



sustainability

The Influence of COVID-19 on Sustainable Economy

Edited by

Darko Vukovic, Moinak Maiti and Michael Frömmel

Printed Edition of the Special Issue published in *Sustainability*

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This is a reprint of articles from the Special Issue published online in the open access journal *Sustainability* (ISSN 2071-1050) (available at: https://www.mdpi.com/journal/sustainability/special_issues/influence_sustainable_economy).

For citation purposes, cite each article independently as indicated on the article page online and as indicated below:

LastName, A.A.; LastName, B.B.; LastName, C.C. Article Title. <i>Journal Name</i> Year , <i>Volume Number</i> , Page Range.

ISBN 978-3-0365-4403-8 (Hbk)

ISBN 978-3-0365-4404-5 (PDF)

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Contents

About the Editors	vii
Preface to “The Influence of COVID-19 on Sustainable Economy”	ix
Darko Vukovic, Moinak Maiti and Michael Frömmel Sustainable Economy in Light of COVID-19 Reprinted from: <i>Sustainability</i> 2022 , <i>14</i> , 5363, doi:10.3390/su14095363	1
Darko Vukovic, Moinak Maiti, Zoran Grubisic, Elena M. Grigorieva and Michael Frömmel Correction: Vukovic et al. COVID-19 Pandemic: Is the Crypto Market a Safe Haven? The Impact of the First Wave. <i>Sustainability</i> 2021 , <i>13</i> , 8578 Reprinted from: <i>Sustainability</i> 2021 , <i>13</i> , 12484, doi:10.3390/su132212484	5
Nils Engelhardt, Miguel Krause, Daniel Neukirchen and Peter Posch What Drives Stocks during the Corona-Crash? News Attention vs. Rational Expectation Reprinted from: <i>Sustainability</i> 2020 , <i>12</i> , 5014, doi:10.3390/su12125014	9
Elena-Sabina Turnea, Ștefan Andrei Neșțian, Silviu Mihail Tiță, Ana Iolanda Vodă and Alexandra Luciana Guță Dismissals and Temporary Leaves in Romanian Companies in the Context of Low Demand and Cash Flow Problems during the COVID-19 Economic Lockdown Reprinted from: <i>Sustainability</i> 2020 , <i>12</i> , 8850, doi:10.3390/su12218850	21
Ema Gusheva and Vincent de Gooyert Can We Have Our Cake and Eat It? A Review of the Debate on Green Recovery from the COVID-19 Crisis Reprinted from: <i>Sustainability</i> 2021 , <i>13</i> , 874, doi:10.3390/su13020874	43
Ionica Oncioiu, Ioana Duca, Mirela Anca Postole, Georgiana Camelia Georgescu (Crețan), Rodica Gherghina and Robert-Adrian Grecu Transforming the COVID-19 Threat into an Opportunity: The Pandemic as a Stage to the Sustainable Economy Reprinted from: <i>Sustainability</i> 2021 , <i>13</i> , 2088, doi:10.3390/su13042088	59
Baris Kocaarslan and Ugur Soytaş The Asymmetric Impact of Funding Liquidity Risk on the Volatility of Stock Portfolios during the COVID-19 Crisis Reprinted from: <i>Sustainability</i> 2021 , <i>13</i> , 2286, doi:10.3390/su13042286	77
Darko Vukovic, Moinak Maiti, Zoran Grubisic, Elena M. Grigorieva and Michael Frömmel COVID-19 Pandemic: Is the Crypto Market a Safe Haven? The Impact of the First Wave Reprinted from: <i>Sustainability</i> 2021 , <i>13</i> , 8578, doi:10.3390/su13158578	89
Nurul Ashykin Abd Aziz, Mohd Hizam-Hanafiah, Hasif Rafidee Hasbollah, Zuraimi Abdul Aziz and Nik Syuhailah Nik Hussin Understanding the Survival Ability of Franchise Industries during the COVID-19 Crisis in Malaysia Reprinted from: <i>Sustainability</i> 2022 , <i>14</i> , 3212, doi:10.3390/su14063212	107

About the Editors

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Dr. Vukovic is full professor and the head of the International Laboratory for Finance and Financial Markets at Faculty of Economics, People's Friendship University of Russia (RUDN University), in Moscow, Russia. Prof. Vukovic also works at Geographical Institute "Jovan Cvijic" of the Serbian Academy of Sciences and Arts, as the Head of Department of regional geography. His research interests are financial markets, forecasting, financial risk management, investment finance and regional economics. In 2021, he received a certificate for outstanding paper from Emerald publishing house, UK. Prof. Vukovic has published more than 50 papers indexed in leading databases—Web of Science (Clarivate Analytics), Scopus and ABS (CABS)—including leading journals in the fields of finance and financial forecasting.

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Preface to “The Influence of COVID-19 on Sustainable Economy”

One month after a global pandemic was declared by the World Health Organization in 2020, we (the editors) assumed that the impact of COVID-19 would cause dire consequences in all spheres of human and social life. We decided to run this Special Issue motivated by negative scenarios in financial markets (falling demand, indices, and the value of many companies), negative forecasts of macroeconomies, declining industrial production and recession in tourism markets. Our assumption about this “hot-topic” turned out to be correct. Thereupon, the entire global scientific community has set its primary goals to be focused on “COVID-19 studies”.

The scope of this Special Issue is to collect studies that measure, analyze and express the main issues of the financial-economic universe during the pandemic crisis. The aim is to discover what models would contribute the most to such analysis and how the global literature will respond to the consequences of the global pandemic. Given that the Special Issue covers a wide field of economics, finance and business, the audience to whom this collection of studies is addressed represents a broad scientific community. Authors from many countries have covered large geographical areas in their studies, making them interesting for a global audience. More precisely, within this book, the studies provide answers to the issues of COVID-19’s impact on the crypto-world, volatilities in financial markets, portfolio construction, behavioral finance, industry issues, sustainable and green economics, and business environments.

The editors of this book thank all the authors for their fantastic contributions and help in making this Special Issue able to provide more knowledge on the “pandemic economy”. We are especially grateful to Sustainability’s Editorial Office, for their help and effort in reviewing, improving and publishing the manuscripts covered in this edition. Lastly, we wish to mention that the editor Darko B. Vuković ran this edition as part of the project supported by the Russian Science Foundation (project no. 22-28-01553).

Darko Vukovic, Moinak Maiti, and Michael Frömmel
Editors

Sustainable Economy in Light of COVID-19

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1. Introduction

Two years after the onset of the COVID-19 pandemic, the economy has adapted to the new market conditions that coexist with this global phenomenon. The beginning of the pandemic was marked by a significant decline in global markets: restrictions on transportation and logistics, industry decline and, worst of all, a huge number of global deaths resulted in plummeting economic circumstances. However, in the last year, there has been marked recovery in social and economic trends. The United Nations (UN) announced a 2030 sustainable chain development agenda, with the aim to address the challenges posed by the pandemic. It can be argued that, in the last year, the economy has stabilized to the COVID-19 pandemic, with national leaders emphasizing victory over this crisis and attempting to return the world to normal. If one searches Publons (Web of Science) for COVID-19 related publications, the browser will open more than 89,728 results (as of 5 April 2022). Nature.com declares that, in 2020, about 4% of the world's study output was dedicated to COVID-19 related publications, with more than 200,000 works being published in the first year of the pandemic [1].

This Special Issue, "The Influence of COVID-19 on Sustainable Economy", actively contributes to the scientific community by publishing studies that analyze this issue. Most of the published papers are dedicated to issues surrounding financial markets and sustainable economy under the conditions of the COVID-19 pandemic. All published studies contain an analysis of quantitative data, reflecting real cases which have been methodologically analyzed. The results of these works focus on the development of a post-COVID-19 era, opening a window of chance for sustainable economic transition. Numerous new business processes have been created and the economy has become digitalized, creating new opportunities for sustainable development. Thus, although the COVID-19 crisis completely upended life as we knew it, we are now faced with [2] a world of new investment opportunities. A post-COVID-19 era, with the advent of new financial technologies, could generate sustainable markets, as well as new infrastructures, products and services, increasing the efficiency of business and improving market competition.

2. Synthesis and Contributions

Twenty-nine manuscripts were submitted for consideration for the Special Issue, and all of them were subject to the rigorous *Sustainability* review process. In total, eight papers (including one *corrigendum*) were finally accepted for publication and inclusion in this Special Issue. The contributions are listed below:

- Contribution 1: Abd Aziz, N.A.; Hizam-Hanafiah, M.; Hasbollah, H.R.; Aziz, Z.A.; Hussin, N.S.N. Understanding the Survival Ability of Franchise Industries during the COVID-19 Crisis in Malaysia. *Sustainability* **2022**, *14*, 3212. <https://doi.org/10.3390/su14063212>.

Citation: Vukovic, D.; Maiti, M.; Frömmel, M. Sustainable Economy in Light of COVID-19. *Sustainability* **2022**, *14*, 5363. <https://doi.org/10.3390/su14095363>

Received: 21 April 2022

Accepted: 25 April 2022

Published: 29 April 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



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- Contribution 2: Vukovic, D.; Maiti, M.; Grubisic, Z.; Grigorieva, E.M.; Frömmel, M. COVID-19 Pandemic: Is the Crypto Market a Safe Haven? The Impact of the First Wave. *Sustainability* **2021**, *13*, 8578. <https://doi.org/10.3390/su13158578>.
- Contribution 3: Kocaarslan, B.; Soytaş, U. The Asymmetric Impact of Funding Liquidity Risk on the Volatility of Stock Portfolios during the COVID-19 Crisis. *Sustainability* **2021**, *13*, 2286. <https://doi.org/10.3390/su13042286>.
- Contribution 4: Oncioiu, I.; Duca, I.; Postole, M.A.; Georgescu, G.C.; Gherghina, R.; Grecu, R.-A. Transforming the COVID-19 Threat into an Opportunity: The Pandemic as a Stage to the Sustainable Economy. *Sustainability* **2021**, *13*, 2088. <https://doi.org/10.3390/su13042088>.
- Contribution 5: Gusheva, E.; de Gooyert, V. Can We Have Our Cake and Eat It? A Review of the Debate on Green Recovery from the COVID-19 Crisis. *Sustainability* **2021**, *13*, 874. <https://doi.org/10.3390/su13020874>.
- Contribution 6: Turnea, E.-S.; Neșțian, Ș.A.; Tiță, S.M.; Vodă, A.I.; Guță, A.L. Dismissals and Temporary Leaves in Romanian Companies in the Context of Low Demand and Cash Flow Problems during the COVID-19 Economic Lockdown. *Sustainability* **2020**, *12*, 8850. <https://doi.org/10.3390/su12218850>.
- Contribution 7: Engelhardt, N.; Krause, M.; Neukirchen, D.; Posch, P. What Drives Stocks during the Corona-Crash? News Attention vs. Rational Expectation. *Sustainability* **2020**, *12*, 5014. <https://doi.org/10.3390/su12125014>.
- Contribution 8 (corrigendum): Vukovic, D.; Maiti, M.; Grubisic, Z.; Grigorieva, E.M.; Frömmel, M. Correction: Vukovic et al. COVID-19 Pandemic: Is the Crypto Market a Safe Haven? The Impact of the First Wave. *Sustainability* **2021**, *13*, 12484. <https://doi.org/10.3390/su132212484>.

The contributions covered large geographical areas, from specific country cases (Malaysia, Romania, and the Netherlands) to groups of countries (European Union members), and world data cases (world stock markets and crypto markets). All contributions relate to the wider field of economy: contributions 4 and 5 focus on macro and sustainable economy; contributions 2, 3, and 7 focus on the financial markets; and contributions 1 and 6 focus on business and management issues (Table 1).

Table 1. Research areas and analyzed issues in this Special Issue.

Research Area	Focus	Studies
Economy	Macroeconomy Sustainable economy Greenhouse gas emissions Green economy	Oncioiu et al. 2021 (Contribution 4) Gusheva and Gooyert 2021 (Contribution 5)
Finance	Financial markets The crypto market Portfolio selection and stock markets	Contributions 2, 3, and 7 Vukovic et al. 2021 (Contribution 2) Kocaarslan and Soytaş 2021 (Contribution 3), Engelhardt et al. 2020 (Contribution 7)
Business and Management	Industry analysis Corporate management	Abd Aziz et al. 2021 (Contribution 1) Turnea et al. 2020 (Contribution 6)

Contribution 1 (Abd Aziz et al., 2021) studied 12 franchise business owners and 4 franchise-related agencies in the Malaysian franchising industry during the COVID-19 crisis. Authors used in-depth interviews and the “Atlas.ti” method to analyze this issue. The novelty of this study is reflected in its suggestions to the Malaysian government and franchise-related agencies to create appropriate strategies, improve existing policies, and create effective franchising programs that can be sustained during a pandemic. Contribution 2 (Vukovic et al., 2021) focuses on the issues faced by global financial markets and cryptocurrencies, respectively, during the first wave of the COVID-19 crisis. The study analyzes the safety of the crypto market, developing a COVID-19 global composite index and applying ordinary least squares, quantile, and robust regressions models. All estimates

confirmed that there was no statistically significant direct influence of the COVID-19 crisis on crypto currency. One of the most important findings was that Tether could be used as a crypto market safe haven.

Contribution 3 (Kocaarslan and Soytaş 2021) also analyzed the state of the financial markets during the COVID-19 crisis. The authors applied a quantile regression model to analyze whether fluctuations in funding liquidity circumstances in interbank markets asymmetrically impacted the volatilities of stock portfolios during the COVID-19 crisis. The study tested macroeconomic factors and economic transmission channels to prove that the volatilities of high-risk portfolios increased more in response to a deterioration in funding liquidity conditions, which is a key feature of severe recession. Contribution 4 (Oncioiu et al., 2021) studied the macroeconomic conditions of the sustainable economies of the European Union member states. The study analyzed how supply and demand shocks affected greenhouse gas emissions using a complex regression model. According to the study results, the volume of greenhouse gas emissions declined by 9.8% in the European Union during the COVID-19 pandemic.

Contribution 5 (Gusheva and Gooyert 2021) studied the field of green and sustainable economy. Pertaining to the Netherlands, the authors applied systems thinking to test causal arguments concerning the crucial concepts encompassing green recovery, and identified issues of consensus and dissensus. According to the study results, green recovery contributes to curbing greenhouse gas emissions with increasing socioeconomic inequalities. Contribution 6 (Turnea et al., 2020) studied corporate management in Romania during the COVID-19 pandemic. The authors applied descriptive and regression analyses to test the data collected from company decision-makers to analyze the nexus between lower demand, cash flow issues, employee dismissals, and instances of temporary leave during the pandemic. Their findings confirmed the negative influence of the COVID-19 pandemic on all tested indicators.

Contribution 7 (Engelhardt et al., 2020) analyzes behavioral finance during the COVID-19 pandemic. The study tested rational expectations and news attention to the world's 64 largest national stock markets. The authors found that the stock markets declined a greater rate with news attention, and at a lesser rate with rational expectations. To test this, the study used the Susceptible–Infectious–Recovered regression model. The last contribution, number 8, is corrigendum of contribution 2.

This Special Issue contributes to both the theory and application of the proposed models, and discusses issues surrounding the financial markets, crypto currency management, corporate finance, business environment, macroeconomy issues, and green economy strategies.

3. Future Directions

There are several potential directions of study that could be adopted in the near future to implement a sustainable economy in light of the COVID-19 pandemic. This Special Issue, "The Influence of COVID-19 on Sustainable Economy", identifies the following directions:

1. The global economy has adapted to new conditions during the COVID-19 pandemic. We emphasize that the digitalization of the economy that occurred as a result of COVID-19 restrictions should be used to our advantage [3]. Before the COVID-19 pandemic, numerous studies had attempted to analyze the impact of crisis on financial markets [4,5] and forecast possible consequences [6]. The current pandemic has motivated many scholars to analyze new models and their applications;
2. Secondly, the COVID-19 crisis has illustrated the multidimensional relationship between nature, people, and social norms. This has demonstrated the strong nexus between green economy, sustainable economy, sustainable food production, the energy sectors and markets, inclusive (online) education, digital business and economy, lower gas emission, etc. For example, the nexus between the level of economic development and carbon price demonstrated a short-term negative correlation during the COVID-19 pandemic;

3. Lastly, governments have adopted new strategies to implement sustainable economic recovery plans to generate economic growth. These plans relate to concerns of the UN 2030 sustainable chain development agenda, such as digital environments and the economy, business, education, and labor, lower carbon emissions, rational food production, and many other issues related to the aftermath of COVID-19. Implementing these strategies will be challenging and costly. The transmission outcomes of these new policies should be identified and improved, with strong support from the government to create green industries and sustainable economies. This research direction will strongly influence future legislative and institutional changes and support.

Author Contributions: Conceptualization, D.V., M.M. and M.F.; validation, D.V.; formal analysis, D.V., M.M. and M.F.; investigation, D.V., M.M. and M.F.; resources, D.V.; data curation, D.V.; writing—original draft preparation, D.V.; writing—review and editing, D.V.; visualization, D.V.; supervision, D.V.; project administration, D.V.; funding acquisition, D.V. All authors have read and agreed to the published version of the manuscript.

Funding: This paper has been supported by the RUDN University Strategic Academic Leadership Program.

Acknowledgments: The study is results of the RUDN Strategic Academic Leadership Program Priority-2030 for the project No. 064703-2-174. The study has been supported by the RUDN University Strategic Academic Leadership Program. The authors are very grateful to Sustainability Editorial Office, for the help and effort in reviewing, improving, and publishing the articles included in the Special Issue.

Conflicts of Interest: The authors declare no conflict of interest.

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Correction

Correction: Vukovic et al. COVID-19 Pandemic: Is the Crypto Market a Safe Haven? The Impact of the First Wave. *Sustainability* 2021, 13, 8578

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Citation: Vukovic, D.; Maiti, M.; Grubisic, Z.; Grigorieva, E.M.; Frömmel, M. Correction: Vukovic et al. COVID-19 Pandemic: Is the Crypto Market a Safe Haven? The Impact of the First Wave. *Sustainability* 2021, 13, 8578. *Sustainability* 2021, 13, 12484. <https://doi.org/10.3390/su132212484>

Received: 3 November 2021

Accepted: 5 November 2021

Published: 12 November 2021

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The authors would like to make the following corrections to the published paper [1]. The changes are as follows:

- (1) To clearly indicate, the authors wish to add a citation in "Section 2. Theoretical Background".

The study by [15] forecasts the impact of COVID-19 will be huge, both economically and socially.

with

The study by [15,16] forecasts the impact of COVID-19 will be significant, both economically and socially.

- (2) Replacing the citation in "Section 2. Theoretical Background":

In the study of [16], wavelet methods were applied to examine the impact of COVID-19 on Bitcoin prices.

with

In the study of [17], wavelet methods were applied to examine the impact of COVID-19 on Bitcoin prices.

- (3) To clearly indicate, the authors wish to add a citation in "Section 2. Theoretical Background".

By using specifications that can account for structural breaks in GARCH, namely Markov switching GARCH models, the authors of [20] analyzed Bitcoin daily log returns exhibiting regime changes in their volatility dynamics.

with

By using specifications that can account for structural breaks in GARCH, namely Markov switching GARCH models, the authors of [20,21] analyzed Bitcoin daily log returns exhibiting regime changes in their volatility dynamics.

- (4) Replacing the citation in "Section 2. Theoretical Background":

The study by [21] tested two hypotheses regarding the role of a Tether in the crypto world, especially on Bitcoin.

with

The study by [22] tested two hypotheses regarding the role of a Tether in the crypto world, especially on Bitcoin.

- (5) Replacing the citation in “Section 2. Theoretical Background”:

On the other hand, ref. [21] found in their study that Tether has a sizable impact on Bitcoin prices.

with

On the other hand, ref. [20] found in their study that Tether has a sizable impact on Bitcoin prices.

- (6) To clearly indicate, the authors wish to add a citation in “Section 2. Theoretical Background”

The study by [37] analyzed the dynamic role of gold as a safe haven and found that investors’ behavior can destroy this role in practice.

with

The study by [37,38] analyzed the dynamic role of gold as a safe haven and found that investors’ behavior can destroy this role in practice.

- (7) Replacing the citation in “Section 2. Theoretical Background”:

The analysis by [38] seems to support this finding by applying a VAR-ADCC-BVGARCH (vector autoregressive asymmetric dynamic conditional correlation bivariate generalized autoregressive conditional heteroskedasticity) to the US financial market during the period of 2007–2017, although there is consensus in the literature that gold could be a risk-diminishing instrument against stocks.

with

The analysis by [39] seems to support this finding by applying a VAR-ADCC-BVGARCH (vector autoregressive asymmetric dynamic conditional correlation bivariate generalized autoregressive conditional heteroskedasticity) to the US financial market during the period of 2007–2017, although there is consensus in the literature that gold could be a risk-diminishing instrument against stocks.

