haven against extreme movements in US dollar shares and exchange rates. Yamaka and Maneejuk (2020) already show the existence of significant causalities between the gold shocks and the volatilities of Asian stock markets. The authors evidence the existence of strong correlations between the stock markets of South Korea and India, and the gold market, during the global financial crisis when compared to the pre and post-crisis periods. In addition, there are signs of contagion effects between the gold market and the stock markets analyzed.

In summary, this work aims to contribute to the provision of information to investors and regulators in international stock markets, where individual and institutional investors seek benefits from diversification, as well as helping to promote the implementation of policies that contribute to the efficiency of markets. Therefore, the context of this work is to examine the causalities and the predictability between these stock markets and Gold, in order to understand whether Gold will be a safe haven during the global pandemic (Covid-19).

METHODOLOGY AND DATA

Data

The analyzed data are related to the stock market indexes of the USA (Dow Jones), Europe (EuroStoxx 50), United Kingdom (FTSE 100), Hong Kong (Hang Seng), China (SSEC), Japan (Nikkei 225), and the Gold (XAU), from 02 January 2019 to 20 July 2020. Prices are daily, and were obtained from the Thomson Reuters platform, the same being in local currency, to mitigate exchange rate distortions.

Table 1. Markets and indices applied in this research

Markets	Index
EUA	Dow Jones
Europa	Euro Stoxx 50
Reino Unido	FTSE 100
Hong Kong	Hang Seng
China	SSEC
Japão	Nikkei 225
Gold	XAU

Source: Own elaboration.

Methodology

The development of the research took place over several stages. The characterization of the sample used was made through descriptive statistics, the Jarque and Bera (1980) adherence test, as well as the quantile plots, and the residue stability test (CUSUMQ) by Inclán and Tiao (1994). To estimate the synchronizations between the stock markets and the Gold market (XAU), we will use the VAR model (Granger Causality or Block Exogeneity Wald Test), which uses Wald's statistics, to test the null hypothesis that the coefficients of lagged endogenous variables from the "cause" variable are null or not "cause" in the Grangerian sense the dependent variable. However, it should be noted that the result of this test is highly sensitive to the number of lags considered in the model, so the first concern is to properly estimate this value, in order to arrive at robust evidence (Gujarati, 2004).

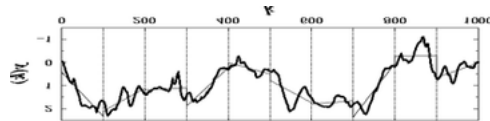
To assess if the financial markets analysed are persistent, that is, whether they are predictable, we will use the Detrended Fluctuation Analysis (DFA) methodology. DFA is an analysis method that examines time dependency on non-stationary data series. This technique, assuming that the time series are non-stationary, avoids spurious results when the analysis focuses on the relationships of the data series in the long run. The DFA exponent has the following interpretation: $0 < \alpha < 0.5$: anti-persistent series; $\alpha = 0.5$ series has a random walk; $0.5 < \alpha < 1$ persistent series.

The main advantage of applying DFA is the ability to remove trends from the series, which skew the true correlation of the fluctuations of the random variables involved, and thus allow to see long-range correlations in signals with polynomial trends, which can mask the true correlations. Briefly, the DFA Method involves the following steps:

- 1 - Consider a sign $u(i)$, where i goes from 1 to the total number of points N in the series. Then we integrate the signal and obtain a new series $y(k)$.
- 2 - The integrated signal is divided into boxes of equal length n .
- 3 - For each size box n , we adjust a degree polynomial l , which we designate by $y_n(k)$, and this value represents the trend in each box.
- 4 - The signal $y(k)$ is subtracted from in $y_n(k)$ each box.

Figure 1. Local Detrending in the DFA Algorithm

Fonte: <http://reylab.bidmc.harvard.edu/tutorial/DFA/node5.html>



- 5 - So for each size box n we calculate its average square root, that is,

$$F(n) = \sqrt{\frac{1}{N} \sum_{k=1}^N [y(k) - y_n(k)]^2}$$

- 6 - The above calculation is repeated for several box sizes (n^s). Therefore, if we have a power law type relation for $F(n)$, then this function is proportional to $F(n) \propto n^\alpha$

α this case it represents the long-range correlation exponent, that is, the high-affinity of the signal, it has the following interpretation:

Box 1.

$\alpha=0.5$	Random Signal
$\alpha>0.5$	Persistent Signal
$\alpha<0.5$	Anti-Persistent Signal

Source: Own elaboration

For a better analysis on the Detrended Fluctuation Analysis (DFA) methodology see the papers by Dias, da Silva, and Dionísio (2019), Dias, Heliodoro, Alexandre, and Vasco (2020), Dias et al. (2020), Dias, Heliodoro, and Alexandre (2020), Dias, Heliodoro, Alexandre, Santos, and Farinha (2021).

RESULTS

Figure 2 shows the evolution, in levels, of the 7 financial markets under analysis, for the period from January 2019 to July 2020. The market price indices show extreme volatility in the markets due to the global pandemic of 2020.

Figure 2. Evolution, in levels, of the 7 financial markets for the period from January 2019 to July 2020.
Source: Own elaboration

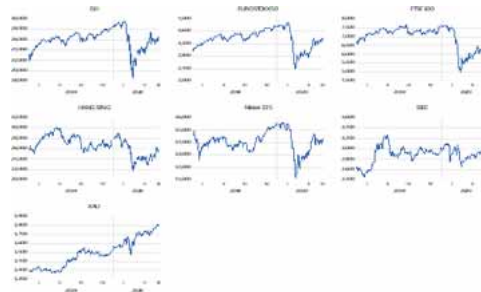


Table 2 shows the main descriptive statistics of the financial markets under analysis and allows us to assess that the profitability of the stock market indexes in the United Kingdom (FTSE 100), Hong Kong (HANG SENG), Japan (NIKKEI 225) has negative daily averages. The US (DJI), Europe (EURO Stoxx 50), China (SSEC) and Gold (XAU) markets have positive averages. On the other hand, all series showed signs of deviation from the hypothesis of normality, given the coefficients of asymmetry and kurtosis. The asymmetry characteristics are negative, with a greater emphasis on the European market. Additionally, the asymmetry and kurtosis coefficients are statistically different from those of a normal distribution, these indications are corroborated with the Jarque and Bera test (1980) where the hypothesis that the data follow a normal distribution is rejected at the level of significance of 1%.

Table 2. Descriptive statistics, rate of return, of the financial markets studied, for the period from January 2019 to July 2020.

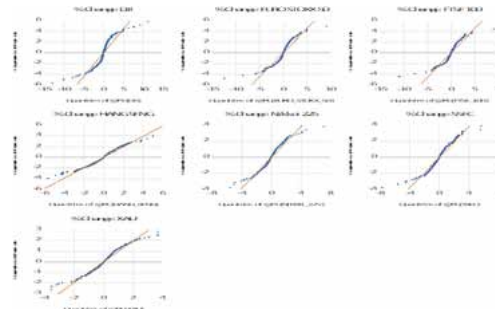
	DJI	EURO STOXX 50	FTSE 100	HANG SENG	NIKKEI 225	SSEC	XAU
Mean	0.000338	0.000304	-0.000173	-0.000108	-7.16E-05	0.000564	0.000861
Skewness	-0.950150	-1.740546	-1.440756	-0.400752	-0.043824	-0.683887	-0.200313
Kurtosis	17.22219	19.09187	17.44567	5.627991	7.743182	9.575371	6.001143
Jarque-Bera	3405.628***	4483.889***	3589.221***	124.8688***	372.2778***	746.1335***	151.6434***
Observations	397	397	397	397	397	397	397

Source: Own elaboration

***, **, *, represent significance at 1%. 5% and 10%. respectively.

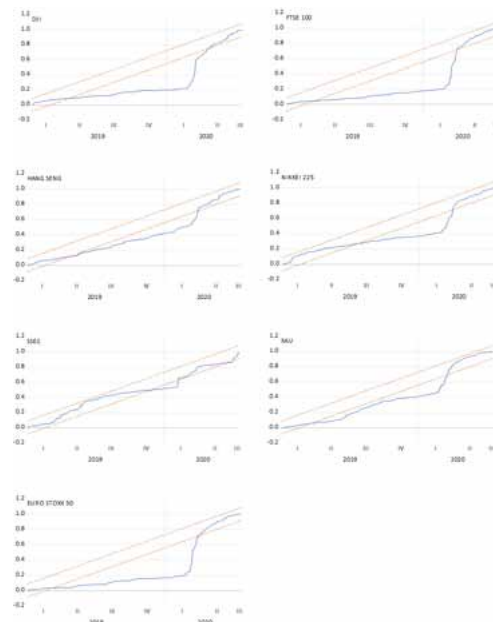
The Relationship Between Gold and Stock Markets During the COVID-19 Pandemic

Figure 3. Graphs of, rate of return, quantiles, of the financial markets studied, for the period from January 2019 to July 2020. Source: Own elaboration



The quantile graphs show that the profitability rate distribution is leptocurtic and asymmetric or skewed. The distribution is leptocurtic because the graph has an “S” shape on the 45° line and is asymmetric because the “S” is not symmetrical on the line, showing the existence of non-linear relationships (see figure 3).

Figure 4. CUSUMQ test, rate of return, of the 7 financial markets, for the period from January 2019 to July 2020. Source: Own elaboration



In order to analyse the possible breakdowns in the structure of the financial markets, we will perform the CUSUMQ test by Inclán and Tiao (1994). The determination of the structural break is relevant, as it has an effect potentially similar to that of the unit roots. Through the graphical analysis we can verify

the existence of disturbances in the variance. Thus, when examining the cumulative sum graphs (CUSUMQ) of the 95% probability limits, we find the violation of the probability limits, thus, the series have an unstable behavior (see figure 4).

Table 3. Unit root tests, with structural breaks, for the period from January 2019 to July 2020.

Index	t-stat	Break Date
DJI	-27.44(0)***	07/01/2019
EURO STOXX 50	-20.68(0)***	24/03/2020
FTSE 100	-20.38(0)***	21/01/2019
HANG SENG	-21.30(0)***	26/05/2020
NIKKEI 225	-19.68(0)***	27/03/2020
SSEC	-20.85(0)***	07/02/2020
XAU	-19.11(0)***	20/03/2020

Source: Own elaboration.

Note: Lag Length (Automatic Length based on SIC). Break Selection: Minimize Dickey-Fuller t-statistic. The lateral values in parentheses refer to lags. ***, **, *, represent significance at 1%, 5% and 10%, respectively.