- (8) Replacing the citation in “Section 2. Theoretical Background”:

For example, the authors of [45] suggest a bivariate copula approach for tail risk modeling, the authors of [30] propose a linear bivariate quantile regression (bivariate CoVaR) as the most appropriate model, and [43] (based on the work of [46,47]), used a tail-event driven network to analyze the tail-risk interdependence among 23 cryptocurrencies.

with

For example, the authors of [44] suggest a bivariate copula approach for tail risk modeling, the authors of [44] propose a linear bivariate quantile regression (bivariate CoVaR) as the most appropriate model, and [43] (based on the work of [46,47]), used a tail-event driven network to analyze the tail-risk interdependence among 23 cryptocurrencies.

- (9) To clearly indicate, the authors wish to add two citations in “Section 2. Theoretical Background”

According to [53,54], such a model visualizes heteroscedasticity in the dataset.

with

According to [53–56], such a model visualizes heteroscedasticity in the dataset.

- (10) Replacing the citation in “Section 2. Theoretical Background”

This technique was popularized by [55], who found that it is possible to model the relationship between returns and beta for companies that overperform and underperform relative to the mean.

with

This technique was popularized by [53], who found that it is possible to model the relationship between returns and beta for companies that overperform and underperform relative to the mean.

(11) Replacing the citation in “Section 2. Theoretical Background”

In the study of [56], it was shown that quantile regression is the most appropriate model in the study of the sensitivity of cryptocurrency returns to changes in gold price returns.

with

In the study of [57], it was shown that quantile regression is the most appropriate model in the study of the sensitivity of cryptocurrency returns to changes in gold price returns.

(12) Replacing the citation in “Section 3.2.1. COVID-19 Global Index Construction”

For the present study, we constructed a composite COVID-19 index following [57–59] to answer the fundamental question of how one should measure the effect of COVID-19 globally.

with

For the present study, we constructed a composite COVID-19 index following [58–60] to answer the fundamental question of how one should measure the effect of COVID-19 globally.

(13) Replacing the citation in “Section 3.2.2. Wavelet Coherence”

To study the co-movement between the cryptocurrencies’ daily returns, a wavelet coherence diagram was plotted using the “biwavelet” R package, similar to the studies of [60,61].

with

To study the co-movement between the cryptocurrencies’ daily returns, a wavelet coherence diagram was plotted using the “biwavelet” R package, similar to the studies of [61,62].

(14) To clearly indicate, the authors wish to delete a citation in “Section 3.2.3. Regressions”.

The authors of [62–65] and others extensively used this method recently to derive the study estimates.

with

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(15) To clearly indicate, the authors wish to delete three citations in “Section 5. Conclusions”.

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The authors and the Editorial Office would like to apologize for any inconvenience caused to the readers and state that the scientific conclusions are unaffected. The original article has been updated.

Reference

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Article

What Drives Stocks during the Corona-Crash? News Attention vs. Rational Expectation

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Received: 28 April 2020; Accepted: 17 June 2020; Published: 19 June 2020

Abstract: We explore if the corona-crash 2020 was driven by news attention or rational expectations about the pandemic’s economic impact. Using a sample of 64 national stock markets covering 94% of the world’s GDP, we find the stock markets’ decline to be mainly associated with higher news attention and less with rational expectation. We estimate the economic cost from the news hype to amount to USD 3.5 trillion for the US and USD 200 billion on average for the rest of the G8 countries.

Keywords: corona-crash; news attention; investor expectation

JEL Classification: G01; G1; G15

1. Introduction

The spread of the coronavirus Sars-CoV-2 causing the disease called COVID-19 hit the world’s economy unprepared. The increasing number of infections has not only led to countermeasures by the affected countries’ governments but also resulted in a severe decline in stock markets. For instance, the S&P500 dropped by 33% from its all-time high during the corona stock market crash (see Figure 1).

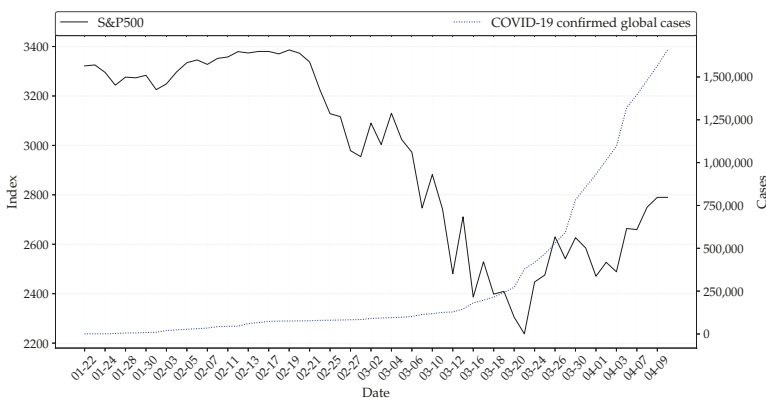


Figure 1. This figure shows the S&P500 stock market index and global confirmed COVID-19 cases for the period from 22 January 2020 to 9 April 2020. The figure is our own contribution based on stock market data from Trading Economics and COVID-19 infection data from Johns Hopkins University.

While several recent studies show negative stock market reactions to the most severe pandemic since the Spanish flu in 1918 [1–3], the question still remains to what extent this was driven by (bounded) rational expectations. In this paper we explore whether such expectations prevail over a news hype which could have driven traders into panic mode. Our aim is to study the short-term effects on global financial markets during the ongoing COVID-19 crisis.

As proxies for bounded rational expectation we use both the growth rates from the exponential fit as well as the epidemiologists' susceptible–infectious–recovered (SIR) model by Hethcote [4]. This is because without countermeasures in place, a pandemic grows exponentially [5], while in later stages the growth of infections starts following a logistic function with increasing herd immunity. We refer to the concept of bounded rationality, because if models are not correctly specified by individuals with cognitive limitations, they might result in non-rational expectations [6,7]. However, we believe that the underlying models used in this study represent the best alternatives to approximate the severity of the current COVID-19 pandemic. For brevity, we denote our measures of bounded rational expectation as rational expectation throughout the paper.

News attention is proxied by Google's abnormal search volume [8]. We hereby refer to the concept of rational inattention. Although news may be biased and incomplete, investors and especially retail investors may nonetheless rely on them to make their investment decisions because fitting models on real data is time consuming and requires cognitive effort which may be too costly [9]. However, when relying on news as the primary source of information for investment decision making, investors are confronted with the negativity bias. As psychological literature shows, people pay increased attention to negative information [10–12]. In the economic context, Carroll [13] and Garz [14] even highlight repeated media coverage leading the public into forming rather pessimistic "expectations" than rational expectations.

Using stock market indices from 64 countries, covering 94% of the world's GDP, we find the stock markets' decline to be mainly associated with higher news attention and less with rational expectation. Over our entire observation period, a one standard deviation increase in news attention leads to a decrease of 0.279 standard deviations of market returns, while a one standard deviation increase in our rational expectation measure results in a decrease of 0.131 standard deviations of market returns. This imposes significant economic costs. For instance, we estimate the economic cost for the US stock market resulting from the news hype to amount to USD 3.5 trillion until April 2020.

Our findings also imply investors should rather focus on news attention than on rational expectation when making their investment decisions during a crisis. Comparing three different investment strategies, we find a strategy focusing on news attention during the corona crisis to outperform both a buy and hold strategy and a strategy based on rational expectation. This is in line with the findings from psychology highlighting the increased attention to negative information.

The remainder of this paper is structured into a literature review, a description of the data and methodology used, followed by a discussion of the results, and a final conclusion.

2. Literature Review

There is an evolving strand of literature on the impact of COVID-19 on global financial markets. Baker et al. [15], Liu et al. [1], Zhang et al. [2], and Ali et al. [16] show the COVID-19 pandemic having induced an enormous level of uncertainty accompanied by high market volatility and significant negative market returns across all affected countries. Zaremba et al. [17] even show that countries' policy interventions increase stock market volatility.

Higher growth rates of confirmed COVID-19 cases also result in negative effects for companies as investors and analysts became extremely concerned about corporate debt and liquidity [18–20]. Especially, companies whose corporate identity is related to the term 'corona' are experiencing additional pressure and exhibit abnormal losses [21].

Contagion effects of the crisis have been analyzed by Conlon and McGee [22], Corbet et al. [23] and Ji et al. [24] who focus on cryptocurrencies, gold, and commodity futures. During the COVID-19

pandemic Bitcoin does not act as a safe-haven nor does it offer any hedging opportunities. Gold and soybean futures, however, are seen as safe-havens in the current crisis. Moreover, Sharif et al. [3] examine the relationship between the COVID-19 outbreak, the oil price and the US stock market. They show that news concerning oil prices and the pandemic appear to be a driver of the US financial market. This is in line with the paper by Mamaysky [25] who shows news sentiment to explain volatility among several asset classes in the US.

Based on the studies mentioned above investigating the stock markets' reaction to the crisis, our paper contributes by disentangling potential drivers, namely news attention and rational expectation. Furthermore, we contribute to the literature by measuring the economic costs resulting from news attention.

3. Data and Methodology

We obtained daily data on confirmed COVID-19 cases per country from 22 January 2020 to 9 April 2020 from Johns Hopkins University and daily Google search volume (SVI) for the keyword "corona" for each affected country as well as daily closing prices of the country's lead stock market index from Trading Economics. Our final sample consisted of daily data for 64 countries covering 94% of the world's GDP. Table A1 in the Appendix A holds a list of countries covered.

To estimate the news attention we calculated an abnormal Google search volume index (ASVI), which was also commonly used to measure retail investor attention [8,26]. Plante [27] shows search volume to strongly correlate with news attention as the amount of news the public is confronted with translates into a rise of related Google searches. Since we investigate a rather small time window, we adjusted the measure proposed by Da et al. [8] by calculating our news coverage variable (NC_t) as the natural log of the search volume on trading day $t - 1$ minus the natural log of the median search volume over the previous five trading days.

$$NC_t = \log(SVI_{t-1}) - \log(\text{med}(SVI_{t-2}, \dots, SVI_{t-6})). \quad (1)$$

To estimate rational expectations of the corona pandemic we turn to epidemiological models. For infectious diseases such as COVID-19, the spread of infections is initially characterized by an exponential growth in time [28]. Using the data from Johns Hopkins University, we fit the number of infections to an exponential growth model $P(t) = a \cdot \exp(b \cdot t)$ with $P(t)$ being the number of infections at time t , $P(0) = a$ being the initial value of P , and b being the exponential growth rate. We calculated daily exponential growth rates by fitting the exponential growth model and used the change in growth rates between two days as proxy for a rational investor's expectation.

In later stages of the pandemic and as countermeasures unfold, the exponential growth is weakened and the infections start following a logistic function. This is incorporated in the epidemiological standard model—the Susceptible–Infectious–Recovered model (SIR) [4,29]. This model uses both the number of infected individuals and the number of susceptible and recovered individuals in a population. Based on the assumption of immunity of recovered individuals the SIR model derives from a set of differential equations as the transmissions between the groups of individuals are formulated as derivatives. Following Ma [30] the model equations are

$$\begin{aligned} \frac{dS(t)}{dt} &= -\frac{\beta}{N}I(t)S(t) \\ \frac{dI(t)}{dt} &= \frac{\beta}{N}I(t)S(t) - \gamma I(t) \\ \frac{dR(t)}{dt} &= \gamma I(t), \end{aligned} \quad (2)$$

where $S(t)$ is the number of susceptible individuals at time t , $I(t)$ is the number of infected individuals at time t , $R(t)$ is the number of recovered individuals, β is the transmission rate per infectious

individual, and γ is the recovery rate. The overall number of individuals $N = S(t) + I(t) + R(t)$ is considered as a constant. The expected growth rate of the SIR model can be calculated as $\lambda = \beta - \gamma$. As above, we also fit the SIR model at each time step and use the changes in growth rates between t and $t + 1$ as an independent variable for a rational investor’s expectation in additional regression models.

Table 1 provides descriptive statistics for the variables in our sample. Mean daily log returns of the stock market indices were negative over our observation period indicating the massive impact of the COVID-19 pandemic. The lower mean of -0.4% compared to the median of -0.02% is related to large drops on single days, especially on “Black Thursday” 12 March 2020 where the S&P500 dropped by 10% marking the worst day since the stock market crash in 1987 [31]. The changes of the exponential growth rates and SIR growth rates exhibited a positive mean. News coverage based on the ASVI for the keyword “corona” had a positive mean of 4.69%.

Table 1. The table reports descriptive statistics for the entire sample. The sample contains a total of 3366 observations. We observe 64 countries over a time period of 51 trading days starting from 30 January 2020 to 9 April 2020. The market return variable is defined by the log return series of each stock market index. For the rational investor’s expectation we use the changes of the exponential growth rates and as an alternative the changes of the susceptible–infectious–recovered (SIR) growth rates. We calculate our news attention variable as the abnormal Google search volume index (ASVI) for the keyword “corona”. The stock market data come from Trading Economics. COVID-19 data for the fitted growth rates come from Johns Hopkins University.

	Observations	Minimum	Maximum	Mean	Median	Std.
Market Return	3366	−0.1854	0.1554	−0.004	−0.0002	0.0294
Exponential Growth Rate	3366	−1.3481	2.2777	0.0006	−0.0022	0.1527
SIR Growth Rate	3366	−1.7375	2.5254	0.0047	0	0.245
News Attention	3366	−1.9459	3.4012	0.0469	0	0.4284

To examine the impact of news attention and rational investor expectation on the development of stock markets during the COVID-19 crisis, we consider the following straightforward regression model

$$MKT_{i,t} = \rho MKT_{i,t-1} + \beta_1 EXP_{i,t} + \beta_2 NC_{i,t} + \varepsilon_{i,t}, \tag{3}$$

where i is the country and t denotes the trading day. $MKT_{i,t}$ is the stock market return for country i at time t . The expected exponential growth rate $EXP_{i,t}$ is used as our measure for rational expectation, while $NC_{i,t}$ measures news attention for the keyword “corona”. We use the lagged log returns of the national stock market indices $MKT_{i,t-1}$ to control for all other market effects [32].

Since with a lagged dependent variable the regressors are no longer exogenous and the ordinary least squares (OLS) estimator is biased and inconsistent (e.g., [33]), we estimate the model using the generalized method of moments (GMM) estimator, which provides consistent and unbiased estimates for dynamic panel data models—especially for panel datasets with small time periods T relative to the number of individuals N [34,35].

4. Results and Discussion

Table 2 shows the regression results where for the purpose of comparison, all variables are scaled to have a standard deviation of one and weighted by their country’s GDP.

In Model (1), we used the expected exponential growth rate and news attention as our main independent variables. We also included the one-day lagged market return as an independent variable. As the results show, all regression coefficients were negative and statistically significant. However, the coefficient on news attention was larger in magnitude than the coefficient on our rational expectation variable; thus indicating news attention to be the dominant driver of the drop in stock prices over the entire observation period. To put this into perspective, a one standard deviation increase in news attention leads to a decrease of 0.279 standard deviations of market returns, while a one standard deviation increase in our rational expectation variable results in a decrease of 0.131 standard deviations

of market returns. Further, the coefficient on the one-day lagged market return was larger in magnitude compared to our rational expectation variable. This implies yesterday's market development to have a larger impact than the rational expectation for tomorrow.

Table 2. The effect of news attention and rational investor expectation on global stock markets. This table provides regression results from the estimation of the model: $MKT_{i,t} = \rho MKT_{i,t-1} + \beta_1 EXP_{i,t} + \beta_2 NC_{i,t} + \varepsilon_{i,t}$, where i is the country and t denotes the trading day starting from 30 January 2020 to 9 April 2020. We use the generalized method of moments (GMM) estimator from Arellano and Bond [35]. The dependent variable is the log return of each stock market index MKT_i . The control variable is the lagged log return of each stock market index MKT_{i-1} . The expected exponential growth rate $EXP_{i,t}$ is our measure for rational expectation in Model (1), while $NC_{i,t}$ measures news attention for the keyword “corona” (based on ASVI). In Model (2) we use the expected SIR growth rate for rational expectation. The instrument in the GMM estimation is MKT_{i-1} . The stock market data come from Trading Economics. COVID-19 data for the fitted growth rates come from Johns Hopkins University. Robust standard errors are reported in parentheses. *, **, *** denote significance at the 10%, 5% and 1% level.

Dependent Variable: Market Return	Model (1)	Model (2)
Lagged Market Return	−0.216 ** (0.090)	−0.212 ** (0.094)
Expected Exponential Growth Rate	−0.131 *** (0.033)	
Expected SIR Growth Rate		−0.019 (0.054)
News Attention	−0.279 *** (0.017)	−0.293 *** (0.016)
Observations	3264	3264
Countries	64	64
Trading days	51	51
Estimation method	GMM	GMM
Robust Standard Errors	yes	yes
Country fixed effects	yes	yes
Time fixed effects	no	no

In Model (2), we estimated the model using the changes in growth rates of our SIR model as the independent variable. The coefficients on the one-day lagged market return and news attention are negative, similar in size, and also statistically significant. The coefficient on our rational expectation variable, however, is not statistically significant. This is mostly in line with our results found in Model (1) indicating the large impact of news attention on stock markets during the COVID-19 crisis.

Figure 2 displays statistically significant coefficients from expanding window regressions using the GMM estimator with the same model specification as used in Model (1). We also show the development of the S&P500 and present major news events during the corona crisis as points of reference.

Our first estimation window contained data for the period from 30 January 2020 through 12 February 2020. From this point on, we gradually expand our sample by adding data for one additional trading day. Hence, the last estimation is based on our entire sample for the period from 30 January 2020 through 9 April 2020. As shown in Figure 2, we find negative and statistically significant coefficients on news attention for almost all window sizes, which are also larger in magnitude compared to our rational expectation variable. Thus, this supports our findings from Table 2 showing news attention to have an important impact on the stock price development during the COVID-19 crisis.

Figure 2 also shows, for small window sizes ranging from 10 to 15, the rational expectation variable not to be statistically significant in our model. By extending the window sizes (16 to 30), the coefficients on our rational expectation variable become significant, which goes along with the drop in stock markets. However, the coefficients on news attention are nonetheless larger in magnitude for most window sizes. Furthermore, by extending our window size the coefficients on our variables exhibit less volatility.

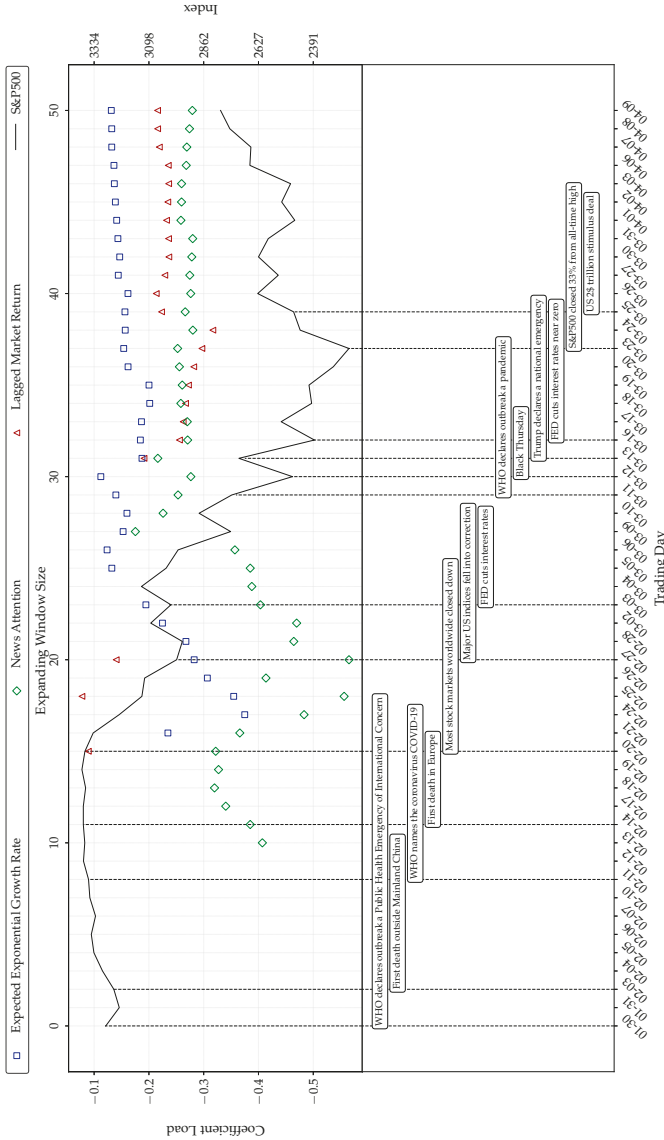


Figure 2. The effect of news attention and rational investor expectation on global stock markets. This figure provides expanding window regression results from the estimation of the model: $MKT_{i,t} = \rho MKT_{i,t-1} + \beta_1 EXP_{i,t} + \beta_2 NC_{i,t} + \varepsilon_{i,t}$, where i is the country and t denotes the trading day starting from 30 January 2020 to 9 April 2020 with a minimum window size of 10. We use the GMM estimator from Arellano and Bond [35]. The dependent variable is the log return of each stock market index $MKT_{i,t}$. The control variable is the lagged log return of each stock market index $MKT_{i,t-1}$. The expected exponential growth rate $EXP_{i,t}$ is our measure for rational expectation, while $NC_{i,t}$ measures news attention for the keyword “corona” (based on ASV). The variables are weighted by GDP and scaled to have a standard deviation of one. The instrument in the GMM estimation is $MKT_{i,t-1}$. GMM coefficients are reported with a significance level of 5%. The figure is our own contribution based on stock market data from Trading Economics and COVID-19 infection data from Johns Hopkins University.