Table 3 presents the results of the unit root tests with structure breaks, by Clemente et al. (1998). The US (DJI) and United Kingdom (FTSE 100) markets show structure breaks in January 2019, while the China market (SSEC) shows a structure break in February 2020. Meanwhile, the European stock index (EURO STOXX 50), Japan (NIKKEI 225), and Gold (XAU) broke down in March 2020, and the Hong Kong market (HANG-SENG) broke down in May 2020. The model by Clemente et al. (1998) identifies the most accentuated break in structure, which means that there may be smaller breakages in structure from January 2019 to July 2020. The results are in line with the findings of authors Dias, Heliodoro, Alexandre, and Vasco, (2020), Dias, Heliodoro, and Alexandre (2020), Dias, Heliodoro, Teixeira, and Godinho (2020), Dias, Teixeira, Machova, et al. (2020), Pardal, Dias, Šuleř, Teixeira, and Krulický (2020) that evidence breaks in financial markets during the 2020 global pandemic.

Table 4. VAR Lag Order Selection Criteria, for the period from January 2019 to July 2020.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	7965.431	NA	4.00e-27	-40.91738	-40.84606	-40.88910
1	8055.717	176.8603	3.24e-27	-41.12965	-40.55906	-40.90344
2	8332.830	532.8549	1.00e-27	-42.30247	-41.23261*	-41.87833*
3	8386.781	101.7983	9.78e-28	-42.32792	-40.75879	-41.70585
4	8440.144	98.77067	9.57e-28	-42.35036	-40.28196	-41.53035
5	8495.593	100.6350	9.28e-28	-42.38351	-39.81585	-41.36558
6	8548.135	93.46762	9.13e-28	-42.40172	-39.33479	-41.18585
7	8607.310	103.1382*	8.70e-28*	-42.45404*	-38.88784	-41.04023
8	8638.759	53.68035	9.57e-28	-42.36380	-38.29833	-40.75206

Source: Own elaboration.

The Relationship Between Gold and Stock Markets During the COVID-19 Pandemic

To analyze the significance of the causal relationships between the financial markets under analysis, the VAR Granger Causality / Block Exogeneity Wald Tests model was applied. To determine the number of lags to include in the causality tests, we used the criteria LR (Sequential modified LR test statistic - each test at 5% level), FPE (Final prediction error), and AIC (Akaike information criterion) that suggest 7 lags. A smaller number of lags increases the degrees of freedom, a larger number of lags decreases the problems of autocorrelation (see Table 4).

Table 5 present the results of the VAR Residual Serial Correlation LM Tests, we estimate a VAR with 7 lags, and then we perform the autocorrelation test at 8 lags, the null hypothesis was not rejected, which corroborates that the model presents an estimation robust.

Table 5. VAR Residual Serial Correlation LM Tests, for the period from January 2019 to July 2020.

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	85.89252	49	0.0009	1.774271	(49, 1583.3)	0.0009
2	80.85345	49	0.0028	1.667541	(49, 1583.3)	0.0028
3	99.96282	49	0.0000	2.074068	(49, 1583.3)	0.0000
4	75.50607	49	0.0089	1.554645	(49, 1583.3)	0.0089
5	115.4520	49	0.0000	2.407147	(49, 1583.3)	0.0000
6	35.04400	49	0.9335	0.712465	(49, 1583.3)	0.9335
7	88.24550	49	0.0005	1.824224	(49, 1583.3)	0.0005
8	56.87789	49	0.2052	1.164282	(49, 1583.3)	0.2053

Source: Own elaboration.

Table 6. Causality and Granger tests/ Block Exogeneity Wald Tests, for the period from January 2019 to July 2020.

	Dow Jones	Euro Stoxx 50	FTSE 100	Hang Seng	SSEC	Nikkei 225	XAU
Dow Jones	*****	38.36(7)***	12.27(7)***	1.46(7)	1.69(7)	5.52(7)***	4.60(7)***
Euro Stoxx 50	4.87(7)***	*****	2.45(7)**	1.89(7)*	0.74(7)	1.26(7)	4.62(7)***
FTSE 100	4.79(7)***	59.99(7)***	*****	1.34(7)	1.65(7)	1.94(7)*	5.11(7)***
Hang Seng	13.12(7)***	12.71(7)***	15.68(7)***	*****	0.92(7)	4.33(7)***	2.26(7)**
SSEC	3.82(7)***	2.07(7)**	3.38(7)***	3.45(7)***	*****	2.92(7)***	1.00(7)
Nikkei 225	4.21(7)***	9.40(7)***	7.50(7)**	2.48(7)**	0.58(7)	*****	4.66(7)***
XAU	2.81(7)***	2.53(7)***	2.66(7)**	1.84(7)*	0.29(7)	3.01(7)***	*****

Source: Own elaboration.

Note: Column markets "cause" online markets. The lateral values in parentheses refer to lags. ***, **, *, represent significance at 1%, 5% and 10%, respectively.

The results of Granger's causality tests are presented in table 6, referring to the financial markets under analysis. The causality tests show 33 causal relationships (out of 42 possible). The US (DJI), Europe (Euro Stoxx 50), and United Kingdom (FTSE 100) markets cause all the markets under analysis (6 out of 6 possible). the USA is not caused by Hong Kong and China, while Europe is not caused by China

and Japan, the United Kingdom is not caused by China, the markets in Hong Kong (Hang Seng), Japan (Nikkei 225) and the Gold caused, in the Grangerian sense, 5 pairs of markets: China is the market that causes less, that is, it does not influence any of the markets under analysis. Gold (XAU) causes all markets, except China, and is caused by their peers, but not with China. These results show that the Gold market is not a safe market when compared to the markets under analysis, that is, it is not a safe harbor, except for the China market. in line with the evidence presented by the authors Yarovaya and Lau (2016), Diaz, Molero, and Perez de Gracia (2016), Ferreira, Dionísio and Movahed (2017) that show significant movements in several financial markets, which calls into question the diversification of portfolios.

In table 7, we can see the results of the DFA exponents, and we can verify that the index of Europe (Euro Stoxx 50), United Kingdom (FTSE 100), and Japan (Nikkei 225) indicate long memories. In addition, the US, Hong Kong and China markets show signs of efficiency (0.52), while the Gold market shows anti-persistence, that is, short-term memories corroborating previous tests that show that it is not an alternative market for portfolio diversification when compared to the stock markets under analysis. These findings show that prices do not fully reflect the information available and that changes in prices are not iid. This situation has implications for investors, since some returns can be expected, creating opportunities for arbitrage and abnormal earnings, contrary to assumed by the hypotheses of random walk and informational efficiency. These results are in line with the evidence suggested by the authors Aggarwal (2018), Rehman, Chhapra, Kashif, and Rehan (2018) that show (in) efficiency, in its weak form, and the possibility of investors having abnormal gains without incurring in increased risk.

Table 7. DFA exponent for index and return. The values of the linear adjustments for α DFA always had $R^2 > 0.99$.

Stock market	DFA exponent (Covid-19 period)
Euro Stoxx 50	$0.61 \pm 0.0012^{***}$
DJI	$0.52 \pm 0.0011^{***}$
FTSE 100	$0.56 \pm 0.0059^{***}$
Hang Seng	$0.52 \pm 0.0002^{***}$
Nikkei 225	$0.56 \pm 0.0010^{***}$
SSEC	$0.52 \pm 0.0002^{***}$
XAU	$0.46 \pm 0.0014^{***}$

Source: Own elaboration.

Note: The hypotheses are $H_0: \alpha = 0.5$ and $H_1: \alpha \neq 0.5$. ***, **, *, represent significance at 1%, 5% and 10%, respectively.

CONCLUDING REMARKS

This chapter test portfolio diversification in the US (Dow Jones), Europe (Euro Stoxx 50), United Kingdom (FTSE 100), Hong Kong (Hang Seng), China (SSEC), Japan (Nikkei 225), and the Gold market (XAU), from January 2019 to July 2020. In order to carry out this analysis, different approaches were taken in order to analyze two research questions, namely in knowing whether: (i) the gold market will be a safe haven when financial markets crash? Could the rejection of the random walk hypothesis make the markets predictable?

We conducted two groups of tests to answer the research questions. The first estimates whether the financial markets under analysis are caused with the purpose of measuring the intensity of movements between markets, through the VAR-Causality test of Granger / Block Exogeneity Wald Tests. In the second test we used the Detrended Fluctuation Analysis (DFA) methodology, to check if the financial markets under analysis are persistent, that is, if they are predictable.

The results of the first test show 33 causal relationships (out of 42 possible). The markets in the USA (DJI), Europe (Euro Stoxx 50), and the United Kingdom (FTSE 100) cause all markets under analysis (6 out of 6 possible). However, the USA is not caused by Hong Kong and China, while Europe is not caused by China and Japan, whereas the United Kingdom is not caused by China. The Hong Kong (Hang Seng), Japan (Nikkei 225) and Gold markets caused, in the Grangerian sense, 5 pairs of markets. China is the market that causes less, that is, it does not influence any of the markets under analysis. Gold (XAU) causes all markets, except China, and is caused by its peers, but not with China. These results show that the Gold market is not a safe market when compared to the markets under analysis, that is, it is not a safe port, with the exception of the China market.

The results of the DFA exponents, show that the index of Europe (Euro Stoxx 50), United Kingdom (FTSE 100), and Japan (Nikkei 225) indicate long memories. In addition, the US, Hong Kong and China markets show signs of efficiency (0.52), while the Gold market shows anti-persistence, that is, short-term memories corroborating previous tests that show that it is not an alternative market for portfolio diversification when compared to the stock markets under analysis. This situation has implications for investors, since some returns can be expected, creating opportunities for arbitrage and abnormal earnings.

The general conclusion to be retained and supported by the results obtained, through tests carried out with econometric and mathematical models, demonstrate that the global pandemic has a significant impact on the memory properties of the analyzed markets. The results indicate that the markets have very significant causalities, which may jeopardize efficient portfolio diversification strategies. The DFA coefficients suggest that the random walk hypothesis is rejected in certain markets, namely in the Gold market, which shows that it is not an alternative market for portfolio diversification. These conclusions also open space for market regulators to take steps to ensure better informational information among international financial markets. In conclusion, we believe that investors should diversify their portfolios and invest in less risky markets, to mitigate risk and improve the efficiency of their portfolios.

In this chapter we estimate the impact of the global pandemic on the memory properties of financial markets, namely the stock markets and Gold. One suggestion for future research would be to analyze the level of integration and contagion with various financial markets, with intraday (5 minutes) data with sliding windows. Another suggestion is to expand the sample to include pre-Covid, during Covid and post-Covid, to validate the real impact of the pandemic on equity markets, commodities, debt markets, foreign exchange markets, and other financial markets.