4.1. Investment Strategies

To test whether an investor focusing on news attention rather than rational expectation is more successful during the corona crisis, we constructed three different portfolios: a “buy-and-hold portfolio”, which invests into the stock market index only, a “news attention” portfolio, and a “rational expectation” portfolio. We assume no transaction costs and do not allow short selling. The news attention investor, as well as the rational expectation investor, buys each stock market index at the beginning and uses buy and sell signals for her investment decisions until the end of the time period. Each investor only holds one stock market index in her portfolio instead of building an efficient portfolio which contains all the companies of the respective stock market index. We use the coefficients from the expanding window regressions in Figure 2 as buy and sell signals. Both the news attention and the rational investor increase or decrease their portfolio holdings according to the trading signal at each point in time.

Table 3 reports the mean returns of the three different portfolios. Panel A compares the mean returns of the buy-and-hold portfolio with the mean returns of the news attention portfolio. Although both portfolios realized a negative mean return during the crisis, the loss from the news attention portfolio was at least 5.1 percentage points smaller than the loss from the buy-and-hold portfolio. In Panel B, we compare the buy and hold portfolio with the rational investor portfolio. Again both portfolios realized a negative return, but the mean return of the rational expectation portfolio was higher. Finally, Panel C compares the mean returns of the news attention portfolio with the mean returns of the rational investor portfolio. The loss from the news attention portfolio was at least 1.5 percentage points smaller compared to the rational investor portfolio. This stresses that an investor focussing on news attention during the corona crisis to outperform both a buy-and-hold investor as well as a rational expectation investor. Further, it underlines the findings from psychology literature showing the increased attention to negative information.

Table 3. Trading strategies of three different types of investors. This table shows mean returns of each investor’s portfolio covering 64 stock market indices for the period from 21 February 2020 through 9 April 2020. We assume no transaction costs and no short selling. The buy-and-hold investor buys a stock market index at the beginning and sells it at the end of the time period. The news attention investor as well as the rational expectation investor buys each stock market index at the beginning and uses buy and sell signals until the end of the time period. As trading signals, we primarily use the coefficients from the expanding window regressions in Figure 2. Both the news attention and the rational investor increase or decrease their portfolio by X% (according to the trading signal) at each point in time. For robustness purposes, we also use weighted coefficients and the change in coefficients as additional trading signals. We perform a two-sided *t*-test to test whether the portfolio mean returns of the strategies significantly differ from each other. Additionally, we perform a one-sided *t*-test to test whether the difference of the mean returns of the two strategies significantly differs from zero. *, **, *** denote significance at the 10%, 5% and 1% level.

	Trading Signal		
	Coefficient	Weighted Coefficient	Coefficient Change
Panel A			
Buy and hold portfolio	−0.2001 ***	−0.2001 ***	−0.2001 ***
News attention portfolio	−0.0255 ***	−0.0412 ***	−0.1492 ***
Difference	−0.1747 ***	−0.1590 ***	−0.0510 ***

Table 3. Cont.

	Trading Signal		
	Coefficient	Weighted Coefficient	Coefficient Change
Panel B			
Buy and hold portfolio	−0.2001 ***	−0.2001 ***	−0.2001 ***
Rational investor portfolio	−0.0405 ***	−0.1049 ***	−0.1636 **
Difference	−0.1597 ***	−0.0952 ***	−0.0366 ***
Panel C			
Rational investor portfolio	−0.0405 ***	−0.1049 ***	−0.1636
News attention portfolio	−0.0255 ***	−0.0412 ***	−0.1492
Difference	−0.0150 ***	−0.0637 ***	−0.0144

4.2. Economic Costs

To estimate the economic costs resulting from the focus on news rather than rational expectation, we first performed one-day-ahead predictions per country using our econometric model's estimators:

$$\begin{aligned}\mathbb{E}[MKT_{i,t+1}] &= \hat{\rho}MKT_{i,t} + \hat{\beta}_1EXP_{i,t} + \hat{\beta}_2NC_{i,t} \\ \mathbb{E}[MKT_{i,t+1}] &= \hat{\rho}MKT_{i,t} + \hat{\beta}_1EXP_{i,t}.\end{aligned}\quad (4)$$

As shown above, we estimated a model including our coefficient for news attention as well as a model excluding our coefficient for news attention. We then accumulate the estimated returns and calculate the difference to separate the effect of trading based on news attention from trading based on rational expectation. Finally, we multiply this difference with the market capitalization of the respective stock market to estimate the economic costs per country. Table 4 reports the results for the G8 countries.

Table 4. Economic costs of news attention during the corona crisis. This table reports the results for the G8 countries. We perform one-day-ahead predictions per country for the period from 21 February 2020 through 9 April 2020 using the following models and our coefficients from the GMM estimation: Model (1) includes our coefficient for news attention ($\mathbb{E}[MKT_{i,t+1}] = \hat{\rho}MKT_{i,t-1} + \hat{\beta}_1EXP_{i,t} + \hat{\beta}_2NC_{i,t}$), while Model (2) excludes our coefficient for news attention ($\mathbb{E}[MKT_{i,t+1}] = \hat{\rho}MKT_{i,t-1} + \hat{\beta}_1EXP_{i,t}$). We then cumulate the estimated returns and calculate the difference to separate the effect of trading based on news attention from trading based on rational expectation. We multiply this difference with the market capitalization of the respective stock market to estimate the economic costs per country. Market capitalization data come from Compustat Capital IQ.

Country	Market Capitalization (in Million USD)	Economic Cost (in Million USD)	Economic Cost (in %)
Canada	1,592,169	−173,742	−10.91
France	2,022,046	−284,826	−14.09
Germany	1,252,274	−276,017	−22.04
Italy	352,545	−34,631	−9.82
Japan	3,458,684	−166,053	−4.80
Russia	691,092	−73,904	−10.69
United Kingdom	3,182,449	−419,499	−13.18
United States	28,256,391	−3,469,174	−12.28

As the results show, trading based on news attention during the corona crisis has a large impact on the respective stock markets. For instance, the economic cost for the US stock market amount to approx. USD 3,469,174 million. In relation to the market capitalization, the effect is even larger for Germany where the economic cost due to trading based on news attention amount to approx. USD 276,017 million.

4.3. Robustness

For robustness purposes, we also estimated OLS regressions using the log returns of the national stock market indices as the dependent variable, while using our rational expectation variable and news attention as the main independent variables of interest. We also included the lagged log return of the S&P500 as a control variable. Using the lagged log return of the S&P500 allowed us to receive consistent OLS coefficient estimates because there was no dynamic adjustment in the econometric model. Moreover, empirical literature since the 1990s has shown a considerable comovement between national stock market indices; especially when global shocks affect markets [36–38]. As the US stock market is the most influential in the world [39,40], we expect the lagged log return of the S&P500 to be an appropriate predictor for the performance of the national stock market indices on the next trading day. Table 5 presents the regression results.

Table 5. The effect of news attention and rational investor expectation on global stock markets. This table provides regression results from the estimation of the model: $MKT_{i,t} = \rho MKT_{i,t-1}^{S\&P500} + \beta_1 EXP_{i,t} + \beta_2 NC_{i,t} + \varepsilon_{i,t}$, where i is the country and t denotes the trading day starting from 30 January 2020 to 9 April 2020. The dependent variable is the log return of each stock market index MKT_i . The control variable is the lagged log return of the S&P500 stock market index $MKT_{i,t-1}^{S\&P500}$. The expected exponential growth rate $EXP_{i,t}$ is our measure for rational expectation in Model (1), while $NC_{i,t}$ measures news attention for the keyword “corona” (based on ASVI). In Model (2) we use the expected SIR growth rate as our rational expectation variable. The stock market data come from Trading Economics. COVID-19 data for the fitted growth rates come from Johns Hopkins University. Robust standard errors are reported in parentheses. *, **, *** denote significance at the 10%, 5% and 1% level.

Dependent Variable: Market Return	Model (1)	Model (2)
Lagged S&P500 Market Return	−0.006 (0.045)	−0.006 (0.044)
Expected Exponential Growth Rate	−0.039 ** (0.019)	
Expected SIR Growth Rate		−0.012 (0.012)
News Attention	−0.226 *** (0.019)	−0.231 *** (0.021)
Observations	3264	3264
Countries	64	64
Trading days	51	51
Estimation method	OLS	OLS
Robust Standard Errors	yes	yes
Country/Time fixed effects	no	no

The results show a similar picture to the one found in the GMM regressions. In Model (1), where the rational expectation variable based on the exponential growth model is used as an independent variable, we find negative and statistically significant coefficients on the variables news attention and rational expectation. In line with the results of the GMM regressions, news attention has a greater influence compared to the rational investor expectation. In Model (2), where the rational expectation variable based on the SIR model is used as an independent variable, we only find a statistically significant coefficient on news attention. In both models, however, we do not find statistically significant coefficients on the lagged log return of the S&P500.

As further robustness checks, we first use the keyword “coronavirus” to construct our news attention variable and estimate all GMM and OLS regressions once more. Second, we adjust the way we calculate our measure for news attention. Instead of using the search volume over the previous five trading days to calculate our news attention measure, we consider the average search volume over the entire sample period. The results do not change qualitatively compared to our previous findings.

5. Conclusions

Financial markets have been on an unprecedented decline during the COVID-19 crisis, indicating wide implications for market participants and policy makers. In this paper, we have analyzed whether the current drop in financial markets is mainly driven by news attention or rational investor expectation.

By investigating a sample of 64 national stock markets, news attention has a significantly negative impact on financial markets. This effect is larger in magnitude compared to the impact of a rational investor's expectation. This imposes significant economic costs. For instance, we estimate the economic cost for the US stock market resulting from the news hype to amount to USD 3.5 trillion until April 2020.

We contribute to the evolving body of research in several ways. We not only disentangle the potential drivers of the stock market reactions but also quantify the impact of news attention on financial markets. Our findings also imply investors should rather focus on news attention than on rational expectation when making their investment decisions during a crisis. Especially, professional investors should, apart from searching for safe-havens, adjust their investment strategy accordingly in order to minimize potential losses.

Finally, as with all research studies our paper has certain limitations. Since we investigate a rather small time window, we are only able to measure the short term effect of news attention and investors' rational expectation on global stock markets during the COVID-19 crisis. Further, although we checked the robustness of our news attention measure, there might also be additional proxies which might capture news attention.

Author Contributions: Conceptualization, N.E., M.K., D.N. and P.P.; data curation, N.E., M.K. and D.N.; formal analysis, N.E., M.K. and D.N.; investigation, N.E., M.K. and D.N.; methodology, N.E., M.K., D.N. and P.P.; project administration, N.E. and P.P.; resources, N.E., M.K., D.N. and P.P.; software, N.E., M.K. and D.N.; supervision, P.P.; validation, N.E., M.K. and D.N.; visualization, N.E., M.K. and D.N.; writing—original draft, N.E., M.K. and D.N.; writing—review and editing, N.E., M.K., D.N. and P.P. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Acknowledgments: The authors wish to thank the team of the center for Finance, Risk and Resource management of the Technical University of Dortmund for their technical and administrative support. Further, we acknowledge financial support by Deutsche Forschungsgemeinschaft and Technische Universität Dortmund/TU Dortmund Technical University within the funding programme Open Access Publishing.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. This table shows the global stock market indices used in this study. ISO codes for each country are reported. For each country we select stock market indices which come from Trading Economics. Our sample covers 64 countries accounting for 94% of the world's GDP and containing countries of each economic region: East Asia and Pacific (10), Europe and Central Asia (32), Latin America and Caribbean (8), Middle East and North Africa (3), North America (2), South Asia (3) and Sub-Saharan Africa (6).

ID	ISO	Country	Market Index	ID	ISO	Country	Market Index
1	AUS	Australia	ASX200	33	KEN	Kenya	NSE20
2	AUT	Austria	ATX	34	KOR	South Korea	KOSPI
3	BEL	Belgium	BEL20	35	LBN	Lebanon	BLOM
4	BGR	Bulgaria	SOFIX	36	LKA	Sri Lanka	CSE
5	BRA	Brazil	BOVESPA	37	LUX	Luxembourg	LUXX
6	BWA	Botswana	BSI DCI	38	LVA	Latvia	OMX Riga
7	CAN	Canada	TSX	39	MAR	Morocco	MASI
8	CHE	Switzerland	SMI	40	MEX	Mexico	IPC

Table A1. Cont.

ID	ISO	Country	Market Index	ID	ISO	Country	Market Index
9	CHL	Chile	IGPA	41	MUS	Mauritius	SEMDEX
10	CHN	China	SSE	42	MYS	Malaysia	FTSE KLCI
11	COL	Colombia	IGBC	43	NGA	Nigeria	NSE 30
12	CYP	Cyprus	CSE	44	NLD	Netherlands	AEX
13	CZE	Czech Republic	SE PX	45	PAK	Pakistan	KSE100
14	DEU	Germany	DAX	46	PER	Peru	PEN
15	DNK	Denmark	OMX20	47	PHL	Philippines	PSEi
16	ECU	Ecuador	BVQA	48	POL	Poland	WIG
17	ESP	Spain	IBEX 35	49	PRT	Portugal	PSI20
18	EST	Estonia	OMX Tallinn	50	ROU	Romania	BET
19	FIN	Finland	HEX25	51	RUS	Russia	MICEX
20	FRA	France	CAC 40	52	SGP	Singapore	STI
21	GBR	United Kingdom	FTSE 100	53	SRB	Serbia	BELEX15
22	GHA	Ghana	GSE-CI	54	SVK	Slovakia	SAX
23	GRC	Greece	ASE	55	SVN	Slovenia	SBITOP
24	HRV	Croatia	CROBEX	56	SWE	Sweden	OMX30
25	HUN	Hungary	BUX	57	THA	Thailand	SET50
26	IDN	Indonesia	JCI	58	TUN	Tunisia	TUNINDEX
27	IND	India	SENSEX	59	TUR	Turkey	XU100
28	IRL	Ireland	ISEQ	60	TWN	Taiwan	TWSE
29	ISL	Iceland	SE ICEX	61	USA	United States	DJIA
30	ITA	Italy	FTSE MIB	62	VEN	Venezuela	IBVC
31	JAM	Jamaica	Jamaica SE	63	VNM	Vietnam	VNINDEX
32	JPN	Japan	NIKKEI 225	64	ZAF	South Africa	JALSH

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Article

Dismissals and Temporary Leaves in Romanian Companies in the Context of Low Demand and Cash Flow Problems during the COVID-19 Economic Lockdown

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Received: 15 September 2020; Accepted: 23 October 2020; Published: 25 October 2020

Abstract: The aim of this study is to describe the relations between low demand, cash flow problems, employee dismissals, and temporary leaves experienced by Romanian companies during the economic lockdown in the first two months of the COVID-19 pandemic outbreak in Romania (16 March–16 May 2020). For this purpose, we conducted a quantitative study using descriptive, correlation, and regression analyses applied to data collected from company decision-makers. Our results show that demand for products/services and cash flow in companies has decreased significantly, the workforce being affected by dismissals and temporary leaves/furloughing. Additionally, the average linear revenue of companies has been decreasing due to insufficient cash flow, higher absenteeism of workers, customers having been affected, and the demand going down. Therefore, employee dismissals, employee temporary leaves (furlough), and dismissal intentions have been positively correlated with insufficient cash flow in companies and an extremely low demand.

Keywords: COVID-19; pandemic; companies; dismissal; temporary leave; cash flow; low demand; Romania; furlough; challenges

1. Introduction

The year 2020 will definitely remain in history as the year of both SARS-CoV-2 pandemic and the year of great economic lockdown. This pandemic has been seen as one of the determinants of current global economic changes [1]. In this general context, the study investigates the economic impact of this pandemic in Romania. The financial crisis of 2007–2008 generated a severe contraction of liquidity on international markets [2]. Similarly, the effect of SARS-CoV-2 pandemic resulted in low demand and cash flow problems in companies, affecting the condition of human resources [1]. From this perspective, the study aims to describe the main challenges faced by Romanian companies during the first two months of the pandemic outbreak in Romania (16 March–16 May 2020) in order to gain a better understanding of particularities of the current economic crisis by focusing mainly on the relations between low demand, cash flow problems and employee dismissals and temporary leaves. For this purpose, we carried out a quantitative study by using descriptive, correlation, and regression analyses, data having been collected from company decision-makers (managers, shareholders, company owners, administrators, etc.) during the state of emergency that had been established in Romania after the

outbreak of COVID-19. So, we have formulated and tested six hypotheses describing the relations between low demand, cash flow problems, and employee dismissals and temporary leaves.

This study seeks to answer the following research question: What are the relations between low demand, cash flow problems, dismissals, and temporary leaves of employees generated by the lockdown that had been imposed by the Romanian Government during the first two months of the COVID-19 pandemic? For this purpose, we conducted a survey in more than 200 Romanian companies using a questionnaire that had been translated and adapted from the International Labour Organization (ILO) [3]. Data were collected between 1–16 May 2020 from managers of Romanian companies, providing full confidentiality of responses.

The general context of this study is the global spread of the SARS-CoV-2 virus. The first human cases of COVID-19, the coronavirus disease caused by SARS-CoV-2, were first reported in China, back in December 2019 in the city of Wuhan. [4]. In December 2019, the Chinese authorities made a preliminary determination of a new coronavirus, identified in a hospitalised patient with pneumonia in Wuhan [5]. On 11 March 2020, the World Health Organization (WHO) issued a statement on the pandemic nature of the COVID-19 outbreak. At that time, almost 125,000 cases had been reported to WHO, covering 118 countries. Two weeks before the announcement of the pandemic, the number of cases outside China had grown almost 13-fold, while the number of affected countries almost tripled [6]. The COVID-19 pandemic affected all areas of life in countries experiencing epidemic outbreaks. To prevent further increase of the cases, countries applied a wide range of preventive measures with such direct effects on the economy as closure of schools and markets, cancellation of flights and other forms of travel or tourism, and prohibition to hold public events, etc. [1,7,8].

In Romania, the National Centre for Surveillance and Control of Communicable Diseases stated that until 18 March 2020, 261 cases of COVID 19 coronavirus infection had been confirmed. The first case of confirmed infection was recorded on 26 February 2020, with 1–2 daily cases having been confirmed in the following 12 days. Starting with 10 March, the upward trend has accelerated to an approximate average of 30 cases per day. The virus was brought to the country by people returning from European countries, 127 of the 261 new cases having been recorded in persons returning to Romania from abroad. The share of imported cases reached 49% on 18 March, a decrease compared to the first days of the epidemic in Romania, when the percentage reached 100%. The infected persons were returning to Romania from Italy (66%), France, Germany, and Spain (5%), and the United Kingdom and Austria (4%) [9]. Due to the high incidence of the coronavirus cases, on 16 March 2020, the President of Romania issued a decree establishing the state of emergency in Romania [7]. One month later, it was extended by one more month [10]. So, Romania had been from 16 March to 16 May 2020 under a state of emergency due to the pandemic. The measures with an immediate economic impact included: Isolation and quarantine of people arriving from risk areas, closure of state borders, restriction of movement of people and vehicles, prohibition of road, rail, sea, river, or air traffic, and temporary closure of restaurants, cafes, and clubs [9].

Many economic activities were directly affected by the newly imposed restrictions. Food serving and consumption of alcoholic and non-alcoholic beverages in restaurants, hotels, cafes, or other public places was prohibited, except for the drive-ins, room-services, or customer delivery. Additionally, all cultural, scientific, artistic, religious, sporting, entertainment or gambling, spa treatments, and personal care activities carried out indoors were cancelled, as well as any event attended by more than 100 people and several flights. People isolated in their homes, were quarantined, or hospitalised as measures taken to prevent the spread of COVID-19 without the approval of competent authorities [11]. Medical services were also affected, the activity of dental clinics being temporarily stopped. Retail sale of products and services in shopping malls was also temporarily suspended, except for the sale of food, veterinary or pharmaceutical products, and provision of cleaning services [12].

The restrictions imposed on free movement of people had also indirectly affected the demand, especially for services. Movement of all people outside their homes was allowed only for precisely defined and proven reasons: Professional purposes, basic needs, medical care, short trips, blood

donation, agricultural activities, and other justified reasons, such as childcare or assistance for the elderly and the sick [13]. The elderly, aged over 65, being one of the most vulnerable categories, were most affected by the restrictions. They had to stay indoors to protect themselves, having been allowed to leave the house only between 11:00 a.m. and 1:00 p.m. [13]. All these restrictions had a significant impact on consumer behaviour, leading to changes in demand and, consequently, poor operation of all businesses in terms of their revenue, cash flow, and financial standing. Home delivery services saw an increase in demand, while conventional shops, isolated or placed in shopping malls, stopped or reduced their operations. Work from home turned out to be an efficient solution for social distancing, leading, in the end, to less fuel consumption and lower demand for several work-related items (e.g., clothes, perfumes, and fashion accessories), or products usually consumed at work (e.g., biscuits, soft drinks, sandwiches). Low demand had observable consequences in terms of unemployment, reduced working time, or employee furloughing. Due to these restrictions, until 17 May, Romania recorded only 16895 COVID cases compared to its population of around 19 million inhabitants (less than 0.09%), 76.6% of deaths having been among people aged over 60, and in 90.5% of the deaths due to, at least, one associated comorbidity [14].

During this period, Romania managed successfully to prevent the spread of the epidemic, although at high economic cost.

The study was divided into following sections: The literature review section outlines the latest developments in the field; the methodology section describes the used research methods; the last part of the study discusses the results and the conclusions.

2. Literature Review

The labour market has been undoubtedly affected by the SARS-CoV-2 pandemic. COVID-19 crisis led to changes in such work arrangements as: Flexible location, flexible working hours, financial changes, shorter schedule, etc. [15]. Data on the US labour market shows a dramatic rise in unemployment insurance claims, and growth in underemployment and unemployment rates [16]. A study conducted in China with 369 participants, 25% of respondents, who stopped working due to the outbreak, reported worse mental and physical health conditions, as well as distress [17]. In India, job dismissals and cuts in wages were expected by employees during COVID-19, especially in malls, restaurants, tourism, airlines, retailers, and the film industry [18]. The argument for workforce cuts seems to be similar all over the world: Enterprises are not able to generate profit [18,19].

It is unclear what will happen to employees with flexible employment relationships, as in the case of temporary agency work and other forms of subcontracted labour, where employees are not officially laid off, or on paid sick leave [15]. In such cases, employees may remain unprotected [15]. In the Ukrainian Labour Code, there are no provisions regarding the right of the employer to dismiss employees during quarantine, and it is forbidden to adopt any additional laws to regulate dismissals as a measure for counteracting the spread of COVID-19 [20]. In Romania, employers have the right to dismiss employees if the economic situation of a company asks for it, but they cannot discharge a person being on quarantine leave [21]. However, governments started providing economic support for affected enterprises through tax cuts, rent reductions, wage subsidies, and even cash transfers [22].

Like everyone, we have no answers and share the global uncertainty on how normality is going to look like on the labour market when all comes back to normal [23,24]. Still, the response of companies should follow two main objectives: A quick redistribution of employees to urgent activities and taking actions that maintain employee attachment [25,26]. Additionally, employers and employees should act in good faith in order to obtain a smart recovery of working arrangements [27]. Before any dismissal, employers should provide to employees enough information justifying the dismissal decision, and let them comment on the option [27]. At the core of managerial work is the decision-making process [28], and this process may be viewed as a moderating factor between organizational performance and sustainability [29]. Even more, in pandemic times, inspired and well-grounded decisions become vital.

In our study, managers were asked if they dismissed or intended to lay off employees due to COVID-19 crisis, and, if so, they had to tick the percentage of dismissed employees. As a result, at least theoretically, the two variables should be correlated, showing that the respondents were in good faith and answered honestly the two questions, which is an important factor for our analysis. Therefore, the first hypothesis has been formulated:

Hypothesis 1. *There is a positive correlation between the act of dismissing employees/the intention to dismiss employees due to the crisis caused by COVID-19 and the percentage of dismissed employees (calculated as a percentage out of total workforce).*

The consequences of COVID-19 epidemic are severe and visible, especially in what regards the labour force, in the rate of unemployment [1,30–34]. In the Organisation for Economic Co-operation and Development (OECD) countries, the unemployment rate rose to 8.4% in April 2020 compared to 5.5 in March 2020 [35]. In the United States, 26.5 million people were fired, the equivalent of over 20% in unemployment [36]. Still, the U.S. Bureau of Labour Statistics reported in June 2020 that the unemployment rate decreased, since efforts had been made to resume economic activities [37]. A survey conducted by ILO Score Programme indicated that many companies have implemented drastic changes since the start of COVID-19, such as: Unpaid leaves, reduced wages by 20%, even laying off staff [1].

The main impact of COVID-19 in small and medium-sized enterprises (SMEs) can be seen in supply chain disruption, cash flow imbalance, and risk of bankruptcy [22,30,38]. An online survey applied to Malaysian SMEs reported that cash flow had been severely affected, companies having difficulties in paying staff wages, rent, or making other payments [30]. The Indian economy has also become vulnerable, since the cash flow has been significantly reduced [18]. A limited cash flow was also found in SMEs in Canadian food processors [39]. Even if restaurants, as well as shops, are slowly opening and many of them cannot afford to pay even their rent [40], it is obvious that liquidity is now the main problem in companies.

Due to the economic crisis, employers were no longer able to pay wages, and thus, employees lost their jobs [41]. However, there are several options for organizations interested in keeping a balance between maintaining personnel and a level of cash flow in business: Reduction of high salaries, paid leaves, sabbatical periods; reduction of working hours; temporary payroll cuts [42]. The most severe option is dismissal of employees, which is a forced decision taken when a business needs to survive [42]. Companies should protect their employees and develop treasury plans for cash flow to ensure continuity of their activities [43–45]. Foresight business operations should also be seen as an important action by managers [30], and companies which have not been affected yet by COVID-19 should also prepare scenarios and plan their cash flow [43].

In our study, managers were asked if they dismissed or intended to dismiss employees due to COVID-19 crisis. They were also asked to disclose whether the cash flow of their companies had been insufficient. Considering all the arguments presented above for connecting dismissals with low liquidity in companies, the second hypothesis has been formulated:

Hypothesis 2. *There is a positive correlation between the dismissal of employees/the intention to dismiss employees due to the crisis generated by COVID-19 and the fact that the cash flow for maintaining staff and company's actions is insufficient.*

A slightly different perspective appears if we consider the type of dismissals, which can be permanent or temporary. In our research, managers were also asked what had been the percentage of laid off employees, taken as a temporary measure, due to the COVID crisis. Taking into consideration all previous arguments, including those used to formulate H2, the following hypothesis has been formulated:

Hypothesis 3. *There is a positive correlation between the percentage of employee layoffs due to the crisis generated by COVID-19 and the fact that the cash flow for maintaining staff and the company's actions are insufficient.*

Consumer demand has been affected in retail companies in the context of the COVID-19 crisis [38]. Consumption and purchasing behaviours have changed lately, and online shopping has become rather usual [34]. In Africa, sales went down during the pandemic, and two out of three companies stated having been seriously affected [46]. In Romania, the fashion industry and luxury retailers, as well as vendors, have been deeply affected [47]. In Spain, in the city of Santander, the demand for public transport decreased by 93% [48]. A study in UK found that 65% of companies reported that their turnover had been lower than normal [49]. International mobility restrictions have negatively affected tourism operations, and the associated food services and handicrafts [50,51]. Unfortunately, there are irrecoverable financial losses in tourism, with severe implications seen in unemployment [52]. The demand for products and services has been globally affected [53,54], with small companies being the most affected [55].

This pandemic has brought wake up signals for businesses [22,56]. Companies have changed the levels of their operations due to lower demand, and these disruptions have led to unemployment and lower income levels [34,38,57]. Since employment was severely affected, companies and governments should be prepared and take measures as soon as possible [58]. We believe there are several measures that could counteract low demand and balance the unemployment rate, first being the furloughing, a temporary reduction in hours or weeks of work. Employees still have a job and remain on the payroll, but they become eligible for unemployment benefits for lost pay, none of their benefits being affected. Second, a temporary leave of some employees, which means that employers have the intention to rehire them down the road, the employees being typically able to collect unemployment benefits while on an unpaid layoff, and frequently employers will allow employees to maintain benefits coverage for a defined period of time as an incentive to remain available for recall. Third, permanent layoff, with no anticipated rehire date being associated with it, and the relationship with the employee being also terminated.

In our research, managers were asked if they dismissed or intended to dismiss employees due to the crisis caused by COVID-19. They were also asked if the demand for their products/services had been affected by this crisis. Taking into consideration the whole cycle leading to unemployment and all information mentioned above, the fourth hypothesis has been formulated:

Hypothesis 4. *There is a positive correlation between the act of dismissing employees/the intention to dismiss employees due to the crisis caused by COVID-19 and the fact that customers of companies were affected and the demand was lower than under normal conditions.*

During the pandemic, managers have been facing challenges related to labour force, consumer demand, and risk anticipation [41,59]. In some areas, the demand for services or products has grown excessively (for example, the demand for disinfecting products, face masks, or hospital services), while in others, it has dramatically fallen (good examples for this category are: The automotive industry; car manufacturing; air travels and cruises) [34,52,60,61]. In Canada, it is expected that the demand for premium food and other niche products will fall [62]. The declining demand and the lockdown enforcements have generated change and restructuring of work in all affected industries [34]. Thus, due to shrinking demand for services, retailing, tourism, aviation, and leisure, unemployment has been on the agenda of mainly services-dependent economies [34]. To provide support to their economies, governments should be involved in growing the demand for products and services [34]. As for high demand for hospital services, personnel with adequate skills and knowledge should be attracted, and it can be achieved by using organizational rewards [61,63].

ILO has three scenarios for global unemployment generated by the COVID-19 crisis: A rise in unemployment reaching 5.3 million people, second, a rise amounting to 24.7 million, and lastly,

13 million people [1]. In comparison, the rise in real unemployment during the economic crisis of 2008–2009 reached 22 million people [1]. Labour reductions and work in the informal sector are expected to appear, especially in SMEs [64].

Furloughed workers are staff who are no longer able to go to work, or work less hours because their places of employment have been forced to close or have a reduced operation due to the pandemic [65]. The term used for these temporary lay-offs or reduced working hours is different from one country to another, so we have encountered such terms as “temporary unemployment” (France) [66], “technical unemployment” (Romania) [21], “short-work” (Germany) [67], “reduced working time” (Suisse) [68], “temporary leave” (Spain) [66]. The employers saw this as a fair treatment of their employees, considering the exceptional context, and behaved in solidarity with their employees. In the UK, a report made public in May 2020, stated that across all industries, 28.0% of the workforce had been furloughed [69]. In August 2020, most employees returning to work from furloughing were in retailing, constructions, hotel industry, wholesales, and restaurants [49].

The solution of suspending employment contracts through furlough (or any other equivalent name which is used in other countries) is a temporary measure for employers wishing to cope with the economic crisis generated by COVID-19. The term furlough does not have the same meaning as unemployment, but both concepts stand for measures that appeared during the COVID-19 pandemic due to liquidity blockages.

There is no doubt that insufficient liquidity can lead to closure of businesses [39]. Thus, in the areas where COVID-19 was spread, the member states of the European Union (EU) were requested to take special measures for supporting firms and employees [45,70]. Further, countries like Spain, Italy, France, Swiss, Germany, and UK have been examples of applying different COVID-19 Job Retention Schemes (CJRS) and financial help for individuals and companies as well [66–69,71,72].

According to the previous analysis, there is no doubt that customer demand has decreased dramatically during this period, and that, implicitly, the level of cash flow in companies has gone down. Thus, in our research, managers were asked to tick the percentage of suspended employment contracts through temporary leave (furlough) due to the COVID crisis. They were also asked to disclose whether cash flow for maintaining the company’s staff and activities is insufficient. So, the following hypothesis has been formulated:

Hypothesis 5. *There is a positive correlation between the percentage of suspended employment contracts through temporary leave/furloughing and the fact that the cash flow for maintaining the company’s staff and activities is insufficient.*

The crisis has already transformed into an economic and labour market shock, impacting not only supply (production of goods and services), but also the demand (consumption and investments) [8]. The pandemic and lockdown will curtail current and near-term aggregate demand through several channels: Temporary shutdown or reduction of epidemic risky activities; temporary disruptions of supply in economy; high economic uncertainty depresses consumption expenditure and investment demand [73]. Due to these prospects, forecasts for companies in what regards their workforce needs had been and will continue to be negative, leading to dismissals or to temporary leaves (furloughs). Taking into consideration all the above-mentioned arguments, including those used for formulating hypothesis H5, the following hypothesis has been formulated:

Hypothesis 6. *There is a positive correlation between the percentage of suspended employment contracts through temporary leave/furloughing and the fact that company customers have been affected and the demand has been lower than under normal conditions.*

3. Methodology and Data

This study was conducted using a questionnaire translated and adapted from the ILO [3]. The purpose of the ILO research was to assess the needs of companies during the COVID-19 crisis. The purpose of our research is to point out what were the main challenges faced by Romanian companies due to the crisis generated by COVID-19, with a focus on the relations between low demand, cash flow problems, the dismissals, and employee temporary leaves. The study seeks to answer the following research question: What are the relations between low demand, cash flow problems, dismissals, and temporary leaves of employees generated by the lockdown imposed by the Romanian Government during the first two months of the COVID-19 pandemic? Data were collected online between 1–16 May 2020 in Romania from decision-makers in companies (owners, directors, administrators, or branch managers), ensuring the confidentiality of responses.

A total of 203 responses were collected: 96 (47.29%) through the Chamber of Commerce and Industry of Iasi (CCI), a direct official e-mail was sent to companies, and 107 (52.71%) through messages sent by members of the research team directly to company managers (on LinkedIn, e-mail, and social networks). A total of 180 e-mails sent by our team produced a response rate of 59.44%, and a total of 900 having been contacted by e-mail generated a response rate of 10.66%. Even if the two collection channels were different, the same questionnaire was used, the status of decision-makers having been constantly monitored, ensuring the quality of responses.

As part of the agreement with the Chamber of Commerce and Industry of Iasi, early results of this data collection were presented in May 2020 in a non-scientific public report made for the Romanian business community [74]. For this article, we complied with the ethics of publication by making sure that the title, the literature review, processed data, interpretations, and conclusions in this article are original, therefore not found in conflict with the content of the earlier presented public report.

Table 1 shows the registered offices of companies by county, for which the respondents provided information.

Table 1. Registered offices of companies by county.

County	Frequency	Percentage (%)
Botoșani	29	14.29
Brașov	1	0.49
Buzău	1	0.49
Cluj	3	1.48
Dâmbovița	13	6.40
Galăț	1	0.49
Harghita	1	0.49
Ialomița	1	0.49
Iași	119	58.64
Ilfov	12	5.91
Neamț	5	2.46
Sibiu	1	0.49
Suceava	11	5.42
Teleorman	5	2.46
Total	203	100

Source: Data processed using the output of SPSS version 21.0.

Data were collected in companies based in Iași (119 answers, 58.64%), Botoșani (29, 14.29%), Dâmbovița (13 answers, 6.40%), and Ilfov (12 answers, 5.91%). Respondents were also asked to specify the sectors in which their companies operate. Data are presented in Table 2.

As shown by the collected data, the IT industry is the leading sector in which companies operate (49 companies, 18.22% of total sectors). Trade and sales hold the second position (39 companies, 14.50% of total companies). Next is education (16 companies, 5.95% of the total sectors). Other types of business specified by respondents mainly as a second option covered healthcare system,

the pharmaceutical industry, business consulting, advertising services, event organization, engineering, as well as manufacturing and services.

Table 2. Company operations by sector.

Sector(s) of Operation	Frequency	Percentage (%)
Financial activities and insurance	5	1.86
Real estate	7	2.60
Agriculture/farm/fishing	8	2.97
Chemicals and plastics	1	0.37
Commerce/Sales	39	14.50
Construction	12	4.46
Electronic and electrical equipment	12	4.46
Education	16	5.95
Manufacture of metals and machinery	4	1.49
Hotels/Tourism	8	2.97
Food and beverage industry	5	1.86
Information and communication	6	2.23
IT	49	18.22
Food services (Restaurants)	15	5.58
Forestry/Wood/Paper products	1	0.37
Textiles, leather and clothing	13	4.83
Transport and transport of equipment	7	2.60
Other areas	61	22.68
Total	269	100

Source: Data processed using the output from SPSS version 21.0.

The total number of sectors covered by company operations (269, details shown in Table 2) is greater than the number of companies included in our research (203, details shown in Table 1) as some companies have more than two types of activities in their portfolio.

The respondents also indicated the total number of employees of their company before the establishment of the state of emergency in Romania, generated by COVID-19—45.32% of companies have between 1 and 10 employees; 37.44% between 11 and 100 employees; 7.39% between 101 and 250 employees, and 9.85% have more than 251 employees (or even 251).

The variables used in this study have been adapted after ILO [3]. The used questions and the scales will be presented in the results section.

Cronbach Alpha coefficient for checking the internal consistency of the used questionnaire was calculated strictly for the 14 items of the study. Its value is 0.620 (greater than 0.600), therefore it has been confirmed that the internal consistency of the items used in the analysis of results is acceptable. However, it could be questioned as the number of responses (N = 203, see details in Table 1) is limited due to the fact that responses were collected only during the state of emergency in Romania.

To start the research investigating the challenges Romanian companies have to face due to the crisis generated by COVID-19, their condition should first be described. Figure 1 shows the extent to which employees working in companies included in the study work from home or at the company's headquarters.

In the analysed period, only a small percentage of companies stopped operations (29.06%), while most companies decided to move online or work remotely, or both (see details in Figure 1 and Table 3).

The frequency analyses show that 80.30% of the responding companies mentioned neither dismissing, nor planning to dismiss workers due to the crisis generated by COVID-19. Moreover, almost half of the companies within our sample had no employees on temporary leave (furlough).

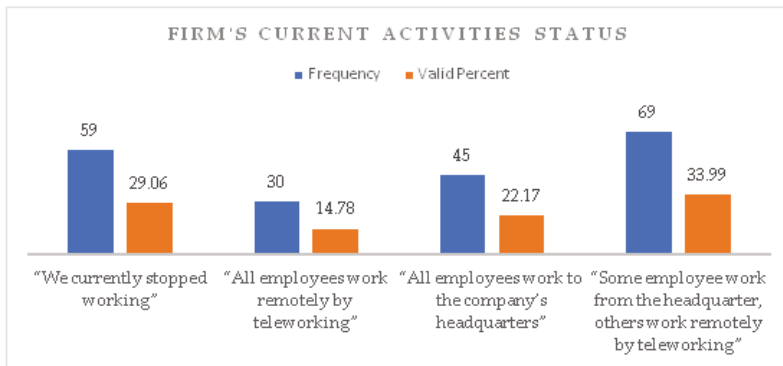


Figure 1. Status of current activities.

For the analysed sample, between 16 March and 16 May 2020, 96.55% of respondents stated that there had been no cases of employees infected with COVID-19 in their companies, or in their families (94.09%). However, almost half of our sample considers that COVID-19 crisis will strongly affect their business, and the financial impact will be high. More specifically, 51.22% of the respondents reported that the average monthly revenue decreased by more than 40%, and 62.07% of respondents stated that the cash flow for maintaining staff and company's actions had been a major challenge. Out of surveyed companies, only 33.50% of the employed staff were absent from work (for medical reasons or due to governmental restrictions), while the procurement of raw materials needed for production had not been a major challenge for 59.61% of respondents. Most respondents believed that suppliers had been able to send inputs (67.98%), only 32.02% stating that it had been impossible for suppliers to do so (details in Table 3).

Additionally, 66.50% of respondents considered that their business partners had been severely affected and failed to operate under normal conditions, while only 33.50% denied it. Moreover, most respondents believed that buyers/customers had been affected, the demand being lower than normal (80.79%), while only 19.21% saw no decrease in demand under current conditions (see details in Table 3).

Table 3. Frequency distribution in our sample (N = 203).