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Chapter 27

Distributional Uncertainty for Spectral Risk Measures

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ABSTRACT

Spectral risk measures, primarily introduced as an extension for expected shortfall, constitute a prominent class of risk measures that take account of the decision-makers risk-aversion. In practice, risk measures are often estimated from data distributions, and due to the uncertain character of the financial market, one has no specific criterium to pick the appropriate distribution. Therefore, risk assessment under different possible scenarios (such as financial crises or outbreaks) is a source of uncertainty that may lead to concerning financial losses. The chapter addresses this issue, first, by adapting a robust framework for spectral risk measures, by considering the whole set of possible scenarios instead of making a specific choice. Second, the author proposes a variability-type approach as an alternative for quantifying uncertainty, since measuring uncertainty provides us with information about how far our risk measurement process could be impacted by uncertainty. Furthermore, the stated theory is illustrated with a practical example from the NASDAQ index.

INTRODUCTION

In risk management, risk measures are used to calculate required capital that acts as a hedging against the inherent risks. Over the last few decades, numerous risk measures have been introduced. Typical examples, in the financial literature, are Value-at-Risk, Expected Shortfall and the much broader classes of coherent and convex risk measures introduced, respectively, in Artzner et al. (1999) and Föllmer and Schied (2002) for which the theoretical definition is founded upon a set of reasonable properties that a measure of risk may satisfy. (For more details, the reader is referred to Pflug and Römisch, 2007, Delbaen, 2012, McNeil et al., 2005, and Föllmer and Schied, 2016).

Among coherent risk measures the law-invariant and co-monotonic additive ones co-incide with spectral risk measures (Kusuoka, 2001). They were introduced by Acerbi (2002) and are arguably con-

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sidered as the most important extensions of Expected Shortfall. Moreover, since decision-makers typically differ on how they perceive the notion of risk, spectral risk measures are designed to incorporate such discrepancy. Hence, beyond fulfilling most of the suitable theoretical properties of a reasonable risk measure, a spectral risk measure is characterized with a weighting function φ that account for the psychological attitude of different profiles, by reflecting the subjective risk-aversion. This full range of attractive features makes the class of spectral risk measures of practical interest and justifies the framework of the present chapter.

In particular, law-invariance is an important feature in practice since it is a necessary property for a risk measure to be estimable from empirical data. In this way, it is totally legitimate to argue that the most suitable risk measures, in practice, are the law-invariant (distribution-based) ones (see e.g., Henryk and Silvia, 2006, Adam et al., 2008, Emmer et al., 2015, and Wang et al., 2018). That is to say, for risk measurement practitioners use risk measures based on a given probability measure according to different alternative scenarios. The author considers that each probability measure reflects the underlying economic situations (such as: normal situation, volatile situation, crash, outbreak, financial crisis). However, improper distribution assumptions can lead to wrong decisions and then to significant financial losses, some examples of real incidences are reported in Dowd (2007, Chap 16), Bloom (2014), Wang et al. (2017) and Jokhadze and Schmidt (2018). Therefore, the choice of probability measures constitutes a source of uncertainty in the risk management process. This situation naturally requires considering robust risk measures, meaning risk measures that are insensitive to the choice of probability measures.

This uncertainty regarding the choice of the proper probability measure (then the proper risk measure) has motivated the investigation of two issues:

- How to overcome uncertainty?
- How to measure uncertainty?

The present chapter contributes to the existent literature recently addressing this issue. In this context, Wang and Ziegel (2018) propose a robust framework based on the worst- case, especially for Value-at-risk (VaR) and Expected Shortfall (ES), as a theoretical foundation for the recent Basel regulations. Jokhadze and Schmidt (2018) and Righi (2018b) explore, additionally to the worst-case approach, results for the weighting average as a construction for robust risk measures and study some issues such as financial properties and dual representations. Works such those of Pflug et al. (2012) and Guo and Xu (2019) focus on the portfolio optimization issue under uncertainty regarding probability. From another perspective and instead of proposing robust risk measures, works such Shapiro (2017) consider robust stochastic optimization under a set of uncertainty, referring to a set of probability measures. The author intends to address the above formulated questions by adapting a consistent framework to the class of spectral risk measures. Moreover, the author intends to propose an alternative approach for measuring uncertainty itself. Since quantifying uncertainty provides us with information about to what extent our risk measurement process could be impacted by uncertainty and it may even be seen as a penalization to add to the required capital for covering the held financial position. To measure uncertainty, Jokhadze and Schmidt (2018) proposed a superposed measure that evaluates the dispersion, of a collection of risk measure, relatively to some reference risk measure ρ_0 . At this point, the approach suggested by the authors is interesting except that it stays dependent on the choice of a risk measure of reference. In this sense, the author is proposing a variability-type approach, especially since the monetary risk mea-

asures used in Jokhadze and Schmidt (2018), such as VaR and ES, do not capture the variability concept (Rockafellar et al., 2006).

The contribution brought in this chapter consists in investigating financial uncertainty under the light of spectral risk measures, which constitute a very attractive notion in the risk management literature. Thus, the author proposes a general approach for overcoming and assessing financial uncertainty using spectral risk and deviation measures. This approach allows taking advantage of the desired properties of both spectral risk and deviation measures.

The rest of the chapter is structured as follows: next section is a preliminary regarding risk and variability measures and examples. In section 3, the researcher studies two approaches of a robust framework for spectral risk measures. To measure uncertainty an alternative approach is suggested in the next section. Section 5 illustrates our contribution with a case study.

BACKGROUND

Consider a measurable space $(\Omega, \mathcal{F})$ and $\mathcal{Q}$ the set of all probability measures on $(\Omega, \mathcal{F})$. For a given probability $P \in \mathcal{Q}$, $L^\infty := L^\infty(\Omega, \mathcal{F}, P)$ is the space of equivalent classes of essentially bounded random variables. We denote X the random future outcome of a financial position. Constant random variables are identified with real numbers. We use $E[X] = \int_\Omega X dP$, $F_{X,P(x)} = P(X \leq x)$ and $F_{X,P(x)}^{-1} = \inf\{x: F_{X,P(x)} \geq \alpha\}$ to represent, respectively, the expected value, the probability function (c.d.f.) and its generalized inverse for X under $P \in \mathcal{Q}$. We say that a pair of random variables $X, Y \in L^\infty$ is co-monotone if $(X(w) - X(w'))(Y(w) - Y(w')) \geq 0$ for all $(w, w') \in \Omega \times \Omega$.

Definition 2.1 (Risk measure). A risk measure is a functional $\rho: L^\infty \rightarrow \mathbb{R}$, which may satisfy the following properties:

- *Law Invariance*: If $X \in L^\infty$ and $Y \in L^\infty$ have the same distribution under P , succinctly $X \stackrel{d}{=} Y$, then $\rho(X) = \rho(Y)$.
- *Monotonicity*: $\rho(X) \leq \rho(Y)$ when $X, Y \in L^\infty$ are such that $X \geq Y$.
- *Translation Invariance*: $\rho(X + C) = \rho(X) - C$ for all $C \in \mathbb{R}$ and $X \in L^\infty$.
- *Sub-Additivity*: $\rho(X + Y) \leq \rho(X) + \rho(Y)$ for every pair $X, Y \in L^\infty$.
- *Positive Homogeneity*: $\rho(\lambda X) = \lambda \rho(X)$ for all $\lambda \geq 0$ and $X \in L^\infty$.
- *Convexity*: $\rho(\lambda X + (1 - \lambda) Y) \leq \lambda \rho(X) + (1 - \lambda) \rho(Y)$ for all $X, Y \in L^\infty$ and $\lambda \in [0, 1]$.
- *Co-monotonic Additivity*: $\rho(X + Y) = \rho(X) + \rho(Y)$ for every co-monotonic pair $X, Y \in L^\infty$.
- *Fatou Continuity*: if $\lim_{n \rightarrow \infty} X_n = X$ and $\{X_n\}_{n=1}^\infty, X \in L^\infty$, then $\rho(X) \leq \liminf_{n \rightarrow \infty} \rho(X_n)$.

We say that a risk measure is distribution-based or law-invariant if it fulfills Law Invariance, monetary if it satisfies Monotonicity and Translation Invariance, convex if it is monetary and possesses Convexity, coherent if it is convex and respects Positive Homogeneity, co-monotone if it attends Co-monotonic Additivity and Fatou Continuous if it fulfills Fatou Continuity.

Example 2.2. We provide some examples of distribution-based risk measures:

Distributional Uncertainty for Spectral Risk Measures

- *Worst-case (WC)*: This is an extreme robust risk measure, since it does not depend on the probability P, defined as:

$$WC(X) = -\inf X, \forall X \in L^\infty \quad (2.1)$$

- *Expected Loss (EL)*: This is a parsimonious law-invariant co-monotone and coherent risk measure defined as:

$$EL(X) = -E[X] = -\int_{[0,1]} F_{X,P}^{-1}(u) du, \forall X \in L^\infty. \quad (2.2)$$

- *Value-at-Risk (VaR)*: This is a leading law-invariant monetary risk measure in both financial theory and practice, defined conform:

$$VaR_\Delta^P(X) = -\inf\{x: F_{X,P}(x) \geq \alpha\}, \alpha \in [0, 1], \forall X \in L^\infty \quad (2.3)$$

- *Entropic risk measure (Entr)*: This is a law-invariant convex risk measure characterized with an aversion parameter $\tau > 0$, defined as:

$$Entr_\tau^P(X) = \frac{1}{\tau} \log E^P \left[e^{-\tilde{A}X} \right] = \sup_Q \left\{ E^Q[-X] - \frac{1}{\tilde{A}} H(Q/P) \right\}, \forall X \in L^\infty \quad (2.4)$$

where, H denotes the relative entropy of Q with respect to P (see Föllmer and Schied, 2002).

- *Expected Shortfall (ES)*: This is a prominent law-invariant co-monotone and coherent risk measure defined as:

$$ES_\Delta^P(X) = \frac{1}{\Delta} \int_0^\Delta VaR_u^P(X) du, \Delta \in [0, 1], \forall X \in L^\infty \quad (2.5)$$

- *Spectral risk measure (ρ_ϕ)*: This is the class of law-invariant co-monotone and coherent risk measures, proposed by Acerbi (2002), and formally expressed as:

$$\rho_\phi(X) = \int_0^1 VaR_u^P(X) \phi(u) du, \forall X \in L^\infty \quad (2.6)$$

where, ϕ is a non-increasing, non-negative, right continuous and integrable weighting function such that $\int_0^1 \phi(u) du = 1$

Definition 2.3 (Variability measure). A variability measure is a functional $v: L^\infty \rightarrow R^+$ (Rockafellar et al., 2006), which may fulfill the following properties:

- *Non-Negativity*: For all $X \in L^\infty$, $\nu(X) = 0$ for constant X and $\nu(X) > 0$ for non- constant X .
- *Translation Insensitivity*: $\nu(X + C) = \nu(X)$ for all $C \in \mathbb{R}$ and $X \in L^\infty$.
- *Convexity*: $\nu(\lambda X + (1 - \lambda)Y) \leq \lambda \nu(X) + (1 - \lambda) \nu(Y)$ for all $X, Y \in L^\infty$.
- *Positive Homogeneity*: $\nu(\lambda X) = \lambda \nu(X)$ for all $\lambda \geq 0$ and $X \in L^\infty$.
- *Co-monotonic additivity*: $\nu(X + Y) = \nu(X) + \nu(Y)$ for every co-monotonic pair $X, Y \in L^\infty$.