Questions/Codes	Items	Frequency	Valid Percent	Cumulative Percent
How is your company currently operating? (FIRMACT)	"We currently stopped working"	59	29.06	29.06
	"All employees work remotely by teleworking"	30	14.78	43.84
	"All employees work at the company's headquarters"	45	22.17	66.01
Have you dismissed or do you plan to dismiss any workers due to COVID-19? (DISMISSW)	"Some employees work from the headquarter, others work remotely by teleworking"	69	33.99	100.00
	"No"	163	80.30	80.30
What is the percentage of dismissed workers? Check the percentage of workers laid off compared to your total workforce. (RELEASEDW)	"Yes"	40	19.70	100.00
	"We did not fire employees"	166	81.77	81.77
	"1–10%"	18	8.87	90.64
	"11–20%"	4	1.97	92.61
	"21–30%"	5	2.46	95.07
	"31–40%"	4	1.97	97.04
Have you suspended employment contracts due to temporary leave (furlough)? If so, what is the percentage of employees sent to temporary leave (furlough) compared to the total workforce? (SUSCONTRACTS)	"Over 41%"	6	2.96	100.00
	"We did not have employees on temporary leave (furlough)"	98	48.27	48.27
	"1–10%"	9	4.43	52.70
	"11–20%"	10	4.93	57.63
	"21–30%"	4	1.97	59.60
	"31–40%"	10	4.93	64.53
	"Over 41%"	72	35.47	100.00
	"No "	196	96.55	96.55
	"Yes"	7	3.45	100.00
	"No"	191	94.09	94.09
Do you have cases of employees infected with COVID-19? (INFECTEDEMPLY)	"Yes"	12	5.91	100.00
	"Not applicable"	24	11.82	11.82
	"Low"	34	16.75	28.57
	"Medium"	55	27.09	55.66
	"High"	90	44.34	100.00
Do you have cases of family members of employees infected with COVID-19? (INFECTEDFAM)	"Not applicable"	41	20.20	20.20
	"10–20%"	18	8.87	29.07
	"21–30%"	25	12.32	41.39
	"31–40%"	15	7.39	48.78
	"41–50%"	13	6.40	55.18
What was the level of financial impact (revenue or sales) on your business and on the company's operations? (FINIMPACT)	"51% and over"	91	44.82	100.00
	"Not applicable"	112	55.18	55.18
How much did the company's average monthly revenues decreased since the state of emergency has been established? (DIMINCOME)	"10–20%"	18	8.87	29.07
	"21–30%"	25	12.32	41.39
	"31–40%"	15	7.39	48.78
	"41–50%"	13	6.40	55.18
	"51% and over"	91	44.82	100.00

Table 3. *Cont.*

Questions/Codes	Items	Frequency	Valid Percent	Cumulative Percent
	<i>Which are the main challenges your company is currently facing resulting from COVID-19?</i>			
Cash flow for maintaining staff and the company's actions is insufficient (LOWCASHFLOW)	"No"	77	37.93	37.93
	"Yes"	126	62.07	100.00
Workers are absent from work due to illness or governmental orders (ABSENTEEISM)	"No"	135	66.50	66.50
	"Yes"	68	33.50	100.00
Raw materials are not in stock or their purchase has become very expensive (LACKROWMAT)	"No"	121	59.61	59.61
	"Yes"	82	40.39	100.00
Suppliers cannot send us inputs (LACKINPUTS)	"No"	138	67.98	67.98
	"Yes"	65	32.02	100.00
Business partners have been severely affected and are not operating under normal conditions (AFFECTEDBUSS)	"No"	68	33.50	33.50
	"Yes"	135	66.50	100.00
Buyer/customers have been affected and demand is lower than normal (AFFECTEDBUYERS)	"No"	39	19.21	19.21
	"Yes"	164	80.79	100.00

Source: Questions and items adapted after ILO (International Labour Organization. Assessing the needs of enterprises resulting from COVID-19, 2020). Data processed using the output from SPSS version 21.0.

4. Results

In our study, we have used the Pearson correlation coefficient to test the hypotheses. Next, we will be presenting the results of the correlation analysis.

For the H1 hypothesis, there is a positive correlation between the act of dismissing employees/the intention to dismiss employees due to the crisis caused by COVID-19 (variable DISMISSW) and the percentage of dismissed employees (calculated as a percentage of total workforce) (variable RELEASEDW).

The Pearson correlation coefficient was calculated to measure both the strength and direction of the correlation between the act of dismissing employees/the intention to dismiss employees due to the crisis caused by COVID-19 and the actual percentage of dismissed employees (calculated as a percentage of the total workforce). Results show that there is a positive and strong correlation between the variables, with a correlation coefficient of 0.749. The associated p value (lower than 0.05) shows a significant correlation between the analysed variables (correlation is significant at the 0.01 level; 2-tailed). Therefore, the hypothesis H1 has been validated. In other words, the hypothesis indicates that there is a strong link between the past action of dismissal of employees (if applicable) and the percentage of actually dismissed (declared) employees. This indicates that the respondents were in good faith and honestly answered the two questions, which is quite important for our analysis.

When testing the H2 hypothesis, results showed that there is a positive correlation between the dismissal of employees/the intention to dismiss employees due to the crisis generated by COVID-19 (variable DISMISSW) and the fact that the cash flow for maintaining staff and company's actions is insufficient (variable LOWCASHFLOW).

As shown by the Pearson correlation coefficient of 0.285, there is a weak correlation between the dismissal of employees/the intention to dismiss employees due to the crisis generated by COVID-19 and the fact that the cash flow for maintaining staff and the company's actions is insufficient. Therefore, hypothesis H2 has been validated. Given that the decision to lay off employees is not very widespread (19.70% of respondent companies decided to lay off some of their employees, and 80.30% had no layoffs, having no intention to lay off employees due to the crisis caused by COVID-19, see details in Table 3), it explains the weak correlation between the two variables. The correlation between the two variables is significant (p value is equal to 0.01, lower than 0.05—correlation is significant at the 0.01 level; 2-tailed).

For the H3 hypothesis, there is a positive correlation between the percentage of employees laid off due to the crisis generated by COVID-19 (RELEASEDW) and the fact that the cash flow for maintaining staff and the company's actions is insufficient (LOWCASHFLOW).

Pearson correlation coefficient (0.217) indicates that there is a weak and positive correlation between the percentage of employees laid off due to the crisis generated by COVID-19 and the fact that the cash flow for maintaining staff and the company's actions is insufficient. The p associated value is lower than 0.05 (p value equal to 0.01; 2-tailed), which shows a significant correlation between the analysed variables, therefore hypothesis H3 has been validated. Given that 81.77% of the companies included in the study had no layoffs (details in Table 3), the weak correlation between the two variables is explained.

The results of testing the H4 hypothesis showed that there is a positive correlation between the dismissal of employees/the intention to dismiss employees due to the crisis generated by COVID-19 (DISMISSW) and the fact that the customers of the companies were affected and the demand is lower than under normal conditions (AFFECTEDBUYERS).

The dismissal of employees/the intention to dismiss employees due to the crisis generated by COVID-19 is positively and weakly correlated, with a correlation coefficient of 0.179, with the fact that the buyers/customers of the companies were affected and the demand is lower than under normal conditions. The p associated value lower than 0.05 shows a significant correlation between the analysed variables, therefore hypothesis H4 has been validated (p value equal to 0.01; 2-tailed).

When testing the H5 hypothesis, the results showed that there is a positive correlation between the percentage of suspended employment contracts through temporary leave/furloughing (SUSCONTRACTS) and the fact that the cash flow for maintaining the company's staff and activities is insufficient (LOWCASHFLOW).

The percentage of suspended employment contracts due to temporary leave (furlough) is positively correlated with the fact that the cash flow for maintaining the company's staff and actions is insufficient, with a correlation coefficient of 0.357 and a significance level of 0.01 (p value lower than 0.05; 2-tailed), therefore hypothesis H5 has been validated.

The results of testing the H6 hypothesis showed that there is a positive correlation between the percentage of suspended employment contracts through temporary leave/furloughing (SUSCONTRACTS) and the fact that the customers of the companies were affected and the demand is lower than under normal conditions (AFFECTEDBUYERS).

There is a positive correlation between the percentage of suspended employment contracts due to temporary leave (furlough) and the fact that the buyers/customers of companies were affected, and the demand is lower than under normal conditions, with a Pearson correlation coefficient of 0.312. The p value lower than 0.05 (p -value is equal to 0.01; 2-tailed) displays a significant correlation between the analysed variables, therefore hypothesis H6 has been validated. When the demand for the products or services offered by the company is lower than normal, it is natural that the company's revenues decrease, and, implicitly, it no longer has the same financial power to support the company's salaries and/or activities, which involves a certain financial turnover. Thus, the short-term solution is temporary leave (furlough) for some of the employees (if not for all). However, a very important observation for this aspect is that, not in all countries, temporary leave (furlough) can be granted as the system of contributions withheld from the gross salary differs.

An additional correlation that can be analysed, besides the established hypotheses, is between the percentage of dismissed employees (calculated as a percentage of total workforce) (variable RELEASEDW) and the percentage of suspended employment contracts through temporary leave/furloughing (SUSCONTRACTS). There is a positive correlation between these two variables. The Pearson correlation coefficient is 0.303, with a p value of 0.01 (2-tailed), which is less than 0.05, thus the correlation is significant. Normally, there should be a negative correlation between temporary leave/furloughing and dismissals. However, from the descriptive analysis (details in Table 3), it can be observed that both temporary leave/furloughing and dismissals were present in different proportions. The correlation is weak (though positive), therefore it strengthens the result, according to which employers had to use both measures.

The "backward" method was chosen for the multiple linear regression, which initiates the model by including all predictors in its composition. After removing the first insignificant variable, the model is adjusted. This last procedure is performed until the optimal model is obtained.

For the multiple regression the estimation framework is based on the following model:

$$\text{DIMINCOME} = \beta_0 + \beta_1 \text{LOWCASHFLOW} + \beta_2 \text{ABSENTEEISM} + \beta_3 \text{LACKINPUTS} + \beta_4 \text{AFFECTEDBUYERS} + \xi \quad (1)$$

where:

DIMINCOME—a dependent variable which indicates how much the company's average monthly revenues decreased since the state of emergency had been established;

LOWCASHFLOW—an independent variable that shows the cash flow to maintain staff and business operations is insufficient; the variable is dichotomous, with the value coded by "1" for an affirmative answer, and "0" otherwise;

ABSENTEEISM—an independent variable that indicates that workers are absent from work due to illness or governmental orders; the variable is dichotomous, with the value coded by "1" for an affirmative answer, and "0" otherwise;

LACKINPUTS—an independent variable that shows the lack of inputs provided by suppliers, coded by “1” for an affirmative answer, and “0” otherwise;

AFFECTEDBUYERS—an independent variable that shows that buyers/customers have been affected and demand is lower than normal; the variable is dichotomous, with the value coded by “1” for an affirmative answer, and “0” otherwise.

The results obtained for estimating the regression model are shown in Table 4.

Table 4. Ordinary least squares (OLS) regression model.

Model OLS regression	Unstandardized Coefficients		Standardized Coefficients	t	p	
	B	Std. Error	Beta			
Model 1	(Constant)	1.729	0.434		3.984	0.000
	LOWCASHFLOW	0.906	0.239	0.273	3.795	0.000
	ABSENTEEISM	0.815	0.219	0.267	3.718	0.000
	LACKINPUTS	0.169	0.229	0.053	0.738	0.462
	AFFECTEDBUYERS	1.151	0.410	0.201	2.807	0.006
Model 2	(Constant)	1.796	0.424		4.236	0.000
	LOWCASHFLOW	0.923	0.237	0.278	3.889	0.000
	ABSENTEEISM	0.832	0.218	0.272	3.818	0.000
	LACKINPUTS	0.120	0.407	0.196	2.750	0.007
	AFFECTEDBUYERS	1.120	0.407	0.196	2.750	0.007

Dependent Variable: DIMINCOME. Source: Data processed using the output from SPSS version 21.0.

In this model, both R^2 and adjusted R^2 have values greater than 0.4, indicating medium to large proportions of the variation of the average monthly revenues of the companies since the installation of the state of emergency, which is explained by the regression model.

Analysis of the regression coefficients shows that the values of t test are all either less than -2 or greater than $+2$, indicating that the considered variables are appropriate for the estimated model. In model 2, the p values associated with the regression coefficients are less than or equal to the significance threshold of $\alpha = 0.05$ for the explanatory variables which means that the three estimated coefficients are significant for the companies from which the sample was extracted.

The level of decrease of the average monthly revenue of companies since the establishment of the state of emergency was positively affected by all independent variables included in the model 2. In other words, the decrease of the average revenue of the companies since the establishment of the state of emergency is even greater, as the cash flow to maintain staff and business operations is insufficient, workers are absent from work due to illness or government orders, buyers/customers having been affected and demand is lower than normal, respectively.

For the model 2, we applied different tests for validation: Multicollinearity between independent variables among others.

Tolerance levels for all explanatory variables in the chosen model (the second model) are not close to 0 (0.983; 0.986; 0.989) and the Variance inflation factor VIF indicator for the same variables (1.018; 1.014; 1.011) has values close to 1 (and not values over 5 or even 10), which leads us to the exclusion of the existence of multicollinearity of the independent variables in the model (details in Table 5).

Table 5. Model 2—Collinearity statistics.

Model 2—OLS Regression	Collinearity Statistics	
	Tolerance	VIF
(Constant)		
LOWCASHFLOW	0.983	1.018
ABSENTEEISM	0.986	1.014
AFFECTEDBUYERS	0.989	1.011

Dependent Variable: DIMINCOME. Source: data processed using the output from SPSS version 21.0.

The normality of the regression model's residuals was tested, and the results indicate normal distribution of the data.

Table 6 illustrates the residual indicators values for our model.

Table 6. Model 2—Residuals statistics.

Residuals Statistics	Minimum	Maximum	Mean	Std. Deviation
Predicted Value	1.80	4.67	3.83	0.684
Residual	−2.838	2.372	0.000	1.337
Std. Predicted Value	−2.970	1.233	0.000	1.000
Std. Residual	−2.103	1.758	0.000	0.991

Dependent Variable: DIMINCOME.

As it can be seen, the mean of the errors for model 2 is equal to 0 (details in Table 6). Thus, it has been confirmed that the model is suitable for the considered variables.

5. Discussion

The aim of our study was to discover the main challenges that Romanian companies were confronted with during the economic lockdown during the first two months of the COVID-19 pandemic outbreak in Romania (16 March–16 May 2020). The focus has been on the relations between low demand, cash flow problems, dismissals, and temporary leaves of employees.

The most important feature of this study is that data were collected from company decision-makers (managers, shareholders, company owners, administrators, etc.) during the last two weeks of the state of emergency in Romania (1 May through 16 May 2020), established due to the COVID-19 epidemic, the period with the maximum economic and personal movement restrictions.

The second important feature of this study is that the results could be compared at a later time to other internationally available data, collected using the same ILO questionnaire.

All the hypotheses of the study have been validated, showing positive correlations, although specific explanations should be given for the strengths of resulted correlations.

The first hypothesis was formulated to test the good faith of respondents. We obtained a correlation coefficient of 0.749, hence a strong and positive correlation between the past action of dismissal of employees and the percentage of current dismissed employees.

When we analysed the correlations between the cash flow problems and the reduction of the employee activity, through dismissals or temporary leaves, the level of the correlation coefficient was high enough to validate the hypotheses, but showing weak correlations. The same weak correlations appeared also when we analysed the relation between low demand and dismissals or temporary leaves.

When we designed the study, the general economic thinking led us to an expectation of a rational economic decision of employers to promptly react in order to preserve their financial interests, hence generating strong correlations with previously experienced situations.

In order to explain the weak correlations, we must consider some potential moderators which have not been considered in the design of this study, since their impact was indirectly acknowledged

only after seeing our results. Some of the moderators of low demand, cash flow problems, percentage of dismissals, and temporary leaves are presented in the following arguments.

A first possible moderator is the percentage of employees transferred to working from home at the beginning of the crisis. A part of the reduced activity impact was attenuated by work from home, a situation in which the reduction of the degree of usage of the 8 h of work per day might become hidden or indistinguishable.

Another possible moderator is the governmental intervention offering several types of financial support for the companies: Delayed payment of taxes and fees, subsidies for the employees on temporary leaves, etc. Financial support from the government has a great potential of affecting the economic rationale of a company's situation. For example, unemployment insurance systems can include short-time compensation programs, and evidence exists that this kind of compensation programs reduce unemployment in downturns and also stabilize permanent employment [75].

A third possible moderator is the conservative approach of employers when deciding on dismissals or temporary leaves of employees, after years of acting in a scarce work market. As our study shows, 80.30% of companies had used a strategy of retaining employees during the crisis (see details in Table 3). Therefore, there is a propensity to keep the employees, even if this is not a perfectly sound economic decision, accepting short time losses in the hope of a potential return to the previous levels of business activity. Additionally, existing evidence seems to show that, usually, people who are reemployed have actually returned to the employers they had previously worked for, although, since job loss, the rate of reemployment decreases with time [76].

A fourth possible moderator is the volatility of informal employment. During crises, the tendency of informal employment is to increase [8]. We cannot exactly predict what happened with self-employed persons, with those already having a part-time job, or with those working on the black-market, but we can say that informal employment can reduce the strength of the correlation between a difficult economic situation of a company and staff reduction.

Finally, a fifth moderator can be the reallocation of jobs to other activities. This is less likely to have had an impact in our study, since only one month and a half passed since the beginning of the crisis, but, nevertheless, it should be considered. The COVID-19 pandemic is considered a major shock in terms of reallocation [73].

Besides the above mentioned and explained potential moderators, another possible explanation for the weak correlations that have resulted between the variables in the study can be determined based on the design of the study. First of all, the emergency situation had been in place only for one month and 15 days when we started collecting the data, hence, some economic figures were far from being clear for some managers. The situation was evolving so fast that many of them failed to understand the situation and react at all in due time to be able to solve the problems appearing in their companies. Second, the closure of our data collection at the same time with the end of the state of emergency imposed by the government has left us with a qualitative and small size sample. More precisely, even though our statistical methodology is accurate, the 203 responses might imply a rather low statistical strength.

6. Limitations and Future Lines of Research

The most important limitation comes from the fact that most companies, for which data were collected, are just from one county of Romania, the Iasi county (119 answers, a percentage of 58.62% of the total number of respondents), which is the most developed county in the Eastern part of Romania. In order to ensure the best possible representativeness, the sample included all types of enterprises, considering their size and type of activity (at least, 18 different fields). The results cannot be generalised for all companies in Romania, even if the operational context of the companies included into the sample was perfectly identical with that of other companies in Romania.

Additionally, we believe that an analysis of specific fields of economic activity would be useful as to find out which fields of activity had been most affected, this could be further investigated in another

study. In this study, this type of analysis was not possible, as time was short and data were collected during the state of emergency, which ensured that true information was collected in relation with challenges occurring during the pandemic. A future study could also explore the types of activities that maintain cash flow as much as possible and the strategies that kept the workforce inside companies during the COVID-19 pandemic.

Due to time constraints, we have encountered difficulties related to data collection, and no sampling scheme has been applied, therefore, the results cannot be generalized.

As this is an exploratory study and due to time constraints, another limitation lies in the fact that the relationships between the variables have been analysed only in terms of their correlations, without considering possible causal relationships. Hence, future research may consider similar studies, but of a longitudinal nature, which could lead to determining relationships of causal nature between the variables.

Our study suggested the potential presence of some moderators between low demand, cash flow problems, percentage of dismissals and temporary leaves, and therefore, future research can further investigate their real leverage in influencing the relations of these variables.

7. Conclusions

In Romania, the state of emergency brought many changes to the economic activity. According to the national legislative portals, the exercise of some free movement rights and some economic freedom rights were restricted [7], and a long list of economic activities were influenced by the newly imposed restrictions during the period between 16 March and 16 May 2020 [11–13].

The negative effects for the Romanian economy proved to be similar to other effects found in many other countries/regions: High cash flow decrease [18,22,30,33,38,39]; low demand for products/services [34,41,48,53,54,62], but not in all sectors [34,52,60,62]; dismissals [18,20,41,42], inconvenient wage cuts [1,18,33,46], and temporary leaves/furloughing [65–69,72].

This is a predominantly quantitative study. It was conducted using a questionnaire translated and adapted from the ILO [3]. The purpose of our research was to point out what were the main challenges faced by Romanian companies due to the crisis generated by COVID-19 by focusing on the relations between low demand, cash flow problems, and dismissals and temporary leaves of employees. Data were collected online from decision-makers in companies (owners, directors, administrators, or branch managers), the confidentiality of responses being ensured. Data were collected in Romania between 1–16 May 2020. The results of the study have been analysed based on descriptive, correlation, and regression analyses.

According to the descriptive analysis, despite the fact that only a few cases of employee infections with COVID-19 had been reported by our respondents (3.45% of respondents reported confirmed cases, see details in Table 3), and just a few cases of employee family members having been infected with this virus (5.91%, see details in Table 3), the financial impact on companies proved to be quite serious: 44.34% of companies view financial impact as high (see details in Table 3), and the average monthly revenues for 44.82% of companies decreased by over 51% (see details in Table 3). At the same time, at the time of reporting, 29.06% of the companies stopped their activity (see details in Table 3).