A measure of variability ν is proper if it is Non-Negativity and Translation Insensitivity, convex if it is proper and satisfies Convexity, coherent if it is convex and fulfills Positive Homogeneity and co-monotone if it respects Co-monotonic additivity (See e.g., Righi, 2018a, Furman et al., 2017, and Berkouch et al., 2018).

Example 2.4. The author provides below some examples of variability measures:

- *Full Range (FR)*: This extremely conservative variability measure, that represents the larger possible difference between two values of $X(\omega)$ for distinct $\omega \in \Omega$, is defined as:

$$FR(X) = \sup X - \inf X, \forall X \in L^\infty \quad (2.7)$$

- *Lower and Upper Range (LR/UR)*: They are adaptations of the full range measure to account for the range below or above the expectation, respectively. They are formulated as:

$$LR^P(X) = E^P[X] - \inf X, \forall X \in L^\infty \quad (2.8)$$

$$UR^P(X) = \sup X - E^P[X], \forall X \in L^\infty \quad (2.9)$$

- *Variance (Var)*: This is the most known variability measure, being defined as:

$$Var^P(X) = E^P[(X - E^P[X])^2], \forall X \in L^\infty \quad (2.10)$$

It represents the second moment around expectation and has been considered as a proxy for risk in modern finance since the pioneering work of Markowitz (1952) and Markowitz (1970).

- *Standard Deviation (SD)*: This variability measure is expressed as the square root of the variance:

$$SD^P(X) = \left(E^P \left[\left(X - E^P[X] \right)^2 \right] \right)^{\frac{1}{2}}, \forall X \in L^\infty \quad (2.11)$$

- *Semi-Deviation (SD−/SD+)*: The lower and upper semi-deviations are adaptations of the standard deviation that consider dispersion only from values, respectively, below or above the expectation in order to avoid symmetry. They are defined conform:

$$SD_{\mp}^P(X) = \left(E^P \left[\left((X - E^P[X])_{\mp} \right)^2 \right] \right)^{\frac{1}{2}}, \forall X \in L^{\infty} \quad (2.12)$$

- *Mean Gini coefficient* (Gini): This is a statistical coefficient that measures the variation degree within the set of values $X(w)$ as w varies in Ω . Since its introduction by Gini (1921), it has been widely studied (see e.g., Shalit and Yitzhaki, 1984, Giorgi, 1993, Giorgi, 2005, Yitzhaki, 1998, Ceriani and Verme, 2012, Furman et al., 2017, and Berkouch et al., 2018). It is defined as:

$$\text{Gini}^P(X) = E^P[|X^* - X^{**}|], \forall X \in L^{\infty} \quad (2.13)$$

where, X^* and X^{**} are two independent copies of X . Or, in terms of covariance (Cov):

$$\text{Gini}^P(X) = 4 \text{Cov}^P[X, F_{X,P}(X)], \forall X \in L^{\infty}$$

- *Extended Gini coefficient* (EGini): This is a well-known coefficient in finance and economics characterized with a parameter of aversion degree $r > 1$ (see Yitzhaki, 1983, Yitzhaki and Schechtman, 2005, Yitzhaki and Schechtman, 2012, Mao and Wang, 2018, and Berkouch et al., 2018). It is formulated conform:

$$\text{EGini}_r^P(X) = -2r \text{Cov}^P[X, (1 - F_{X,P}(X))^{r-1}], \forall X \in L^{\infty} \quad (2.14)$$

For $r = 2$, we get the Mean Gini coefficient.

MAIN FOCUS OF THE CHAPTER

For a measurable space of scenarios $(S, \mathcal{S})$ and a weighting function φ , we consider a collection $\rho\varphi = (\rho_{\varphi}^s)_{s \in S}$ of spectral risk measures such that: $\rho_{\varphi}^s : L^{\infty}(\mathbb{C}, \mathcal{F}) \rightarrow R$, for every $s \in S$. Each probability measure is associated with a scenario $s \in S$. We assume that $\rho_{\varphi, X} \bullet \rho_{\varphi}^{\cdot}(X) : (S, \mathcal{S}) \rightarrow R$ is $\mathcal{S}$ -measurable. Throughout this chapter, we interchangeably use the following notations according to the context:

$$\rho\varphi(X) := (\rho^s\varphi(X))_{s \in S} = (\rho_{\varphi, X}^s)_{s \in S} := \rho_{\varphi, X}$$

Definition 3.1 (Scenario-based spectral risk measurement). We call scenario-based spectral risk measurement (abrie. scenario-based SRM) every family of spectral risk measures with a weighting function φ , formally:

$$\rho_{\varphi} = \{\rho_{\varphi}^s: L^{\infty}(\Omega, \mathcal{F}) \rightarrow \mathbb{R}, s \in S\}$$

Definition 3.2 (Uncertainty-free set). For a held financial position X , we define an uncertainty-free set as:

$$\{\rho_{\varphi, X} \in L^{\infty}(S, \mathbb{S}) \text{ s.t.: } \rho_{\varphi, X}^s = \rho_{\varphi, X}^{s'}, \forall s, s' \in S\}$$

A definition of S -based risk measures is provided as introduced in Wang and Ziegel (2018):

Definition 3.3 (S -based risk measure). For a scenario set S , a measure of risk ρ is called S -based if: $\rho(X) = \rho(Y)$ for $X, Y \in L^{\infty}$ whenever $X =_s Y$.

Consider a scenario-based SRM, ρ_{φ} , and let μ be a probability measure on $(S, \mathbb{S})$. The author intends to capture the uncertain character of ρ_{φ} , by composing ρ_{φ} with a risk measure on $L^{\infty}(S, \mathbb{S})$; the idea is, instead of picking a specific risk measure, we consider the whole set of candidates. Let R be a risk measure on $L^{\infty}(S, \mathbb{S})$:

Definition 3.4 (Composition of risk measures). The composition of R and ρ_{φ} is a monetary risk measure defined as:

$$R \circ \rho_{\varphi}(X) = R(-\rho_{\varphi}(X)), \forall X \in L^{\infty} \quad (3.1)$$

By definition, the composition $R \circ \rho_{\varphi}$ is S -based. This approach allows us to define new robust risk measures that account for the uncertainty inherent to our scenario-based SRM ρ_{φ} , and it entails a large specter of possibilities according to the choice of R on $L^{\infty}(S, \mathbb{S})$.

Example 3.5. The author lists some relevant examples below:

- *Worst-case scenario* (ρ_{φ}^{WC}): For $R = WC$, we get the worst-case scenario defined as:

$$\rho_{\varphi}^{WC}(X) = \sup_{s \in S} \rho_{\varphi}^s(X), \forall X \in L^{\infty} \quad (3.2)$$

- *Scenario-based Expectation* (E_{φ}): For $R = EL\mu$ we introduce the scenario-based expectation:

$$E_{\varphi}^{\mu}(X) = \int_S \rho_{\varphi}^s(X) d\mu, \forall X \in L^{\infty} \quad (3.3)$$

- *Scenario-based Value-at-Risk* ($VaR_{\alpha, \varphi}$): For $R = VaR_{\Delta}^{\mu}, \Delta \in [0, 1)$, we define the scenario-based Value-at-Risk as:

$$VaR_{\alpha, \varphi}(X) = \inf \{x \in \mathbb{R}: \mu(\rho_{\varphi}(X) < x) \leq 1 - \alpha\}, \forall X \in L^{\infty} \quad (3.4)$$

- *Scenario-based entropic risk measure* ($\text{Entr}_{\tau,\varphi}$): For $R = \text{Entr}_{\tau}^{\mu}$, $\tau > 0$, we define the scenario-based entropic risk measure conform:

$$\text{Entr}_{\tau,\varphi}^{\mu}(X) = \sup_Q \left\{ E_{\varphi}^Q(X) - \frac{1}{\tau} H\left(\frac{Q}{\mu}\right) \right\}, \forall X \in L^{\infty} \quad (3.5)$$

- *Scenario-based Expected Shortfall* ($\text{ES}_{\Delta,\varphi}$): For $R = \text{ES}_{\varphi}^{\mu}$, $\Delta \in [0, 1)$, we introduce the scenario-based Expected Shortfall as:

$$\text{ES}_{\Delta,\varphi}(X) = \frac{1}{\Delta} \int_0^{\Delta} \text{VaR}_{u,\varphi}^{\mu}(X) du, \forall X \in L^{\infty} \quad (3.6)$$

Remark 3.6. A discrete version of $\text{E}\varphi$, in (3.3), may be introduced as scenario-based Weighted Average ($\text{WA}\varphi$) across a set of n scenarios $\{s_1, \dots, s_n\}$:

$$\text{WA}_{\varphi}^{\mu}(X) = \sum_{i=1}^n \mu(s_i) \rho_{\varphi}^{s_i}(X), \forall X \in L^{\infty} \quad (3.7)$$

This formulation could be more relevant for practical issues.

Besides, we also note that ρ_{φ}^{WC} and $\text{ES}_{\alpha,\varphi}$ are $\mathbb{S}$ -based and coherent; $\text{Entr}_{\tau,\varphi}$ is $\mathbb{S}$ -based and convex; $\text{WA}\varphi$, $\text{E}\varphi$ and are $\mathbb{S}$ -based co-monotone and coherent.

Remark 3.7. According to the properties of $\rho\varphi$ and R , and from Corollary 1 (Righi, 2018b) (for $f(\cdot) = R(\cdot)$), we provide results regarding dual representation of the super-posed robust risk measure $R \circ \rho\varphi$. Let $\rho\varphi$ be a scenario-based SRM and R be a monetary risk measure. Then:

- If R is a law-invariant convex risk measure, then the representation is conform:

$$R \circ \rho_{\varphi}(X) = \sup_{\mu \in \Delta} \left\{ \int_{[0,1)} \text{ES}_{\gamma}(X) dm^{\mu} - \delta_R(\mu) \right\}, \forall X \in L^{\infty} \quad (3.8)$$

where, $m_{\mu} \in \text{cl}(M_{E_{\varphi}^{\mu}})$. For $\mathbb{V}$ the set of probability measures in $(\mathbb{S}, \mathbb{S})$, and δ_R a penalty term.

- If R is a law-invariant coherent risk measure, then the representation becomes:

$$R \circ \rho_{\varphi}(X) = \sup_{\mu \in \Delta_R} \int_{[0,1)} \text{ES}_{\gamma}(X) dm^{\mu}, \forall X \in L^{\infty} \quad (3.9)$$

Where, $m^\mu \in cl\left(M_{E_\phi^\mu}\right)$ and $\Delta_R = \left\{\mu \in \Delta : Ro\rho_\phi(X) \geq E_\phi^\mu, \forall X \in L^\infty\right\}$.

- iii. If R is a law-invariant co-monotone coherent risk measure, then the representation becomes:

$$Ro\rho_\phi(X) = \int_{[0,1)} ES_\gamma(X) dm^\mu, \forall X \in L^\infty \quad (3.10)$$

From another perspective, since Value-at-Risk (VaR) and Expected Shortfall (ES) are common risk measures which have been widely used in banking and insurance industries, we can consider them as a building block for a second approach for constructing further robust risk measures. First, typically a spectral risk measure is expressed as weighted Value-at-Risk:

$$\rho_\phi^s(X) = \int_0^1 VaR_\gamma^s(X) \phi(\gamma) d\gamma. \quad (3.11)$$

Second, as a classic result from dual representation of law-invariant co-monotone coherent risk measures (see Kusuoka, 2001, Acerbi, 2002, and Frittelli and Gianin, 2005), a spectral risk measure may also be expressed as a mixture of Expected Shortfall (ES):

$$\rho_\phi^s(X) = \int_{[0,1)} ES_\phi^s(X) dm \quad (3.12)$$

for some probability measure m on $[0,1)$.

Therefore, addressing the uncertainty issue over a scenario-based SRM, $\rho_\phi = \left(\rho_\phi^s\right)_{s \in S}$, can be turned to dealing with uncertainty over the collections of $VaR_\Delta = \left(VaR_\Delta^s\right)_{s \in S}$ and/or $ES_\Delta = \left(ES_\Delta^s\right)_{s \in S}$. We then formulate the corresponding robust composition versions of VaR_Δ and ES_Δ , for $R: L^\infty(S, \mathbf{S}) \rightarrow \mathbf{R}$:

$$R \circ VaR_\alpha(X) = R(-VaR_\alpha(X)), \forall X \in L^\infty \quad (3.13)$$

$$R \circ ES_\alpha(X) = R(-ES_\alpha(X)), \forall X \in L^\infty \quad (3.14)$$

Similarly, one may define the following alternative version:

$$ES_{\Delta, R}(X) = \frac{1}{\Delta} \int_0^\Delta RoVaR_\gamma(X) d\gamma, \forall X \in L^\infty \quad (3.15)$$

Based on this, the author introduces below some new forms of robust risk measures that capture uncertainty over a scenario-based SRM ρ_ϕ , by means of exploiting the connections between VaR, ES and spectral risk measures.

Definition 3.8. For a scenario-based SRM, ρ_φ and a risk measure R on $L^\infty(S, S)$, we introduce the following variants:

$$\rho_{\varphi,R}(X) = \int_0^1 RoVaR_\gamma(X) \varphi(\gamma) d\gamma, \forall X \in L^\infty \quad (3.16)$$

$$\rho_{\varphi,R}(X) = \int_{[0,1)} RoES_\gamma(X) dm, \forall X \in L^\infty \quad (3.17)$$

$$\rho_{\varphi,R}(X) = \int_{[0,1)} ES_{\gamma,R}(X) dm, \forall X \in L^\infty \quad (3.18)$$

Proposition 3.9. Let R be a risk measure on $L^\infty(S, S)$ and consider $\rho_{\varphi,R}$ defined in (3.17).

- i. If R is convex then $\rho_{\varphi,R}$ is S -based and convex.
- ii. If R is coherent then $\rho_{\varphi,R}$ is S -based and coherent.
- iii. If R is co-monotone then $\rho_{\varphi,R}$ is S -based and co-monotone.

Proof.

- i. R is convex and ES_γ is convex.

We have $R \circ ES_\gamma$ is convex. Let $C \in R$:

$$\rho_{\varphi,R}(X + C) = \int_{[0,1)} RoES_\gamma(X + C) dm = \int_{[0,1)} RoES_\gamma(X) dm - C = \rho_{\varphi,R}(X) - C.$$

Let $X, Y \in L^\infty$ s.t.: $X \leq Y$, we have:

Thus, $\rho_{\varphi,R}$ is a monetary risk measure.

Let $\lambda \in [0, 1]$ and $X, Y \in L^\infty$, since $R \circ ES_\gamma$ is convex we have:

Therefore, $\rho_{\varphi,R}$ is convex.

- ii. R is coherent.

$R \circ ES_\gamma$ is coherent. Let $\lambda \geq 0$, we get:

Thus, $\rho_{\varphi,R}$ is positive homogeneous. Then, $\rho_{\varphi,R}$ is coherent.

- iii. R is co-monotone.

$R \circ ES_\gamma$ is co-monotone. Let X, Y be a co-monotone pair $\in L^\infty$, we have:

Therefore, $\rho_{\varphi,R}$ is co-monotone.

Remark 3.10. Spectral risk measures are a special case of the larger class of distortion risk measures.

Therefore, the proposed approaches in this chapter could be extended, in the same fashion, to the

class of distortion measures of risk via the framework of Choquet integrals under a given capacity (see e.g., Choquet, 1954, Schmeidler, 1986, Schmeidler, 1989, Yaari, 1987, and Wang et al., 2018).

MEASURING UNCERTAINTY

In this section we propose to quantify uncertainty, which implies assessing its impact on the risk measurement process and it may even be viewed as a penalty to add to the required capital as a hedging for the held financial position. In the context of this chapter, measuring uncertainty means quantifying the dispersion over $\rho_\varphi(X) = (\rho_\varphi^s(X))_{s \in S}$ as long as s varies across the scenario set S .

Definition 4.1 (Uncertainty measure). Consider a scenario-based SRM ρ_φ , a measure of uncertainty U is a non-negative mapping on $L^\infty(S, S)$ that evaluates uncertainty over $(\rho_\varphi^s(X))_{s \in S}$ as s varies in S , for a financial position X :

$$U: L^\infty(S, S) \rightarrow \mathbb{R}_+$$

$$\rho_\varphi(X) \rightarrow U(\rho_\varphi(X))$$

Given that the aim is to assess variability, we argue that this quantification could be done within the elements of $\rho_\varphi(X)$ without reliance on a reference measure, as proposed in Jokhadze and Schmidt (2018), and we propose measuring uncertainty by taking advantage of variability measures (Rockafellar et al., 2006) on $L^\infty(S, S)$, i.e., $U = \nu$. Thus, we claim that measuring uncertainty by a variability-type approach is relevant and suits the objective, since variability measures are, by definition, designed for capturing the variability concept. In contrast, measures such as VaR and ES, used in Jokhadze and Schmidt (2018), do not seize this concept. Moreover, the theoretical properties of a variability measure (see Definition 2.3) are consistent and easily interpretable in this context of uncertainty measurement. For instance, Non-Negativity assures that there is no variability in an uncertainty-free set (see Definition 3.2); Translation Insensitivity indicates that uncertainty does not change if a certain constant value is added. Throughout this section we opt for the following notation:

$$\rho_\varphi(X) := \rho_{\varphi, X}$$

Consider a scenario-based SRM, ρ_φ , and a financial position X . Let μ be a probability measure on (S, S) and F_μ be the corresponding distribution function for the random variable $\rho_{\varphi, X}$ on $L^\infty(S, S)$. We provide some examples of uncertainty measures to illustrate our variability-type approach:

$$U(\rho_{\varphi, X}) = \nu(\rho_{\varphi, X}) := \nu_\varphi(X)$$

- For $\nu = \text{FR}$, we introduce the Full Range-type uncertainty measure (FR_φ):

Distributional Uncertainty for Spectral Risk Measures

$$FR_{\varphi}^{\mu}(X) = \sup_{s \in S} \rho_{\varphi, X}^s - \inf_{s \in S} \rho_{\varphi, X}^s, \forall X \in L^{\infty} \quad (4.1)$$

This measure of uncertainty assesses the maximum distance between the candidates $\{\rho_{\varphi, X}^s, s \in S\}$. Thus, it tends to overestimate uncertainty.

- For $\nu = LR/\nu = UR$, we get a Lower/Upper Range-type uncertainty measure ($LR_{\varphi}/UR_{\varphi}$):

$$LR_{\varphi}^{\mu}(X) = E^{\mu}[\rho_{\varphi, X}] - \inf_{s \in S} \rho_{\varphi, X}^s, \forall X \in L^{\infty} \quad (4.2)$$

$$UR_{\varphi}^{\mu}(X) = \sup_{s \in S} \rho_{\varphi, X}^s - E^{\mu}[\rho_{\varphi, X}], \forall X \in L^{\infty} \quad (4.3)$$

- For $\nu = Var$, we define a Variance-type uncertainty measure (Var_{φ}):

$$Var_{\varphi}^{\mu}(X) = E^{\mu}\left[\left(\rho_{\varphi, X} - E^{\mu}[\rho_{\varphi, X}]\right)^2\right], \forall X \in L^{\infty} \quad (4.4)$$

- For $\nu = SD$, we define a Standard variability-type uncertainty measure (SD_{φ}):

$$SD_{\varphi}^{\mu}(X) = \left(E^{\mu}\left[\left(\rho_{\varphi, X} - E^{\mu}[\rho_{\varphi, X}]\right)^2\right]\right)^{\frac{1}{2}}, \forall X \in L^{\infty} \quad (4.5)$$

- For $\nu = Gini$, we introduce a Gini-type uncertainty measure ($Gini_{\varphi}$):

$$Gini_{\varphi}^{\mu}(X) = E^{\mu}\left[\left|\hat{A}_{\mathbb{E}X}^{*} - \hat{A}_{\mathbb{E}X}^{**}\right|\right], \forall X \in L^{\infty} \quad (4.6)$$

where, $\rho_{\varphi, X}^{*}$ and $\rho_{\varphi, X}^{**}$ are two independent copies of $\rho_{\varphi, X}$. Or, in terms of covariance:

$$Gini_{\varphi}^{\mu}(X) = 4Cov^{\mu}\left[\rho_{\varphi, X}, F_{\mu}(\rho_{\varphi, X})\right], \forall X \in L^{\infty} \quad (4.7)$$

- For $\nu = EGini$, we get an Extended Gini-type uncertainty measure ($EGini_{\varphi}$):

$$EGini_{\varphi}^{\mu}(X) = -2r Cov^{\mu}\left[\rho_{\varphi, X}, \left(1 - F_{\mu}(\rho_{\varphi, X})\right)^{r-1}\right], \forall X \in L^{\infty} \quad (4.8)$$

where, the parameter $r > 1$ might be seen as a degree of uncertainty-aversion. This measure could be used in order to exhibit the attitude towards uncertainty of different profiles.