On the one hand, most companies resorted to a strategy of retaining employees even during the crisis generated by COVID-19, so that 80.30% have not been dismissing employees and were not intending to dismiss employees (see details in Table 3). On the other hand, 48.27% of the analysed companies have not had any employees on a temporary leave (furlough), but 51.73% of the companies temporarily suspended the employment contracts of their employees, a condition called temporary leave (furlough) (see details in Table 3). As it is allowed by the Romanian legislation, a temporary leave (furlough) was a short-term solution counteracting the negative financial impact that companies had been facing at that time.

The main challenges currently faced by companies due to the crisis generated by COVID-19 are: Insufficient cash flow for maintaining any company's staff and size of activity (62.07% of respondents

reporting it); staff being absent from work due to medical reasons or governmental restrictions (33.50% of respondents reporting it); business partners being severely affected and not operating under normal conditions (66.50% of respondents reporting it), and for 80.79% of companies, buyers/customers having been affected and the demand going lower than under normal conditions (see details in Table 3). On the other hand, the procurement of raw materials necessary for production had not been a challenge for 59.61% of the companies (see details in Table 3).

The six hypotheses considered in our research were tested using the correlation analysis. All of them have been validated, these results being representative only for the considered sample in the analysed period. Briefly, these confirm the following: There is a strong correlation between the past action of employee dismissals and the percentage of declared dismissed employees (H1); there is a weak correlation between the dismissal of employees/the intention to dismiss employees due to the crisis generated by COVID-19 and the fact that the company's cash flow is insufficient (H2), explained by the fact that only 19.70% of companies laid off or planned to dismiss workforce because of the economic crisis generated by COVID-19; there is a weak correlation between the percentage of employee layoffs due to the crisis generated by COVID-19 and the fact that the company's cash flow is not sufficient (H3), explained by the fact that only 81.77% of managers have not fired employees during this period (see details in Table 3); there is a weak correlation between the act of dismissing employees/the intention to dismiss employees due to the crisis caused by COVID-19 and the fact that the demand is lower than under normal conditions (H4); there is a correlation between the percentage of suspended employment contracts through temporary leave/furloughing and the fact that the company's cash flow is not sufficient (H5), showing that negative effects of this COVID-19 economic crisis can be counteracted by means of temporary leaves/furloughing; there is a correlation between the percentage of suspended employment contracts through temporary leave/furloughing and the fact that the demand is lower than under normal conditions (H6).

An additional correlation highlights the fact that, during COVID-19 crisis, employers dismissed employees and suspended employment contracts through temporary leave/furloughing simultaneously, even if these two measures seem to exclude each other.

The regression analysis shows that the average linear revenue of companies decreases as cash flow for maintaining personnel and company's actions becomes less sufficient, workers are more absent from work due to illness or governmental orders, buyers/customers becoming more affected, and demand getting lower than normal. We consider that this model could be improved in further research if more companies are included into the study and their differences are tested by sector.

Author Contributions: The authors' contributions were equal. Conceptualization, S.A.N., S.M.T., E.-S.T., A.I.V. and A.L.G.; methodology, S.A.N., S.M.T., E.-S.T., A.I.V., and A.L.G.; statistical method and analysis, E.-S.T., A.I.V., and A.L.G.; writing—original draft preparation S.A.N., S.M.T., and E.-S.T.; writing—review and editing, S.A.N., S.M.T., E.-S.T., A.I.V., and A.L.G. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

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Article

Can We Have Our Cake and Eat It? A Review of the Debate on Green Recovery from the COVID-19 Crisis

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Abstract: As we speed through the development and distribution of a vaccine for the COVID-19 pandemic, economies are suffering through the worst decline of the century while, at the same time, being pushed to comply with global agreements regarding climate change. Because of this, the economic downturn is also seen as an opportunity to speed up the sustainability transition or, in simple terms, to achieve a “green recovery”. What can we expect from a green recovery? We address this question by reviewing position documents in the debate between green recovery and its opponent, “quick rebound”, in the Netherlands. We apply systems thinking to model causal arguments regarding key concepts comprising green recovery and identify issues of consensus and dissensus. Our findings indicate that green recovery is promising for curbing greenhouse gas emissions and addressing growing socioeconomic inequalities. However, the position of what green recovery means for economic growth, including the development of gross domestic product and employment, is still largely unclear and at times contradictory. While some see tradeoffs, others suggest that economic growth and sustainability goals can be achieved simultaneously. Thus, we conclude by reflecting on the question: Can we have our cake and eat it?

Keywords: COVID-19; green recovery; systems thinking; system dynamics; economic crisis; sustainability transition

Citation: Gusheva, E.; de Gooyert, V. Can We Have Our Cake and Eat It? A Review of the Debate on Green Recovery from the COVID-19 Crisis. *Sustainability* **2021**, *13*, 874. <https://doi.org/10.3390/su13020874>

Received: 22 December 2020

Accepted: 3 January 2021

Published: 16 January 2021

Publisher’s Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



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1. Introduction

COVID-19 has shaken up global economies to an extent comparable to the Great Depression [1]. Historically, governments have responded to past economic crises with various measures ranging from austerity to tariff increases. This time, there is large emphasis on worker subsidies and government spending policies. These policies are taking place because the origin of the crisis has been low expenditures and interruptions in production due to strict lockdown measures, whereas other crises such as the Financial crisis of 2007–2008 originated as a banking crisis within the US housing sector. COVID-19 economic recovery policies have significantly boosted government debt levels but are generally not seen as a concern because of historically low inflation [2]. Other than the size of the economic blow, and its global proportion, this economic crisis is special because the concept of environmental sustainability is gaining as much publicity as economic recovery policies themselves [3].

For the first time, there is talk of a “green recovery”, and analyses of what the proposed measures mean for environmental stability. Green recovery is an idea that the stagnation of economic activity can be used as an opportunity to restructure the economy and decouple it from its environmental impact [4,5]. For example, subsidies for retrofitting buildings are a green recovery policy since they increase energy efficiency by lowering greenhouse gas emissions and create jobs that boost economic development at the same time. Similar ideas have been argued as early as the 2008 Global financial crisis [6,7]. Then, as now, there was recognition of the unsustainability of our socioeconomic system and its dependence on the

environment [8]. Despite this, it can be said that the popularity of the concept of “green recovery” is unprecedented. This is clearly evidenced through the initiatives for a Green New Deal (US) and the European Green Deal (EU), which are different from the New Deal (US) or the Stability and Growth Pact (EU). These new initiatives are aimed at addressing the COVID-19 economic crisis, while at the same time continuing, or even accelerating, efforts to implement the Paris agreement.

Not everyone agrees with the idea of a green recovery, however, and the notion has become the topic of a debate [9]. Some are critical of the concept because they see climate action as a luxury we cannot afford to entertain in a pandemic [10]. In developed and developing countries alike, there is concern over the loss of jobs and general prosperity, which are seen as of higher priority than environmental health [11,12]. This does not mean that this side of the debate negates the need for a sustainability transition; rather, they emphasize the need for a “quick rebound”—one which will get the economy back on its feet as fast as possible and would thus enable a sustainability transition to take place as a result of economic recovery. The lack of consensus on the potential of green recovery is interesting and motivates our research on the reasons that the various parties use to come to their position. Accordingly, our research question is: “What are the expected consequences of a green recovery from the COVID-19 crisis”?

We previously engaged in a study that summarized this debate specific to the Netherlands with recommendations for Dutch infrastructure companies [9]. The objective of the current paper is wider, as we aim to analyze the argumentation about the mechanisms of economic recovery as they relate to the sustainability transition. These concepts are complex and hard to think about intuitively [13] since the processes describing both economic recovery and climate change tend to include time delays, nonlinearity, and feedback mechanisms [14]. We apply a systems thinking approach that puts exactly these characteristics at the central stage. Systems thinking is a powerful way of visualizing logical argumentation and is useful for making inferences, including some that may be missed or appear counterintuitive using a linear approach [15]. Elucidating these causal mechanisms is relevant, because it helps with identifying logical inconsistencies and deriving policy implications [16].

The remainder of this paper is structured as follows. In Section 2, we provide background on the impact that earlier crises have had on economic growth and environmental impact. In Section 3, we discuss the selection of position papers, and our systems analysis. Section 4 uses causal loop diagrams to provide a visual representation of the key concepts in the debate. In Section 5, we discuss the implications of our review for the relation between green recovery and economic growth.

2. Background

There is no generalizable understanding of what economic crises mean for environmental sustainability. Historically, there were some efforts to green the recovery from the 2008 Global Financial crisis, but their impact was very limited as they failed to structure long-term support to sustainability initiatives [17,18]. Falcone and Sica [17] have conducted a case study of the Italian biofuel sector and found that the economic crisis has had adverse effects on the development of this sector. However, some show that green recovery policies in 2008 helped to create jobs, which suggests the potential economic benefits of climate action during the ongoing COVID-19 crisis [18,19]. Further, Maxim and Zander [20] tested out different green tax policies in a simulation model and found that all are very promising for lowering emissions and increasing gross domestic product (GDP) and employment.

Elliott [21] analyzed the impact of the Asian 1997 crisis and 2008 Global financial crisis and concluded that their effect on the environment is counterintuitive because it starts out being positive only to end up being negative. This transition into a negative effect is partly explained by an increased pressure on the environment because of lowered economic output from the crisis, which results in further environmental degradation either in legal or illegal ways [22]. Consequently, the arising environmental crisis and apparent

negative effects of economic crises make a strong case for green recovery: the economic and environmental crisis need to be tackled collectively through strong policy frameworks. This approach is also stressed during the current crisis because of the environment of rising socioeconomic inequalities and environmental degradation caused by neoliberal philosophies which put markets over the state [23].

This situation is even more urgent for low-income countries because they are more vulnerable to climate change [24] and calls for policies that address both the economic and environmental crisis [25]. However, financial crises are associated with significant increases in the extreme poor in low-income countries [26]. Additionally, there is a lack of available financing [11] to address the crisis in developing countries, and the UN has warned that 55 countries are expected to face food insecurity [27]. This makes a strong case for quick rebound, as not all can afford to invest in green recovery when there is a humanitarian crisis going on at the same time.

This is not solely the issue of whether recovery policies are green or not. The process of arriving at and implementing policies is just as important. Several sources note this finding based on past crises. For example, a case study comparing Latvia and Iceland [28] found that differences in political collaboration can be used to explain differences in the courses of sustainability transition attempts. Political collaboration refers both to coordination between public institutions and between the public and the government. Further, Yurtsever [29] found that collaboration is critical for the pace of economic recovery, especially in monetary unions such as the Eurozone. The argument here is that the level of collaboration can make or break attempts of a socioeconomic transition, which are necessary to overcome an economic crisis.

In addition to this, public awareness is crucial as it steers both public and private investment. Obani and Gupta [30] found that societal emphasis on green recovery has been reduced during economic crises because it was seen as wishful thinking that is detrimental to economic recovery. During the ongoing COVID-19 crisis, public awareness of environmental topics, such as pollution and climate change, has been reduced, but awareness for local natural resources, such as access to green spaces and biodiversity, has increased. Rousseau and Deschact interpreted these findings in light of dramatic changes in lifestyle brought about as a result of the pandemic. Specifically, there has been a reduction of mobility, which has increased use of local green spaces, and an increase in media attention on COVID-19, which has subsequently reduced media coverage of climate change [31].

We can conclude that, while there is an urgent call to invest in a green recovery from the COVID-19 crisis, it is far from obvious that both economic recovery and improved sustainability can simultaneously be achieved. To better understand the opportunities and risks associated with engaging in a green recovery, this paper provides a review of the different lines of argumentation that are presented in this debate.

3. Materials and Methods

This article is a follow-up to a study focused on implications of the green recovery debate for Dutch infrastructure operators [9]. That study, however, proved to have broader relevance, which led us to write about the broader consequences of green recovery.

The underlying material remains the same: in order to obtain a nuanced overview of the lines of reasoning in this debate, we collected position papers and other reports, forming an inventory of 105 documents (available as Supplementary Material). The data collection period lasted from 5 October 2020 to 26 October 2020. During this period, we visited the websites of known Dutch and international experts including governmental agencies, intergovernmental agencies, nongovernmental organizations, think-tanks, and private companies within the media and consulting industry and checked to see whether they had any publications covering the economic recovery debate for COVID-19. Our aim was to create an inventory of documents representative of as many diverse opinions as possible. In order to do that, and at the same time manage our risk of bias, we checked to

see if we had missed any data by looking at the first 10 pages of Google search results on the keywords “COVID-19 economic recovery” and “COVID-19 green recovery” and consulted with representatives from a consortium of Dutch infrastructure sector representatives to identify any extra documents that we may have missed.

Then, we did content analysis one document at a time, purposively choosing documents that reflect diverse perspectives, until reaching saturation as no new concepts emerged from the documents. This led us to analyze a total of 16 documents (summaries of content analyses are available as Supplementary Material). Each document was analyzed by converting its main arguments into causal word-and-arrow diagrams, either causal loop or stock-and-flow diagrams [32–35]. These diagrams are particularly suited for representing feedback loops, accumulations, and nonlinearities [36]; thus, they are representative of the dynamics that may arise from interconnections between key concepts. The process of conversion is based on grounded theory, with the addition that textual statements are translated into causal relationships [37,38]. The resulting models then provide a holistic overview of implicit and explicit causal relationships in the document, which is useful for analyzing the various lines of argumentation and identifying their commonalities and differences [39].

After analyzing each document separately, we induced common emerging themes in the data. Using these themes as a focal point, we engaged in cross-document analysis. Specifically, we analyzed the data collectively in two different ways: (1) model-based deduction for identifying aggregate causal arguments and (2) text-based induction for identifying issues of consensus and dissensus (see Table 1). For the purpose of model-based deduction, we collected all model structures (with specific emphasis on feedback loops as sources of endogenous dynamics) that connect to a given theme (Step 1) and then aggregated their causal logic into causal loop diagrams for each theme (Step 2). This allowed us to have an overview of the main arguments for each theme in the form of a causal loop diagram (Output), while, for the purpose of text-based induction, we created statements for each theme (Step 1) and then went back to the source data to induce the implicit or explicit position of all documents (Step 2), forming tables of document positions on each theme (Output).

Table 1. Description of parallel data analysis processes according to steps and output.

Process	Model-Based Deduction	Text-Based Induction
Step 1	Code model feedback loops to themes	Create statements based on themes
Step 2	Aggregate causal arguments	Induce document position on statements
Output	Causal loop diagrams	Tables of document positions

This method of cross-document analysis is original and complementary to the established method. Specifically, the main difference underlies the output of the process. While Kim and Andersen [33] ended up with a single model representative of the system structure, we created multiple aggregate models, which are not necessarily consistent. Thus, they complement issues of dissensus, which also are not consistent. Conclusively, we were able to highlight issues of consensus and dissensus using text-based analysis and discuss their reasoning through causal argumentation using model-based analysis.

4. Results

Five topics related to the effects of green recovery emerged from analyzing the debate between “quick rebound” and “green recovery”. They denote common themes across documents as each topic needed to be present in at least a quarter of the documents in order to be included. All topics are considered key factors affecting the consequences of green growth. We present the findings for each topic separately and reflect on their implications in the discussion.

Tables 2–6 showcase issues of consensus and dissensus in each of the identified themes. Generally, there is much common ground in the debate between “green recovery” and “quick rebound”. There is wide consensus that investments must continue as the main tool for economic recovery, with few organizations criticizing existing government policies for their shortcomings in promoting sustainability and inclusivity. The largest differences between position papers occur because most sources cover only an aspect of the debate (see Appendix A for topic coverage).

Table 2. Table of document positions on statements related to resilience.

Statement	Agreement	Disagreement	Not Discussed
There should be focus on building resilience to future shocks	[3,5,40–48]	N/A	[4,49–52]
Shorter supply chains have a positive effect on economic resilience	[3,40,44,48,50]	[41,45]	[4,5,42,46,47,49,51–53]

Table 3. Table of document positions on statements related to behavior shift.

Statement	Agreement	Disagreement	Not Discussed
Post-COVID-19 consumer behavior shift is uncertain	[3,4,44,48–51]	[42]	[5,40,41,43,45–48,52]

Table 4. Table of document positions on statements related to human capital.

Statement	Agreement	Disagreement	Not Discussed
Green recovery will create jobs, possibly more than quick rebound	[3,5,43–45,51]	N/A	[4,40–42,46–50,52]
The crisis has a negative effect on productivity, which is difficult to overcome in the future	[41,50]	[3,40,43–45]	[4,5,42,46–49,51,52]
Investment in human capital is key to economic recovery	[3,41,42,44,46–48,50,51]	N/A	[4,5,40,43,45,49,52]

Table 5. Table of document positions on statements related to models of growth.

Statement	Agreement	Disagreement	Not Discussed
Investment in innovation is important for economic recovery	[3,5,40,42,44,46,51]	N/A	[4,41,43,45–49,52]
Recovery should be focused on wellbeing metrics rather than GDP	[3,42,46,47]	N/A	[4,5,40,41,43–45,48–52]
Anticipated post-COVID GDP development will be the same or worse than pre-COVID GDP	[4,41–43]	[40,44,45]	[3,5,42,46–49,51,52]

Table 6. Table of document positions on statements related to inclusivity.

Statement	Agreement	Disagreement	Not Discussed
It is important to have inclusive accessible policies	[3,5,41,42,44,46–48,51,52]	N/A	[4,40,43,45,49,50]

Figures 1–5 are causal loop diagrams. Each arrow denotes a causal link between two of the variables. Causal links are read according to their polarity, which is either positive (+) or negative (−), so that a positive polarity link means that variables move in the same direction while a negative link means that they move in the opposite direction (see Appendix A for all causal links). For example, the link from “Ecological footprint” to “Likelihood of environmental shocks” (Figure 1) is read as follows: “a larger ecological footprint increases the likelihood of environmental shocks” or “a lower ecological footprint decreases the likelihood of environmental shocks”. In addition, these diagrams contain feedback loops, which are closed chains of causal relations that start and end with a change in the same variable. They can be reinforcing, where a variable reinforces itself through the other variables; or balancing, where a variable drives itself up to a point of equilibrium. As an example, B2 (Figure 2) is a balancing loop and is read as follows: “As economic prosperity decreases, the duration of support packages increases, which brings economic prosperity back up again”.

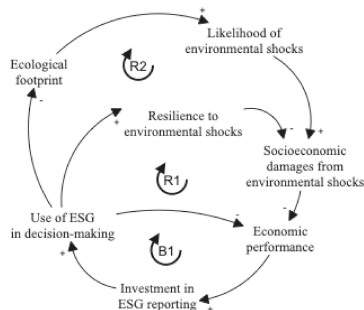


Figure 1. Environmental, social, and governance (ESG) decision making is a leverage for shifting focus from short-term to long-term economic performance.

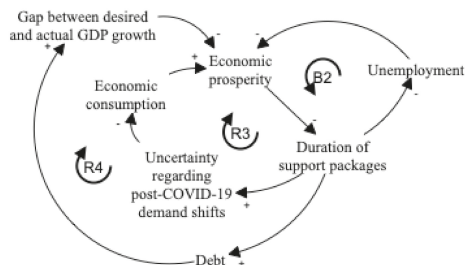


Figure 2. Economic support packages can be detrimental due to increased uncertainty regarding post-COVID-19 demand shifts.

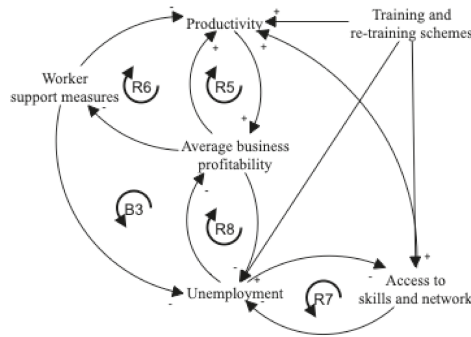


Figure 3. Human capital can drive economic recovery through training and retraining.

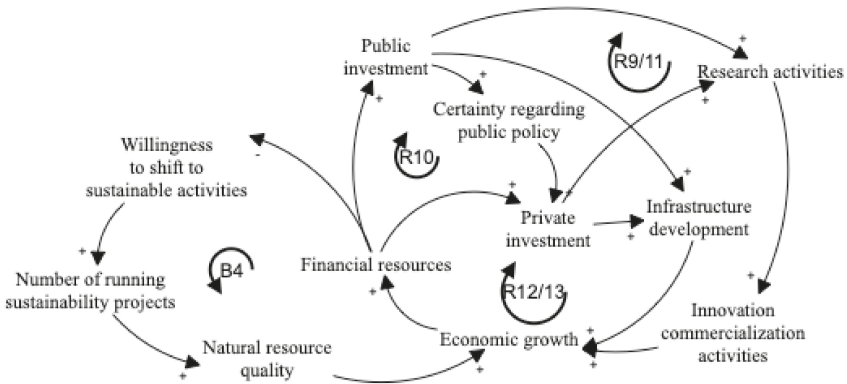


Figure 4. Models of growth based on social, human, and natural capital.