AN EMPIRICAL EXAMPLE

In this section we are going to provide an illustration using a database from the NASDAQ index. We consider a scenario-based SRM, ρ_ϕ , where the spectral risk measure ρ_ϕ^s is the Extended Gini Shortfall introduced in Berkouch et al. (2018), formally:

$$EGS_{r,p,\lambda}^s(X) = \int_0^1 VaR_\gamma^s(X) \phi_{r,p}^\lambda(\gamma) d\gamma, \forall X \in L^\infty$$

Where

$$\phi_{r,p}^\lambda(\gamma) = \frac{1-p+2\lambda \left[(1-p)^{r-1} - r(1-\gamma)^{r-1} \right]}{(1-p)^2} 1_{[p,1]}(\gamma) \quad (5.1)$$

With $\gamma \in [0, 1]$, $p \in (0, 1)$, $r > 1$, and $\lambda \in [0, 1/(2(r-1)(1-p)^{r-2})]$.

Our data set consists of daily return X of the NASDAQ index, covering the period from Jun. 01, 2007 to Mar. 31, 2019, with a total of $N = 3080$ observations¹. Figure 1 shows the return evolution of the NASDAQ index over the observed period.

We arbitrarily consider sequences of three months from our data set. Thus, for illustrative purposes each trimester is regarded as a different economic situation (or scenario) that represents a different distribution of data. Therefore, we get a total of $n = 49$ scenarios.

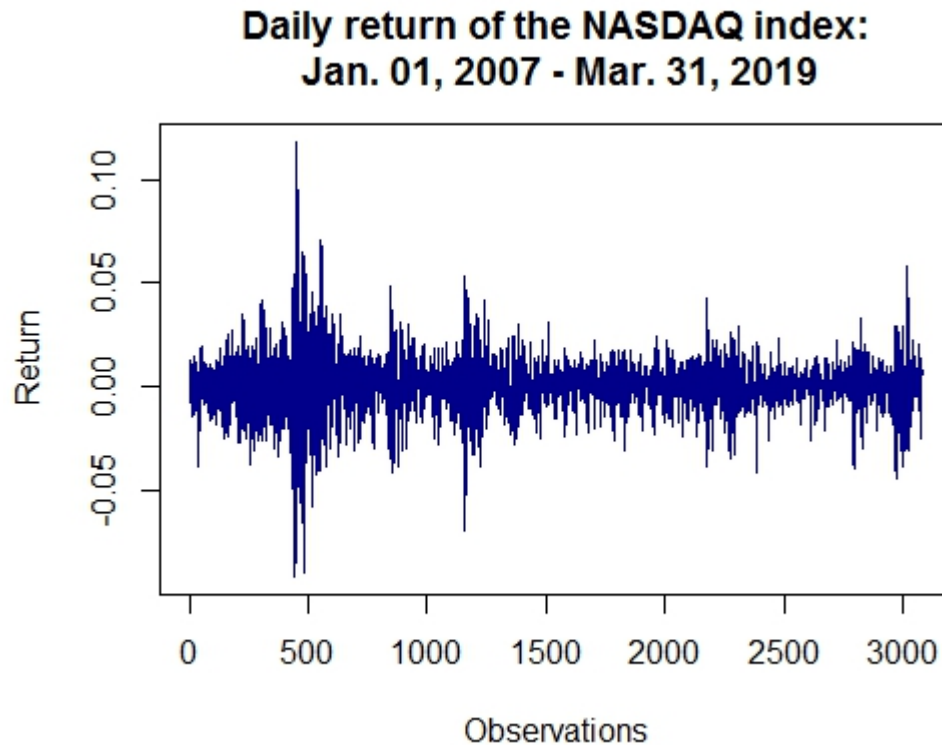
For each scenario s , we evaluate $EGS(X)$ for a confidence level $p = 95\%$ and a risk-aversion degree $r=2$. To fulfill the coherency condition of EGS we arbitrarily take λ the midpoint of the interval $[0, 1/(2(r-1)(1-p)^{r-2})]$, thus $\lambda = \frac{1}{4(r-1)(1-p)^{r-2}}$.

Table 1 reports the estimated values of EGS according to each scenario².

From Table 1, we notice discrepancy between the estimated values of EGS under the different scenarios; for instance, we got extreme values of risk during the period between 2008 and early 2009 which is characterized by an extremely bad economic situation, due to the crisis. This observed discrepancy emphasizes the point argued in this chapter about the problem of uncertainty regarding the choice of the correct distribution. Moreover, it highlights the fact that inappropriate distributional assumptions could lead to misled decisions and worrying financial losses.

At this point, we suggest proceeding for measuring uncertainty using the proposed variability-type approach, see Table 2. This could be used for comparison between different scenario-based SRM, especially for decision-making purposes. In this regard, a notion of uncertainty-aversion could come in to reflect the subjective preferences of decision-makers and describe their attitude towards uncertainty, using appropriate variability measures such as EGInir according to the parameter r .

Figure 1. Graph of the daily observed NASDAQ return.



Now, in order to overcome the uncertainty issue, we consider the entire set of scenarios, and we suggest superposing our scenario-based SRM with classical risk measures such as Expectation, Value-at-Risk and Expected Shortfall. The results are shown in Table 3. Therefrom, we notice that while WC actually overestimates risk, A and WA do underestimate risk. Moreover, between VaR and ES, as enough argued in the literature, ES seems more convenient.

To sum up, this empirical exercise, based on the daily returns of the NASDAQ index between Jan. 01, 2007 and Mar. 31, 2019, is a historical application that stresses the potential risk associated with the uncertainty issue regarding the choice of distributions over the special subclass of spectral risk measures. Furthermore, it illustrates the robust framework of risk measures proposed in the present chapter for overcoming uncertainty, together with the variability-type approach suggested as a tool to give the concept of uncertainty a quantifiable aspect.

Table 1. Estimated values of EGSs(X).

	Scenarios	EGS*(X)
1	2007-a	2.73%
2	2007-b	1.61%
3	2007-c	2.31%
4	2007-d	2.61%
5	2008-a	3.25%
6	2008-b	2.93%
7	2008-c	6.12%
8	2008-d	7.87%
9	2009-a	4.86%
10	2009-b	3.40%
11	2009-c	2.53%
12	2009-d	2.65%
13	2010-a	2.62%
14	2010-b	3.85%
15	2010-c	2.58%
16	2010-d	1.65%
17	2011-a	2.45%
18	2011-b	1.92%
19	2011-c	5.65%
20	2011-d	3.31%
21	2012-a	1.01%
22	2012-b	2.49%
23	2012-c	1.33%
24	2012-d	2.06%
25	2013-a	1.50%
26	2013-b	2.09%
27	2013-c	1.56%
28	2013-d	1.72%
29	2014-a	2.18%
30	2014-b	2.44%
31	2014-c	1.80%
32	2014-d	2.01%
33	2015-a	2.04%
34	2015-b	1.88%
35	2015-c	3.45%
36	2015-d	1.83%
37	2016-a	3.27%
38	2016-b	2.68%
39	2016-c	1.56%
40	2016-d	1.30%
41	2017-a	1.15%
42	2017-b	1.99%
43	2017-c	1.68%
44	2017-d	1.00%
45	2018-a	3.63%
46	2018-b	2.33%
47	2018-c	1.41%
48	2018-d	4.01%
49	2019-a	2.59%

Table 2. Uncertainty measurement.

U	FR	LR	UR	Var	SD	Gini
$U_{\varphi, p, \lambda}(X)$	6.87%	5.28%	1.59%	0.02%	1.32%	1.31%

Table 3. Estimated values for examples of robust risk measures

R	WC	A	WA	VaR	ES
$R \circ \rho_{\varphi, p, \lambda}(X)$	7.87%	2.59%	3.26%	5.33%	6.55%

CONCLUSION

In this chapter, the author intends to address the problem of overcoming and evaluation financial uncertainty by adapting a consistent framework to the class of spectral risk measures. The author intends to propose an alternative approach for measuring uncertainty itself. Since quantifying uncertainty provides information about to what extent our risk measurement process could be impacted by uncertainty and it may even be seen as a penalization to add to the required capital for covering the held financial position. To measure uncertainty, Jokhadze and Schmidt (2018) proposed a superposed measure that evaluates the dispersion, of a collection of risk measure, relatively to some reference risk measure ρ_0 . However, this approach stays dependent on the choice of a risk measure of reference. In this sense, the author is proposing a variability-type approach, especially since the monetary risk measures used in Jokhadze and Schmidt (2018), such as *VaR* and *ES*, do not capture the variability concept (Rockafellar et al., 2006). Moreover, the measures used in this chapter opens a wild range for decent interpretations in the financial reality.

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KEY TERMS AND DEFINITIONS

Expected Shortfall: The expected shortfall, at a given level of confidence α in the unit interval, is a measure of risk that represents the mean loss beyond the corresponding value-at-risk.

Financial Crises: They are extreme events with sudden and unpredictable effects on the financial system.

Risk Measure: A mapping that associates a real value to a given financial position, which represents the risk value.

Risk-Aversion: A quantitative variable that reflects the psychological behavior or attitude toward risk of a given investor.

Utility Function: A mapping that evaluates the satisfaction brought by a specific realization for a given investor.

Value-at-Risk: The value-at-risk, at a given level of confidence α in the unit interval, is a risk measure that coincides with the α -quantile of the underlying financial position.

Variability Measure: A function that allows the quantification of the variability or dispersion of the realizations of a given random variable.

ENDNOTES

¹ <https://finance.yahoo.com>

² a: Jan.- Feb.- Mar./ b: Apr.- May.- Jun./ c: Jul.- Aug.- Sep./ d: Oct.- Nov.- Dec.