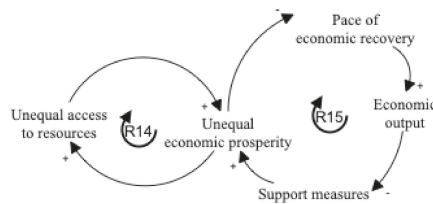


Figure 5. Infrastructure can break the vicious inequality cycle.

4.1. Resilience

There is widespread agreement on the importance of shaping economic policy in a way that boosts resilience to future environmental shocks (see Table 2). However, there is dissensus regarding the way to do that. Some documents state that shortening supply chains improves economic resilience, while others argue that local producers can fail just as well and that diversifying supply chains is a better way to boost resilience. In addition to this, some documents stress that digitalization has a positive effect on boosting resilience [40,41].

The environmental crisis necessitates the distinction between two key concepts: likelihood of environmental shocks and resilience to environmental shocks. This is echoed in efforts for climate change mitigation and adaptation. Both affect economic performance through socioeconomic damages from environmental shocks and can be leveraged by

changing the decision-making system within organizations (see Figure 1). A shift to environmental, social, and governance (ESG) decision making, as opposed to decision making centered around economic benefit, can both reduce organizational ecological footprints [3], thereby decreasing the likelihood of future shocks, and boost resilience to future environmental shocks (R1) [42]. Importantly, because of its lack of emphasis on economic performance, ESG decision making has a short-term negative effect on economic performance and may thus slow down its adoption (B1). However, despite this negative effect, ESG decision making is argued to have a positive long-term effect on economic performance because of its ability to mitigate environmental shocks (R2).

4.2. Behavior Shift

The largest unknown regarding this crisis is post-COVID-19 behavior shifts (see Figure 2). Hence, consumer behavior shifts are classified as uncertain by many documents (see Table 3). The World Economic Forum is in disagreement of this as they rely on early post-first-wave data to show that consumer behaviors are likely to return to pre-COVID-19 patterns [42]. A consumer behavior shift was also anticipated during the 2008 Global Financial crisis [53] whereby consumers were expected to shift to more environmentally sustainable purchases. Other than changes in goods consumption, there have also been changes in global trade, mobility, and energy demand. These demand shifts lower economic prosperity through decreased economic output and increased debt level (R4) [4,44]. Despite their well-meaning intentions (B2), governmental support packages are only said to increase uncertainty since they maintain the status quo, decreasing consumer confidence and calling for even more support packages (R3) [45].

4.3. Human Capital

The crisis has been detrimental to business profitability (R6) and has thus increased unemployment, which is reinforced through the loss of access to skills and network (see R7 in Figure 3). In light of this, there is no disagreement to the statement that green recovery policies will create jobs (see Table 4). Some documents go as far as stating that green recovery will create even more jobs than quick rebound [46,47]. Additionally, retraining policies are advanced as extremely important with any job creation policy. There is a call for a shift from firm-specific retraining policies to general continuous education policies, prioritizing policies for human capital development for the entire labor force, including during periods of unemployment.

On the other hand, there is some dissensus regarding the development of productivity. Some optimistic sources posit that productivity can be a driver of growth if there are investments in innovation [40,48], disagreeing with the pessimistic view that productivity will be crippled in the medium term because of the crisis [41,45]. In other words, innovation and retraining schemes boost productivity, thus reinforcing human activity (R5) as opposed to worker support measures (e.g., furlough), which are found to decrease productivity (R6), but ultimately balance out their negative effect on productivity through reduced unemployment (B3). All in all, investment in human capital is stressed as important by almost all documents.

4.4. Models of Growth

Most sources discussing GDP development agreed that post-crisis GDP development will remain the same or worse than pre-crisis GDP (see Table 5). On the other hand, some optimistic sources predict that post-crisis GDP can be significantly larger if there are structural shifts in the economy, which would help to address public debt [40,49].

The current model of economic growth is largely based on investments as a way of increasing financial resources beyond the time value of money. Further, economic growth can be intensified through a synergy between public and private investment (see R10 in Figure 4). Specifically, public investments in green energy create a sense of long-term certainty, which reinforces private investment. Some of this investment is toward research

activities, which drive innovation development and digitalization, ultimately boosting economic growth. In fact, about half the documents stress the importance of investment in innovation as the only way GDP growth can come to its desired levels (R9 and R11). Alternatively, growth can be driven through investments in infrastructure developments that set the stage for economic growth (R12 and R13).

Unfortunately, much of historic economic growth has exploited natural resources to an unsustainable level. While it is clear that environmentally destructive activities benefit the economy, many documents point toward the benefits of environmentally conservative activities for the economy. Thus, natural resources and economic capital are interdependent in a symbiotic relationship.

The economic crisis is characterized by a larger willingness to shift to sustainable activities if financial capital is granted under “green” conditions. As an example, many businesses are facing lower financial resources, which increases their willingness to make a shift to sustainable activities if that is a condition for them to get financial support. Such a shift, in turn, can restore natural resource quality and address this environmental limit to growth (B4). Both private and public investors during this crisis are key to steering economic activity in a direction that maintains or improves natural resource quality or one that deteriorates it [5]. On the other side of the debate, there are proposals for new models of growth. A quarter of the documents propose a shift from GDP to other wellbeing metrics for recovery investments [50,51]. This goes beyond the idea of decoupling economic growth from climate change to an economy based on wellbeing that bases growth on digital innovation and human capital development.

4.5. Inclusivity

The pandemic has widened the gap between social groups as the poor and vulnerable have been more adversely affected. Similarly to unemployment, inequality is reinforced by unequal access to resources (see R14 in Figure 5.) [52,53]. One of the consequences of inequality is a slower pace of economic recovery, since the vulnerable have a harder time getting back on track and thus require more support measures. Unfortunately, most governmental support measures so far have not been structured on inclusivity principles. Thus, it can be said that they are only further driving inequality (R15). Not all documents discuss inclusivity, but those that do have a strong opinion that recovery policies should be designed to be inclusive (see Table 6).

5. Conclusions and Discussion

Unlike past economic crises, the ongoing COVID-19 crisis is accompanied by a call for green recovery: a call to action for climate change [54], biodiversity [55], and a general sustainability transition. Therefore, there is a debate around whether (i) sustainability transition efforts should be continued and even intensified (green recovery) or (ii) should be paused, and funds should be spent on getting the economy back on its feet (quick rebound). Our study reviewed this debate in order to identify expected consequences of green recovery. We found that the debate revolved around five main topics: resilience, behavior shift, human capital, models of growth, and inclusivity.

5.1. Debate Summary

We found a broad consensus that green recovery is critical to making substantial progress toward the established climate goals [4]. In addition, there is consensus that green recovery would facilitate the creation of new jobs, with some arguments that the total number of jobs would be higher in the case of green recovery compared to quick rebound [47]. Green recovery policies would also have a positive effect on socioeconomic inequalities through an inclusivity principle that targets the vulnerable [51]. An example of this can be investing in infrastructure for the vulnerable, which may have a lower economic return but will contribute to equalizing access to resources.

We found different consequences for policies that focus on supporting existing jobs and policies that are aimed at innovation and new jobs. Worker support measures endure uncertainty about shifts in behavior by maintaining the status quo, while investments in innovation and retraining programs have a longer-term perspective by helping employees and industry to become more future-proof.

There is no consensus on the future development of global trade. Some argue that resilience could and should be improved by focusing on more local supply chains. Others warn that local supply chains also remain vulnerable and warn against the downsides of barriers to global trade. This is echoed in the real world where we can see both tariff policies and trade openness evidenced through the establishment of the largest economic union—the Regional Comprehensive Economic Partnership [56]. Wang and Wang [57] have confirmed the importance of trade openness and urge for more energy efficiency policies, while WEF [41] gives ideas that advances in digitalization may pave the way toward global economic convergence as companies get more comfortable with remote work and reinforce the trend of offshoring white-collar labor.

The fact that most documents are in agreement regarding the job creation potential of green recovery illuminates a contradiction in their arguments regarding what green recovery would mean for GDP development. While some posit that green recovery would contribute to GDP, others call for a shift to a wellbeing economy through the abandonment of GDP as a decision-making metric. It is unclear whether green recovery would boost financial performance by decoupling economic activity from its ecological footprint or whether it would facilitate a shift to ESG metrics and entertain reduced financial performance. UNEP [15] and Maxim and Zander [20] advocate the former while Elliott [21], Geels [22], and Falcone and Sica [17] stand witness to the latter. We are left with the question: Is green growth an oxymoron?

5.2. Knowledge Contribution

Looking back on past research, Oprean-Stan, Oncioiu, Iuga and Stan [58] showed that the publication of nonfinancial metrics has a positive impact on traditional performance indicators such as return on assets. In fact, investments in renewables have fared better in the current crisis than investments in nonrenewables [4]. Mukanjari and Sterner [59] confirmed this finding and added that environmental performance, as an ESG variable, is an even better explanation for this than carbon intensity.

However, they also posited that official ESG “climate change policy” has had no effect on firm performance during the crisis as they elaborated that investors may be looking at other metrics when making decisions. These findings are in line with the causal argumentation that ESG-based decision-making benefits long-term performance through increasing resilience. Specifically, despite this initial negative effect on financial performance, ESG decision making is argued to have a positive long-term effect on performance because of its ability to mitigate and adapt to environmental shocks [3,42]. In other words, shifting from profit maximization to a broader set of indicators helps to increase resilience, which may result in lower economic growth in the short term and higher economic growth in the long term.

Earlier studies on the relation between crisis recovery and environmental impact stress the relevance of collaboration [28,29] and public awareness [30,31]. The many position papers on the topic of green recovery (we had little trouble identifying 105 of them) signal a growing awareness of sustainability issues. Some of the papers also underscore the relevance of collaboration, mainly through noting the need for combined public and private investments in innovation and retraining.

5.3. Concluding Remarks

To conclude, we started this study by addressing the debate of “quick rebound” versus “green recovery” but, contrary to our expectation, we found there was no real debate going on as most sources praised green recovery. Instead, we found that there is a debate within

the area of green recovery itself. The debate within green recovery concerns whether green recovery simply means green growth or a fundamental restructuring of our socioeconomic system to focus on wellbeing rather than growth. If one adopts the former as the concept of green recovery, then “quick rebound” and “green recovery” are really one and the same as they both focus on job creation and economic growth. However, if we are to adopt the latter as the definition of green recovery, then some serious thought needs to be given regarding whether absolute decoupling is truly possible with an economic growth narrative. Authors have noted that many decision makers are prone to subscribing to a decoupling delusion as there are faults within the ways we currently calculate decoupling such as masking efficiency gains to look like decoupling [60] or shifting ecological footprints onto poorer nations [61]. We too came to the same conclusion through our systems analysis as we noticed the contradiction between economic growth on the one hand and sustainability transition on the other. Thus, this development in thinking marks our biggest takeaway. We hope that our study hereby contributes to an even stronger base for collaboration and more critical thinking about the ways in which we can or cannot both increase economic prosperity and environmental quality.

5.4. Study Limitations and Recommendations for Future Work

Our study looked at a very wide debate using qualitative systems methods. While this is our study’s greatest strength given systems methodologies’ ability to enable holistic analyses stemming from the interconnections between key concepts, it is also a great limitation. We suggest future research to untangle under what circumstances COVID-19 economic recovery policies and the sustainability transition mutually benefit one another and under what conditions they hinder one another. While our study was general, looking at specific situations is important in order to understand whether and why economic recovery and the sustainability transition can or cannot be achieved simultaneously in different contexts. Following the example of Vivid Economics [62], who have created a Greenness of Stimulus Index, scholarly research can examine public policies set in different contexts by analyzing their ability to bring about true eco-economic decoupling or unanticipated trade-offs on measurables other than gross economic product.

Supplementary Materials: The inventory of all of the documents we collected and summaries of the content analysis of each of the reviewed documents are available online at <https://www.mdpi.com/2071-1050/13/2/874/s1>.

Author Contributions: Conceptualization, V.d.G.; methodology, E.G. and V.d.G. software, E.G.; investigation, E.G.; writing—original draft preparation, E.G.; writing—review and editing, V.d.G.; visualization, E.G.; supervision, V.d.G.; funding acquisition, V.d.G. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by Next Generation Infrastructures, grant number 20201002NGI.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The documents reviewed in this study are all publicly available.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1 represents an overview of topic coverage per document. Specifically, a document is characterized as having covered a topic if content analysis (content analysis summaries are available from the authors) contributed to the creation of the causal loop diagrams (Figures 1–5) presented in the results section. Table A2 lists all of the causal links found within these diagrams and the references the sources within which support is found for the causal link. Readers are encouraged to identify whether a document covers a topic

in Table A1 and then see the document's causal arguments regarding the topic by finding for which causal link the document is referenced.

Table A1. Topics covered in each document. Grey signifies that a topic is covered.

Source	Resilience	Behavior Shift	Human Capital	Models of Growth	Inclusivity
[3]					
[4]					
[5]					
[40]					
[41]					
[42]					
[43]					
[44]					
[45]					
[46]					
[47]					
[48]					
[49]					
[50]					
[51]					
[52]					

Table A2. A list of all causal links with their polarity and sourcing documents.

Causal Link	Polarity	Reference
Likelihood of environmental shocks -> Socioeconomic damages from environmental shocks	+	[3,4,46]
Socioeconomic damages from environmental shocks -> Economic performance	-	[3,5,40,41,44]
Economic performance -> Investment in ESG reporting	+	[3,42,46,47]
Investment in ESG reporting -> Use of ESG-based decision making	+	[42,46]
Use of ESG-based decision making -> Resilience to environmental shock	+	[42,44,46,48]
Resilience to environmental shock -> Socioeconomic damages from environmental shock	+	[3,5,40,41,44]
Use of ESG-based decision making -> Ecological footprint	-	[42,46]
Ecological footprint -> Likelihood of environmental shocks	+	[3,4]
Use of ESG-based decision making -> Economic performance	-	[42,46]
Economic prosperity -> Duration of support packages	-	[3,40,41]
Duration of support packages -> Unemployment	-	[40,41]
Unemployment -> Economic prosperity	-	[5,40-42,50]
Duration of support packages -> Debt	+	[41,51]
Debt -> Gap between desired and actual GDP growth	+	[40,50]
Gap between desired and actual GDP -> Economic prosperity	-	[40,50]
Duration of support packages -> Uncertainty regarding post-COVID-19 demand shifts	+	[41,45,47,50]
Uncertainty regarding post-COVID-19 demand shifts -> Economic consumption	-	[4,41,47,50]
Economic consumption -> Economic prosperity	+	[40,46,47]

Table A2. Cont.

Causal Link	Polarity	Reference
Average business profitability -> Unemployment	–	[5,40,41,50]
Unemployment -> Average business profitability	–	[5,40–42,50]
Average business profitability -> Productivity	+	[40,43]
Productivity -> Average business profitability	+	[40,42,43]
Average business profitability -> Worker support measures	–	[3,40,41]
Worker support measures -> Productivity	–	[40,41,50]
Worker support measures -> Unemployment	–	[40,41]
Unemployment -> Access to skills and network	–	[40,47,50]
Access to skills and network -> Unemployment	–	[42,47,50]
Access to skills and network -> Productivity	+	[42,50]
Training and retraining schemes -> Unemployment	–	[42,46,50]
Training and retraining schemes -> Access to skills and network	+	[42,46,50]
Training and retraining schemes -> Productivity	+	[42,43,46,50]
Public investment -> Research activities	+	[40,42]
Research activities -> Innovation commercialization activities	+	[40,42]
Innovation commercialization activities -> Economic growth	+	[40,42]
Economic growth -> Financial resources	+	[43,45,46,49,50]
Financial resources -> Public investment	+	[40–42,52]
Public investment -> Infrastructure development	+	[42,43,45,46]
Infrastructure development -> Economic growth	+	[42–45,49]
Public investment > Certainty regarding public policy	+	[5,41]
Certainty regarding public policy -> Private investment	+	[5,51]
Private investment -> Research activities	+	[40,42]
Private investment -> Infrastructure development	+	[42,43,45,49]
Financial resources -> Private investment	+	[40,42]
Financial resources -> Willingness to shift to sustainable activities	–	[5,51]
Willingness to shift to sustainable activities -> Number of running sustainability projects	+	[3,51]
Number of running sustainability projects -> Natural resource quality	+	[3,42,44,51]
Natural resource quality -> Economic growth	+	[3,44,51]
Unequal economic prosperity -> Unequal access to resources	+	[40,42,50]
Unequal access to resources -> Unequal economic prosperity	+	[41,48,52]
Unequal economic prosperity -> Pace of economic recovery	–	[5,41]
Pace of economic recovery -> Economic output	+	[41,44,46,49]
Economic output -> Support measures	–	[3,40,41]
Support measures -> Unequal economic prosperity	+	[41,47]

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Article

Transforming the COVID-19 Threat into an Opportunity: The Pandemic as a Stage to the Sustainable Economy

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Abstract: The aim of this research is to assess the impact of the economic shocks of supply and demand generated by the COVID-19 crisis on the climate sphere at the level of the Member States of the European Union. In this respect, a macroeconomic model was used to obtain firstly an estimate of the measure of demand shock and secondly an estimate of the supply of the economy. These milestones were eventually used to estimate the impact of the two economic shocks on the level of greenhouse gas emissions. The obtained results show that both the shock from the aggregate demand area and that from the aggregate supply area had the effect of decreasing the level of greenhouse gases, leading to a positive effect on the environment. From a quantitative point of view, the model estimates show that, as a result of the manifestation of the two cumulative shocks, the level of greenhouse gas emissions could decrease by about 10%.

Citation: Oncioiu, I.; Duca, I.; Postole, M.A.; Georgescu (Crețan), G.C.; Gherghina, R.; Grecu, R.-A. Transforming the COVID-19 Threat into an Opportunity: The Pandemic as a Stage to the Sustainable Economy. *Sustainability* **2021**, *13*, 2088. <https://doi.org/10.3390/su13042088>

Academic Editor: Darko Vukovic

Received: 23 January 2021

Accepted: 11 February 2021

Published: 16 February 2021

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



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Keywords: green economy; COVID-19; pandemic; economic shock; economic crisis; sustainable development; greenhouse gas emissions

1. Introduction

Under the current conditions, the economic situations of all the states around the world have undergone substantial changes due to the COVID-19 crisis [1–3]. These changes brought to the surface the inequalities between states and the fragility of the social, financial, political, and economic systems that can be felt both at the level of the community of which we are part and within these various states [4–6]. In response to COVID-19, decision-makers in several countries have developed fiscal measures proposing to use a series of tools to assess the green economy in order to align monetary and fiscal policies to the ecological recovery process. In this way, COVID-19 has highlighted the increasing role of the state in all countries affected by this pandemic. The analysis of these effects resides in the measures adopted along with their impacts, especially in emerging countries where the effects of the economic crises will be felt for longer periods of time [1,6,7].

At the same time, state intervention in the climate stabilization process is necessary, in order to replace some energy systems with modern, high-performance ones featuring lower costs and the promise of a cleaner environment in the future [8–10]. In addition to economic measures, the application of environmental policies is also required. Indeed, decisions made about the COVID-19 crisis will have a major impact on health and the environment for decades. As a result, we must act responsibly against climate change and the negative externalities of intensive economic activities. Authors have highlighted the need for the transition to a new economic model based on low greenhouse gas emissions, greater use of renewable energy sources, and increased energy efficiency [8,9].

In this sense, an important role is played by the actions of supporting alternative economic elements through introducing the concept of the “Green Economy” [11]. The green economy offers opportunities to all states, regardless of their degree of development and economic structure [12]. Moreover, the green economy has been discussed in terms of the main tools used to achieve the process of sustainable development.

The perspectives offered by both the green and circular economy consider an extended approach to sustainable development with common actions employed to protect the environment and to increase both the competitiveness and the productivity of the resources relevant to every economy [13,14]. In view of the above factors, developed countries should provide financial support to help emerging countries reduce their carbon emissions, adapt to the consequences of climate change, and supplement their disaster-related funds in response to the COVID-19 crisis [15,16].

There is no doubt that the COVID-19 pandemic is an alarm signal that draws our attention to the fact that a return to the previous normal will be detrimental to the environment and human health because it puts the profit before the real cost of a balanced life, and therefore a new development model must be radically redefined [4,11,15]. Any positive and visible impact of reducing energy consumption and greenhouse gas emissions will only be temporary in the absence of a radical change in the direction of political will towards less polluting and sustainable solutions [8–10].

In this context, the central theme of the article presents, with the help of quantitative methods, the assessment of the impact of economic and supply shock on the environment, so that the present research answers a relevant question: Is the COVID-19 crisis, in addition to all its known threats, an opportunity for the transition to a green economy?