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Index

A

ABC 233, 238, 305-306
 accounting standards 174-176, 181, 183, 195, 222, 224
 accounts payable 199-200, 203, 280
 accounts receivable 185, 199-200, 210, 212
 adaptation 28, 69, 71, 73, 128, 154, 195, 267
 affiliated companies 41-42, 44-47, 49-51, 55
 Altman Z-Score 112, 116, 133, 197
 anti-persistence 367, 370, 451, 459, 473-474
 artificial intelligence 131, 147, 149, 152, 328, 334, 338
 Artificial Neural Network 148, 151-152, 373
 Assessment Credit Granting 112
 Asset Backed Security 343
 AUM 428-433, 440-441, 443

B

bank 9, 20-21, 25, 27, 47, 54, 78, 81, 87-90, 92-93, 95-96, 100, 103, 110, 123, 130, 151, 160, 215-216, 256, 275, 281-282, 285-314, 317, 319-322, 328-329, 333, 336-337, 340-341, 350, 356, 378, 430-431, 438, 441-443, 446
 bank lending 90, 288, 290
 banking 46, 56, 88-89, 124, 131, 150, 171, 256, 275-276, 281, 285, 289-294, 296-304, 306-307, 309-310, 312, 315, 318-321, 325, 328-329, 331, 334-335, 339, 341, 347, 351, 438, 441, 455, 486, 493-495
 bankruptcy 8, 80-81, 92, 100, 107, 112-115, 117, 121-124, 126-128, 130-133, 141-142, 146-147, 151, 181, 193, 196-197, 201-202, 218, 223, 225, 294, 308, 319
 banks 24, 45, 47-49, 56, 95, 100, 113, 150, 200, 203, 228, 275-277, 281-282, 284-287, 290-294, 296-304, 306-313, 315-322, 325-327, 334, 336-337, 350, 352-353, 437
 beta 133, 143, 314, 374-375, 377, 379, 381-382, 385-388
 borrower 305, 309-310, 312-314, 317, 319, 322, 353

Brazilian companies 218
 budgetary 229, 248-258, 263, 265-269, 344, 349
 business 1-11, 16-18, 20-25, 27-28, 30-32, 37-48, 50-51, 53-56, 59, 74-75, 79, 81, 83, 88-93, 122-133, 138, 141, 143-159, 162, 168-172, 184-185, 189-191, 196-197, 199-200, 202, 215-216, 220, 222-226, 228, 231, 234, 240, 244-246, 249, 253, 270-273, 280-281, 284, 286-287, 289-290, 298-299, 301-305, 307-309, 316-319, 325-327, 329, 333-334, 337, 339-340, 346-348, 351, 371, 373-374, 387, 408, 410, 423-425, 455, 474, 476-477
 business group 42-43, 46-48, 56
 Business Investment 152
 business performance 128-130, 152
 business value 126-128, 130-132, 149, 151-152, 159, 224, 340
 Buyer Interest 218, 226

C

Capital Buffer 291-294, 296-302, 304
 capital structure 9, 77-82, 85-94, 109-110, 135, 146-147, 159, 163, 200, 290, 304, 308, 352
 cash conversion cycle (CCC) 200, 202, 208, 212, 217
 causes of unfavorable budgetary deviations 248-250, 253-255, 257-258, 263, 265-268
 Chinese stock market 445-446, 448, 451-454
 competitiveness 1-2, 4, 9-10, 27, 92, 126, 223, 229, 248-249, 256, 269-270
 Computers 70, 76
 conglomerate 41-42, 44, 54-55
 construction companies 130, 151, 248-250, 252-257, 265-268
 correlation coefficient 68, 70, 376, 411-412, 416-417, 422, 426-427, 456, 459
 Cost Controls 233
 Cost Managerial Analysis 233, 243, 247
 Cost Model 233
 Cost of Capacity 218, 221, 226

Index

cost reduction 2, 189, 224, 233, 238, 346
Counterparty risk 344, 346, 357
Covid-19 20-21, 26-27, 36, 59-62, 65, 71-75, 94-95, 98, 107, 112, 114, 116, 121-123, 135, 153-156, 161, 165, 169-191, 193-196, 218, 222-223, 228, 232, 249, 266-268, 291, 293, 295, 316, 318, 359-360, 363-364, 366-367, 370-373, 389-390, 392-393, 406, 408-414, 421-426, 445-446, 448, 450-457, 464-466, 474-476
CRAM 305, 312-313, 315-316, 318-319
credit 4, 78, 81, 87-88, 95, 100, 102, 104, 109-113, 123, 149, 160, 174, 176-177, 184, 186-187, 190, 198, 200-201, 203, 205-209, 212, 214-217, 226, 252-253, 268, 275, 279-282, 286-300, 302, 305-322, 328, 332, 335-336, 344-346, 348-354, 357, 442
credit supply 275, 281, 290, 293
crises 21, 75, 93, 155, 216, 219, 222, 225, 227, 229, 267, 279, 293, 303, 371, 420, 446, 453, 466, 478, 496
crisis 26, 46-47, 59-62, 65-66, 71-74, 77-92, 94-96, 104-105, 107-108, 110, 113-114, 121, 126, 131-132, 139-140, 142, 146-148, 150, 154, 156-157, 161, 165, 169, 175, 180, 195-196, 199-200, 204-206, 208-210, 214, 216, 218-219, 222, 227-229, 233-234, 247, 254, 267, 291-294, 296, 301-303, 305, 307, 319-320, 324-325, 356, 359, 362, 371-372, 390, 392, 408-409, 411-412, 419-420, 422-423, 429, 442, 446, 448, 451, 453-454, 456, 465-466, 475, 477, 479, 490
Cryptocurrency 343, 347, 355, 357, 448, 457
Current Ratios 191, 198

D

Data Security 344, 348, 357
Data tampering 347, 357
Data Transparency 354, 357
Days Payment Outstanding (DPO) 208, 217
days sales inventories (DSI) 208, 212, 217
days sales outstanding (DSO) 208, 212, 217
debt oriented 428, 430-431, 433, 435-436, 438, 441
Debt-to-Total-Assets Ratios 198
defaulting 305-306, 310-316, 321, 350
delinquency 305-306, 311, 313, 318, 320
dependence 56, 143, 148, 200, 205, 344, 353-354, 362, 411-417, 419-420, 422, 424, 426-427, 445-449, 451-455, 458-459, 477
dependence levels 411, 451
Deployment of funds 428, 431, 437
depreciation 6-7, 12, 81-83, 129, 133, 138, 218, 225-226, 235, 465
Detrended Fluctuation Analysis 359-360, 363-364,

370-371, 393, 395-396, 406, 408, 445-446, 448, 455, 457-459, 467-468, 474-475

different country 41

digitalization 323, 328, 330, 337

Discretionary Costs 234, 236-238, 243, 247

distributed ledger technology 343-344, 347, 356-357

downturn 77, 79, 104-105, 108, 199-200, 204-207, 212, 214, 305, 316, 318

E

economic policy 38, 151, 275-290

economic policy uncertainty 275-290

Economic Policy Uncertainty (EPU) Index 290

Economic Value Added 6, 129, 133, 148-150, 152-154, 157-158, 167, 170-173

ecosystem 21-25, 27, 38, 228, 323-326, 328, 330, 332, 334-337, 340, 351

efficiency 4, 54, 74, 99, 127, 160, 192, 216, 220, 225, 227, 229, 234, 239, 250, 253, 291, 294-295, 298, 300-302, 316-317, 326, 329, 333, 335-336, 345, 348, 352-353, 355, 359-362, 367, 369-373, 375-377, 386-392, 401, 406-410, 412-413, 419, 421, 423-425, 427, 445-448, 451, 453-456, 458-459, 464, 466, 473-476

Efficient Market Hypothesis 362, 372, 391, 406, 408, 412-413, 424-427, 445-447, 454, 458, 475

elections 276, 286

entrepreneurship 10, 20-28, 36-40, 87, 91-92, 122, 150, 197, 246, 476

Environmental Sustainability 323, 340

equity 6, 8-9, 11-12, 46, 48-50, 61, 77-80, 82, 86-88, 91, 95, 100-109, 117, 126-127, 129-130, 132-139, 141-148, 153, 158-159, 161-164, 166-167, 169, 198, 201, 206, 256, 279, 289, 298-300, 302, 307, 372-373, 388, 408-409, 428-431, 433-434, 436-439, 441-442, 454-455, 457, 466, 474-475

equity oriented 428, 433-434, 436-439, 441-442

ETF 374-378, 382-388, 428-429, 431, 441

Europe 9, 27, 49, 74, 113, 117, 133, 163, 297, 326, 332, 370, 374, 385, 387-388, 390, 392-393, 419, 431, 452, 464-465, 467, 469, 472-474

European funds 1, 9

EVA® 19, 153-154, 157-171

exchange rates 220, 307, 309, 359, 362, 370, 372-373, 393, 412-413, 466, 475

Exchange-Traded Funds performance 374

Expected Credit Loss 177, 198

Expected Shortfall 478-479, 481, 485-486, 491, 496

F

finances 10, 59, 65, 206, 296, 301-302, 316
 financial analysis 3, 88, 112, 114, 124, 126-128, 132-133, 147-148, 156, 161, 290, 371, 408, 410, 426, 457, 475
 financial crises 93, 216, 371, 466, 478, 496
 financial health 61, 74, 113, 120, 126, 174-175, 180-182, 184, 191-195
 financial instruments 9, 176-177, 183, 198, 327
 financial leverage 11, 90, 94-96, 101, 103, 106-110, 114, 132, 147-148, 162, 164, 167, 169-170, 226
 Financial Management 53, 88, 90-92, 123, 126, 135, 137, 151-152, 172, 195, 200, 215, 227, 269, 272, 287, 316, 387-388, 427
 financial statements 5, 11, 17, 117, 120-121, 129, 148, 156, 159, 163-164, 174-176, 178-184, 190, 194-195, 222, 234, 239, 275, 280
 financial sustainability 3, 5, 20, 122, 243
 financing decisions 91, 94, 99, 289
 FinTech 323-342
 firm performance 236, 279, 286, 288, 290
 function of a holding company 41
 Fundraising 76
 future development 126-127, 131, 334

G

G7 278, 287, 411, 413, 416, 419-420, 422, 424-425, 427, 475
 general linear models 291, 300
 global correlation 411-412, 415-422, 427
 global correlation coefficient 411-412, 416-417, 422, 427
 Gold returns 464
 government 4, 18, 20-21, 23, 25-27, 36-37, 42, 45-48, 51, 67, 74, 87, 156, 178, 189, 193, 196, 232, 275-280, 282, 284, 286, 288-289, 291-296, 301, 306, 328-329, 332-334, 336-338, 370, 412, 438, 441
 government grants 20-21, 178, 189, 193

H

hedge 188, 307, 317, 464-465
 hidden costs 218-219, 224, 226
 High-Frequent Data 427, 459
 holding company 41-57
 hospitality companies 94, 104, 108
 Hurst exponent 446, 448-452, 454-457, 460-461

I

idle costs 218-220, 222, 225
 Indian mutual funds 428, 443
 inflation 7, 161-162, 164, 167, 169-170, 238, 276, 466, 476
 Interest from Suppliers 226
 internationalization 1-2, 4, 9-12, 16-17, 40, 292, 297
 inventories 12, 28, 185, 199-203, 205-212, 214-215, 217, 222-225
 Inventory loading 226
 iShares 374-378, 386, 388

L

linear correlation 411, 417, 422, 427
 loan origination 343, 346
 Long memory 371, 408, 464, 475

M

management 1-2, 5-6, 8-10, 19, 22-23, 25-26, 38-50, 53-56, 60, 62, 70-75, 80, 88, 90-92, 94, 100, 110, 115, 123-124, 126-127, 129-130, 135, 137, 147-154, 156-160, 163, 169-173, 177, 180, 185, 187-188, 195-197, 199-201, 203-205, 207, 212-216, 218-225, 227, 230-231, 233-240, 243-247, 249-251, 254, 266-272, 276, 282, 286-291, 296, 298, 300-302, 304, 306-310, 313, 316-323, 326, 335, 340, 342-343, 345-348, 372-373, 375-377, 380, 387-388, 425, 427, 429-432, 439, 442, 458, 476, 478-480, 494-495
 management control techniques 233, 235, 237, 240, 243
 model 9, 12, 14-15, 25, 56, 90, 92, 94-95, 100, 109, 114-115, 123-124, 130, 133, 141-145, 148-151, 154-155, 159, 162-164, 167-169, 174-175, 178, 181, 184, 188, 191-193, 195, 197, 200, 205, 211-213, 220-221, 226-227, 233-234, 243-244, 246, 248, 250, 256-257, 259-261, 263-265, 268, 271-273, 298, 300, 305-307, 312-319, 327, 334, 337, 339, 346, 361, 363, 370, 372-373, 377, 390, 392, 406-407, 410, 425, 447, 455, 457, 467, 471-472, 474, 476, 494-496
 mutual information 411-417, 421-425, 427

N

Net Realizable Value 198
 new ventures 77-85, 87-88, 91
 news 94, 275, 278, 305-306, 321, 329, 340-342, 423
 non-financial assets 176, 183, 185, 198

Index

non-profits 59-73, 76
number of folios 428, 430-431, 434-435, 439, 441
number of schemes 430-431, 435-436, 439, 441-442

O

organisation 60, 62, 96, 316, 318-319
outbreaks 478

P

pandemic 1-2, 17, 20-21, 25-27, 36-37, 59-62, 65-66, 69-74, 94-95, 107, 112-114, 116-117, 120-124, 153-155, 161, 165, 169-170, 174-177, 179, 185, 187-190, 193, 195, 218-219, 222-223, 228-229, 231, 240, 249, 266-268, 273, 291-296, 301-302, 316, 318, 359-360, 363-364, 366-367, 369-370, 372-373, 389-390, 392-393, 397-398, 401, 406-414, 417, 420-423, 425-426, 428, 431-432, 441-443, 449-451, 453-455, 464-466, 469, 471, 474-476
pandemic declaration 411
Pearson Correlation Coefficient 427
performance 2, 4-7, 17-19, 24, 40, 52, 55, 57, 82, 95, 99, 107, 110, 115-116, 122, 128-131, 134, 144-146, 149-150, 152-154, 157-162, 169-173, 175-176, 178, 181, 185, 193, 199-200, 210, 215-216, 221, 224, 227, 229, 231, 233-236, 239, 244-247, 249-253, 256, 266-267, 269, 271-272, 279-280, 282, 284, 286, 288, 290, 293, 295-296, 309, 314, 318-321, 347, 349, 353, 374-388, 410, 428-431, 443-444, 457
persistence 149, 298, 359, 367, 370, 376-377, 388, 406-407, 444, 448, 451, 455, 459
petrol sector 112, 114, 116
policy uncertainty 275-290, 426
Portugal 1, 3, 9-11, 15, 20-21, 26-28, 35-36, 38, 40, 59-60, 62, 65, 73, 77, 79, 83, 87-90, 92, 94-96, 98, 103-106, 109-111, 153, 155, 165, 174, 196, 199-200, 204-210, 215, 248, 291-297, 300-301, 303-304, 359, 374, 376, 389, 411, 424, 445, 464
Portuguese Stock Index 20 174-175
prediction 81-82, 112-115, 123-124, 127, 130-131, 150-151, 181, 197-198, 313, 347, 391, 406, 425, 456, 472
profitability 2-10, 77, 79-83, 86-87, 92, 100, 102-103, 107, 110, 114-115, 129, 132, 135-136, 146, 154, 156, 160, 164, 166, 168-169, 199-203, 205, 209-210, 212, 214-216, 218, 220, 222-227, 233, 238-239, 242-243, 245, 282, 291, 294-296, 298-301, 314, 319, 362, 376, 379, 381, 392, 396, 469-470

R

recession period 204, 206
recovery 3, 17, 72-73, 122, 132, 180, 190, 204-205, 246, 267, 293, 295, 305, 317, 411, 420, 422, 452
return 6-8, 36, 43, 94-95, 101-103, 105-109, 113, 126, 130, 132, 157-160, 162, 169, 172, 180-181, 184, 193, 199, 201, 203, 205, 209-214, 221, 223, 228, 250, 252, 278-279, 298-300, 319, 327, 348, 369, 374-384, 386, 388, 396, 412-413, 417, 424-425, 431, 446-451, 469-470, 473, 477, 490-491
risk 1-2, 8-9, 11, 31, 43-44, 47, 57, 60, 74, 80, 89, 95, 100, 107, 113-114, 120-121, 123, 129-130, 141, 143, 149-151, 155, 157, 159-160, 162, 164, 174, 176-177, 179, 181, 184-188, 193, 196-197, 200-203, 214, 222, 225, 243, 245, 269, 271, 276, 280, 282, 285-286, 288-289, 291-293, 296-299, 301-322, 344, 346-349, 353, 357, 359, 371-372, 375-377, 380-383, 385, 389, 391, 407, 426-427, 431, 441, 447, 464-466, 473-474, 476, 478-488, 490-491, 493-496
risk diversification 222, 447, 464-465
risk measure 314, 320, 479-481, 484-487, 490, 493-496
risk-aversion 479, 490, 496
risks 1, 3, 60-61, 81, 128, 157, 176-177, 185-189, 193, 222, 226, 234, 249, 268, 281, 286, 293, 295, 302, 307-308, 317-320, 326-328, 342, 346, 348-349, 351-352, 361, 441-443, 478, 494
ROA Ratios 192, 198
robust risk measures 478-479, 484, 486, 493

S

safety 59, 71, 73, 189, 249, 267, 314, 344, 346, 348, 354
Satoshi Nakamoto 347
scenarios 66, 108, 227, 239, 243, 267, 319, 334, 337, 478-479, 483, 485, 490-491
shareholders 43, 48-51, 94-95, 99, 102-103, 108, 126-128, 153-160, 169-170, 172, 236, 256, 298
shareholders' return 94-95
short-term financing 199, 286
sliding windows 426, 445-446, 449-450, 452, 459, 474
smart contracts 343-344, 346-349, 353-355, 357
social 4, 9, 19-21, 23-25, 28, 30, 36-40, 53-56, 59-63, 65, 71-72, 74-76, 92, 110, 112-113, 116, 124, 134, 149-151, 154-155, 157, 160, 171-172, 213, 218-219, 223, 228-232, 247, 254, 268, 326, 328, 338-339, 370, 390, 410-411, 423, 446, 455, 464, 476
solvability 291, 296-299, 301
Special Purpose Vehicle 352
spectral risk measures 478-480, 483, 486-487, 491,

493-494
 stakeholders 100, 114, 128, 153-159, 169-170, 172-173, 222, 267, 326
 stock markets 276, 285, 287, 362, 371-372, 389-390, 392-393, 397-401, 405-414, 416-417, 420-427, 446-447, 452-455, 459, 464-467, 473-477
 Strategic Costs 234-235, 239, 247
 strategic decision-making 126-127
 stratex 233, 235
 Structural Break 359, 373, 470
 structural costs 220-221, 223-224, 233, 235, 237, 243, 247
 structural equation model 248, 257
 structure of a holding company 41
 subsidiaries 42-43, 45, 47-48, 53, 163, 177, 179, 297
 sustainability 3, 5, 20, 25, 61, 74, 95, 108, 122-123, 149-150, 155, 157, 171, 184, 234, 243, 248, 268, 323, 325, 327-329, 334-335, 338-342
 Sustainable Development Goals 323-324, 329, 336, 338, 341
 synergy 43, 323-325, 330-331

T

tax code 275-276, 278
 technology 1, 18, 25, 59, 61, 71-72, 74-76, 88, 94, 109, 126, 149, 165, 167, 169, 199, 214, 227-228, 267, 272, 305, 307, 315-316, 318-319, 324, 326-328, 331, 334-335, 339-340, 343-357, 387, 443-444
 Telework 70, 72, 76
 Text-Mining 76
 Third Sector 59
 tourism 28, 94-96, 98-99, 107, 121, 183, 390, 464
 Transactional Costs 236, 238, 243, 247

U

uncertainty 2, 61, 78-81, 100, 176, 178, 180, 190, 202, 218, 245, 248-250, 252, 254, 256, 266-269, 271, 275-290, 292-293, 296, 301, 309, 316, 319, 359, 363, 393, 398, 426, 465-466, 478-480, 484, 486, 488-491, 493-494

unemployment 20-21, 26-27, 36, 62, 72, 96, 113, 187, 281, 286, 316
 United Nations 323-325
 Utility Function 496

V

value 1-19, 21, 28, 31-32, 34, 36-37, 42, 46, 48-51, 54, 66, 75, 78, 83, 86, 91-92, 95-96, 99-100, 103-105, 107, 109, 117-118, 122, 126-133, 135, 137-138, 140, 142-173, 176-178, 188, 191-192, 198-202, 209, 218-219, 221-224, 226, 228, 235-237, 239-241, 245, 247, 249, 251-252, 255, 259, 268, 273, 277-280, 286, 288, 292, 295, 298-299, 302, 304-306, 308-309, 321, 331-332, 334, 337, 340, 353, 361, 364, 375, 377, 380-381, 383, 386, 391, 393, 416, 429, 431, 446, 449-450, 467-468, 480, 488, 496
 value creation 1-12, 14-15, 17, 36, 128, 130, 149, 151, 153-165, 167-171
 value drivers 127-130, 143-145, 148-154, 159-162, 170-172
 value generators 126
 Value-at-Risk 478-479, 481, 484, 486, 491, 496
 variability 478, 480-482, 488, 490, 493-496
 variability measures 480, 482, 488, 490

W

Weak-Form Efficiency 359, 373, 391, 409, 476
 Working Capital (WC) 217
 working capital management 199-201, 203-205, 207, 212, 214-216

Z

ZBB 233, 236, 238
 Zmijewski model 174-175, 181, 191-193, 195, 197