To perform the present analysis, a macroeconomic model was applied to estimate the impact of the shocks of supply and demand in the economy generated by the COVID-19 crisis at the level of the Member States of the European Union. The results obtained in estimating the impact of the two economic shocks on the level of greenhouse gas emissions will afford a better understanding of the current situation and will make it possible to take appropriate measures in the future. This requires consideration of structural paradigm shifts due to the coronavirus crisis that can go hand in hand with economic and environmental reforms so that 2020 can be a cornerstone not only for climate negotiations but also for the future world economy [15]. Thus, through the research question, this article can be considered as a reflection on the ambitions of climate neutrality in Europe, during the Covid-19 epidemic. Even more, it can reinforce the idea that a global health crisis is not the answer to greenhouse gas emissions, but the phenomenon can give us the chance to choose a new mentality in terms of the effects that human activities have on the planet.

From a practical point of view, the findings of this study also indicate that understanding the nature of this pandemic crisis and their impacts will require dedicated attention, because there should be some limits for scarifying economic and social goals in favor of ecological goals. In addition, a socially equitable transition, planned and implemented in the long run, is the only way to build a resilient society with a strong and sustainable economy. It is hoped that this study will lay a foundation for further research in this area and support enhanced closer cooperation from policy-makers on this critical matters, thus respecting the commitments made under the European Green Pact.

The rest of this paper is organized as follows: Section 2 provides a brief presentation of the literature, Section 3 provides the methodology, Section 4 analyses the empirical results and discussions the implications, and Section 5 presents the conclusions.

2. Literature Review

In recent years, the concept of the green economy has been increasingly discussed. Indeed, the concepts of the circular economy and the green economy are part of the concept of sustainable development advanced in 1987 by the Brundland Commission [14]. The plan for a green economy was first presented in 1989 in the Blueprint for a Green Economy by a group of environmental economists. This blueprint included a series of practical

measures and policies for greening modern economies and ordering them in the context of sustainable development [11,13].

Later in 2008, this concept was revived in the context of discussions on the policy response to multiple global crises. At the same time, other publications of United Nations Environment Programme (UNEP) (2011), UNCTAD (2011), UN DESA (2011), and UNCSD (2011) considered the concept of the green economy and sought to outline a series of guidelines, benefits, and risks in implementing this economy [13]. In addition, there have been a number of non-governmental organizations and partnerships concluded in recent years that aimed to promote the green economy as a concept along with employment, research, analysis, and information [11].

Discussions with a particular focus on the transition to a green economy were addressed at the 2012 UN Conference on Sustainable Development (Rio + 20), giving a strong signal to governments, businesses, and civil societies around the world on the transformation of the green economy for sustainable development and poverty eradication [17].

The concept of the green economy is increasingly used at the international level. The Paris Agreement signed at the XXI Conference of the Parties (COP 21) to the UN Framework Convention on Climate Change represented a major global decision to reduce the global average temperature growth by 2 °C. Moreover, the Batumi Green Economy Initiative (BIG-E) envisages a pan-European strategic framework for the transition to an inclusive green economy. However, in addition to these frameworks, a number of other important initiatives can be listed (Table 1) [18].

Table 1. Initiatives related to the implementation of the green economy concept [18].

Initiatives		Initiative Presentation
1	Green Growth Knowledge Platform (GGKP)	The GGKP brings together a number of international experts working in the field of the green economy and participates annually in a conference dedicated to this platform in connection with the conference organized by the OECD.
2	Partnership for Action on Green Economy (PAGE)	Launched in 2013, the Green Economy Partnership for Action (PAGE) was designed to support countries considering implementing a green approach to the economy.
3	Green Industry Platform	The platform initiated by UNIDO with UNEP being invited to involve national governments, as well as the private sector and NGOs, in the field of green industry around the world.
4	WIPO Green—The Sustainable Technology Marketplace (WIPO)	An initiative of the World Intellectual Property Organization (WIPO) that facilitates the adoption and implementation of environmental technologies, mainly in countries with emerging economies.
5	Greening Economies in the European Union’s Eastern Neighbourhood (EaP GREEN)	EaP Green is structured in three components and aims to support the six Eastern Partnership countries (Armenia, Azerbaijan, Belarus, Georgia, Moldova, and Ukraine) in order to progress towards a green economy by separating economic growth from environmental degradation and resource depletion.
6	SWITCH to Green Facility	A platform that facilitates cooperation to improve international progress towards the transition to a green economy.
7	GreenEcoNet	An initiative funded by the European Commission is being developed by six European research partner organizations to present a range of SMEs that have implemented sustainable business models.

The transition to a green economy must equally consider three dimensions of interconnected politics. The first dimensions relate to large investments in the process of the sustainable development of resources and natural capital; then, the right markets and regulatory conditions must be established, and, at the same time, the administration must be improved, along with an increase in private sector involvement [19–21]. On that basis, sustainable economic development must achieve a type of economy (green economy) based on reducing energy and obtaining clean energy, which will contribute to the creation of green jobs [22]. Moreover, the transition to the green economy involves a major concern based on adequate knowledge, research, and innovation to create a framework for promoting long-term sustainable development [23].

Another vision of the green economy is as a process of transformation that eliminates the dysfunctions of the current economy and aims to achieve human well-being and, at the same time, equitable access to opportunities for all people, while protecting economic and environmental integrity—i.e., the economy cannot be green without being equitable [24–26]. In 2012, at the UN Conference on Sustainable Development, the Green Economy Coalition, after a series of consultations with organizations around the world, proposed a series of principles in favor of supporting the green economy—an economy that is fair and favorable to social inclusion, thereby offering a better quality and more ecological life [27,28]. Since 2015, those campaigning for an inclusive green economy have worked together to build social, economic, and environmental resilience, both globally and locally, through policy reforms that reduce system vulnerabilities.

At the level of the European Union, the implementation of the circular economy reflects the European Union's direct awareness of the environment [29]. However, Europe's goal is to achieve climate neutrality through gradual and irreversible reductions and long-term goals, in order to build a resilient economy and a resilient society, and not through disruptive shocks [28]. Indeed, the European Commission in 2015 presented an ambitious plan related to environmental protection for a circular economy that reuses all available resources, replacing the so-called linear economy in which citizens consume and throw away resources [28]. The European Commission has also considered a number of elements that comprise the green economy. These include innovation, resource efficiency, promoting sustainable production and consumption patterns, waste prevention and management, and water resources management [30].

Among the priorities to be considered are recovery efforts for greening that can help the world's states better rebuild after the pandemic to increase resilience against future crises, ensuring a healthy environment that supports citizens. In this regard, green fiscal policies can play a major role in countries' recoveries by eliminating the inefficiency of public spending and increasing additional tax revenues that can be directed to immediate COVID-19 aid measures, while supporting medium- and long-term investment and planning for a more sustainable, resilient, and inclusive future [31–33].

The UNESCO report presents five important areas to ensure the transition to the green economy: education (to change behaviors and attitudes that are necessary for sustainability), science, innovation, and new technology that will lead to sustainable development. Culture must also consider new approaches to the development process. Moreover, information is very important in the process of the transition to the green economy, and the management of water systems must also be changed [31].

Another report presented three objectives that underlie the transition to the green economy (economic recovery, poverty eradication, and reduction of carbon emissions), but the fulfillment of these objectives is related to the allocation of financial resources from the state [34]. In the same way, the UNEP report, ILO (2011), highlights the so-called ecological jobs that will be found in agriculture, industry, research, development, and services that will contribute to preserving and increasing the quality of the environment. However, the report states that there will be both winners and losers and that the proposed public policies should reduce these differences [35].

At the same time, other authors noted that the business responses to climate change are also a part of the transition to a green economy [36–40]. In this economy, carbon emissions are reduced, resources are efficient, and emphasis is placed on social inclusion. Moreover, these authors note that in a green economy, increasing income and employment can generate both public and private investments aimed at reducing carbon emissions, improving resource efficiency, and reducing biodiversity loss. Firms can accelerate this transition by aligning their investments in the context of climate change, thereby changing their opportunities for adaptation and participating in the process of greening the economy [36].

Rizos et al. [41] noted that the costs of circular measures should be considered, taking into account the risks in the current business environment, as well as the long-term prospects. However, decision makers must evaluate concrete proposals before moving on to the application of this type of economy. Indeed, the circular economy and the green economy, as tools in the process of sustainable development, pursue key objectives that will lead to economic growth, job creation, reduction of carbon emissions, and environmental protection [42].

On the other hand, the crisis related to the spread of the COVID-19 pandemic represents an epoch-defining event destined to generate strong economic and social consequences. Moreover, the crisis has achieved an impact on the environment, with high costs for well-being and the economy. The response to climate change must be carefully planned, inclusive, and more sustained [43,44]. Thus, the coordinated economic response to the COVID-19 epidemic caused the cost of living to increase more than the income and affected people's satisfaction with living standards. For example, in China, at the economic level, the gross domestic product has decreased significantly; moreover, industrial activity and the volume of transport have decreased, reducing pollution by decreasing (CO₂) emissions [45].

The COVID-19 pandemic has profoundly changed our daily lives in many ways, and the authorities' responses to this global challenge have involved quarantines and isolation to prevent the transmission of the virus and infection of the population. The effects of these measures did not take long to appear, including blocking the functioning of the economy under normal parameters, increasing unemployment, and leading to the loss of businesses [46–48]. Nevertheless, the isolation imposed during the COVID-19 pandemic crisis has helped reduce carbon emissions, improve air quality, and reduce noise—goals that were expected to be achievable only in a few years [47]. According to the Global Energy Review report [49], CO₂ emissions fell the most in regions that suffered the greatest impact from COVID-19 (China –8%, European Union –8%, and United States –9%). However, it is not yet known to what extent the COVID-19 pandemic will continue to affect annual CO₂ emissions, especially since no quantitative assessment has been made of the decrease in CO₂ due to the pandemic [50,51]. In addition, the COVID-19 crisis will eventually produce negative and significant indirect effects on the environment. Although the decrease in CO₂ concentrations has produced a positive impact on the environment in a short period of time, this impact is not a sustainable way to clean the environment. With the end of the pandemic, there will eventually be a revival of the state economy, leading at the same time to an increase in carbon emissions [52,53].

Other studies show a positive relationship between emissions of carbon dioxide, the most important greenhouse gas (GHG) involved in global warming, and GDP per capita [54,55]. According to a previous study [3,56], financial markets around the world have suffered heavy losses, especially in the first months after the crisis.

For the COVID-19 crisis, the international community must take concrete action related to financial collapse, economic systems, global climate change and the environment, and growing inequalities [57]. Moreover, the COVID-19 pandemic triggered a series of shocks related to the supply and demand of the economy, such as the shock of liquidity, uncertainty, and a shock to the financial sector [58]. As a result, government action and post-crisis economic incentives could have a global impact on CO₂ emissions for decades [4,15].

However, before COVID-19 is cured, mankind needs a “careful vaccine against the viruses of the mind”.

3. Materials and Methods

The year 2020 represents the end point of the last financial cycle over an interval of over 10 years. However, unlike the crises that took place during the 21st century (e.g., the crisis of 2007–2008 or that at the beginning of the 2000s), the present crisis has introduced several novel factors. The first, and perhaps most important, is the generating element of the crisis, which, unlike previous situations, was not an element within the financial system (endogenous) but an exogenous element, foreshadowed by a health crisis that quickly echoed its effects in the economic sector and beyond. The second element of novelty is related to the origin of the economic shock—more precisely, whether the health context manifested itself as a shock on the demand side or on the supply side in the economy.

Until now, economic crises resulted either as a result of a shock to demand or as a result of a shock to supply. In the case of the COVID-19 crisis, the shock came from both components of the economy. The pandemic limited the possibility for large masses of people to continue their professional activities due to the measures of physical distancing, which affected production capacity and ultimately the aggregate supply of the economy. At the same time, because a state of emergency or a state of alert was established in most states, the possibility for citizens to exercise their right to free movement was also limited, which is why the consumption of goods and services was also limited, which ultimately affected aggregate demand, as can be seen in Figure 1.

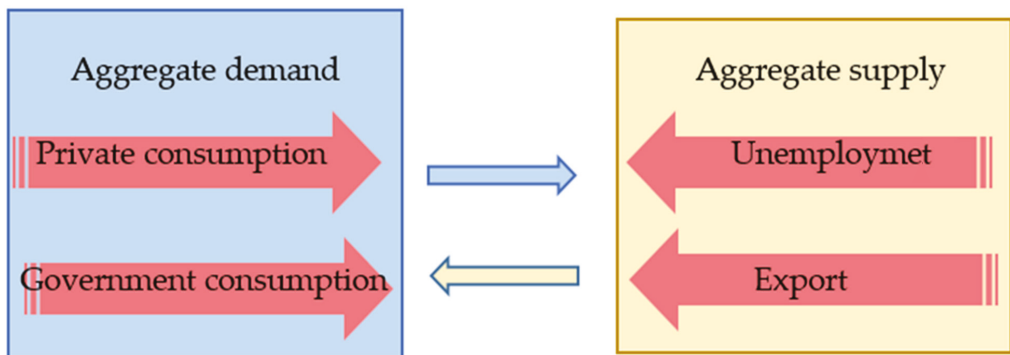


Figure 1. The effects of the COVID-19 crisis on the global economy.

Figure 1 also took into account a set of variables that were severely affected during the COVID-19 pandemic: private consumption as a result of households reaction, government consumption as a result of all the measures it took to stimulate the economy, the unemployment rate due to the whole context that made it impossible for a large part of the employees to work for the situations where work from home is impossible, and the export, due to the way in which trade flows between states were influenced, taking into account all traffic restrictions from this period. Practically, governmental and public consumption has directly and strongly influenced the aggregate demand, while the unemployment rate but also the level of exports has strongly and directly influenced the aggregate supply. The export component was put on the supply side because due to the traffic restrictions that have been implemented, many companies have been unable to deliver or carry out activities outside of the country (for example, the companies that export a large part of their products), but due to all of the restrictions, the time until the products reach the recipient state has been increased sharply, situation which gave an incentive to some of these companies to reduce their supply in order not to stay with it in the form of inventories.

The social and economic effects generated by the context of the COVID-19 pandemic were also reflected in other aspects such as climate, with the quantification of these effects providing the subject of the present analysis. Specifically, the impact of the economic shock of supply and demand on the environment will be assessed in the quantitative section. The supply side shock will be quantified by the industrial Production Index (PI), which is an aggregate measure of the level of production of goods in the economy. The shock on the demand side will be quantified by the industrial turnover (TI) index. The element through which the effect on the environment will be quantified is the level of greenhouse gas (GS) emissions.

Because the units of measurement of the three variables are different, standardization was performed using the logarithmic and difference operators, so all variables are expressed as a percentage:

$$\ln\left(\frac{GS_{t+1}}{GS_t}\right) = \gamma_1 \pm \gamma_2 \times \ln\left(\frac{PI_{t+1}}{PI_t}\right) \pm \gamma_3 \times \ln\left(\frac{TI_{t+1}}{TI_t}\right) + \varepsilon_{t+1}. \quad (1)$$

In a simpler form, the above equation can be written as

$$GS_{t+1}^{\nabla} = \gamma_1 \pm \gamma_2 \times PI_{t+1}^{\nabla} \pm \gamma_3 \times TI_{t+1}^{\nabla} + \varepsilon_{t+1}, \quad (2)$$

where GS_{t+1}^{∇} represents the rate of change (increase or decrease) in the level of greenhouse gas emissions from year $t + 1$ compared to the previous year t . Further, PI_{t+1}^{∇} and TI_{t+1}^{∇} represent the rate of change in the level of the industrial production index and the turnover index from year $t + 1$ compared to the previous year, respectively. In this way, we dynamically illustrate the impact of both supply and demand shocks on the proxy variable for the environment.

However, the two shocks make their presence felt as a result of the effects of a greater accumulation of macroeconomic variables. Thus, here, we illustrate the equation of supply and demand, after which the quantitative impact will be used to quantify the shocks:

$$\left\{ \begin{array}{l} PI_{t+1}^{\nabla} = \lambda_1 \pm \lambda_2 \times UR_{t+1} \pm \lambda_3 \times \ln\left(\frac{EX_{t+1}}{EX_t}\right) + \lambda_4 \times \ln\left(\frac{LP_{t+1}}{LP_t}\right) + \theta_{t+1}, \\ EX_{t+1}^{\nabla} = \ln\left(\frac{EX_{t+1}}{EX_t}\right), \\ LP_{t+1}^{\nabla} = \ln\left(\frac{LP_{t+1}}{LP_t}\right), \end{array} \right. \quad (3)$$

where UR_{t+1} represents the unemployment rate in year $t + 1$, the variable EX_{t+1}^{∇} represents the rate of change at the level of exports, and the variable LP_{t+1}^{∇} represents the annual rate of change in labor productivity. The demand equation uses the following system:

$$\left\{ \begin{array}{l} TI_{t+1}^{\nabla} = \mu_1 \pm \mu_2 \times \ln\left(\frac{CP_{t+1}}{CP_t}\right) \pm \mu_3 \times DB_{t+1} + \theta_{t+1}, \\ CP_{t+1}^{\nabla} = \ln\left(\frac{CP_{t+1}}{CP_t}\right), \end{array} \right. \quad (4)$$

where DB_{t+1} represents the budget deficit in year $t + 1$, and variable CP_{t+1}^{∇} represents the rate of change at the level of private consumption in year $t + 1$ based on year t . Following the econometric analysis, the equations described above will take the following form:

$$\left\{ \begin{array}{l} GS_{t+1}^{\nabla} = \gamma_1 \pm \gamma_2 \times PI_{t+1}^{\nabla} \pm \gamma_3 \times TI_{t+1}^{\nabla}, \\ PI_{t+1}^{\nabla} = \lambda_1 \pm \lambda_2 \times \overline{UR}_{t+1} \pm \lambda_3 \times \overline{EX}_{t+1} \pm \lambda_4 \times \overline{LP}_{t+1}, \\ TI_{t+1}^{\nabla} = \mu_1 \pm \mu_2 \times \overline{CP}_{t+1} \pm \mu_3 \times \overline{DB}_{t+1}. \end{array} \right. \quad (5)$$

Then, the cumulative impact of supply and demand shocks at the level of greenhouse gas emissions takes the following analytical form, through which we estimate the potential effects of the COVID-19 pandemic through economic levers on the quality of the environment:

$$GS_{t+1}^{\nabla} = \gamma_1 \pm \gamma_2 \left[\lambda_1 \pm \lambda_2 \times \overline{UR}_{t+1} \pm \lambda_3 \times \overline{EX}_{t+1} \pm \lambda_4 \times \overline{LP}_{t+1} \right] \pm \gamma_3 \left[\mu_1 \pm \mu_2 \times \overline{CP}_{t+1} \pm \mu_3 \times \overline{DB}_{t+1} \right], \quad (6)$$

$$GS_{t+1}^{\nabla} = \gamma_1 \pm \gamma_2 \times \lambda_1 \pm \gamma_3 \times \mu_1 \pm \gamma_2 \times \lambda_2 \times \overline{UR}_{t+1} \pm \gamma_2 \times \lambda_3 \times \overline{EX}_{t+1} \pm \gamma_2 \times \lambda_4 \times \overline{LP}_{t+1} \pm \gamma_3 \times \mu_2 \times \overline{CP}_{t+1} \pm \gamma_3 \times \mu_3 \times \overline{DB}_{t+1}. \quad (7)$$

Using the variable change operation, the system of equations through which the effect of the economic shocks generated by the COVID-19 crisis at the level of greenhouse gases can be estimated as follows:

$$\left\{ \begin{array}{l} GS_{t+1}^{\nabla} = \zeta_1 \pm \zeta_2 \times \overline{UR}_{t+1} \pm \zeta_3 \times \overline{EX}_{t+1} \pm \zeta_4 \times \overline{LP}_{t+1} \pm \zeta_5 \times \overline{CP}_{t+1} \pm \zeta_6 \times \overline{DB}_{t+1} \\ \zeta_1 = \gamma_1 \pm \gamma_2 \times \lambda_1 \pm \gamma_3 \times \mu_1 \\ \zeta_2 = \gamma_2 \times \lambda_2 \\ \zeta_3 = \gamma_2 \times \lambda_3 \\ \zeta_4 = \gamma_2 \times \lambda_4 \\ \zeta_5 = \gamma_3 \times \mu_2 \\ \zeta_6 = \gamma_3 \times \mu_3. \end{array} \right. \quad (8)$$

The econometric analyses were performed by means of multiple regressions applied to structured observations (panel type). Thus, the countries of the European Union were included in the analysis range. The United Kingdom was excluded due to the Brexit event and Ireland was excluded due to the lack of data for the set of variables within the model. The analysis period covers 2010–2018, with each of the three regression equations having over 200 observations. The econometric program used to perform the analyses was Eviews 10.

4. Results and Discussion

The results obtained from the analyses are presented in the following section in three stages. In the first stage, through the dynamics of a set of exogenous variables, the extent of the impact of the health crisis on the demand side will be analyzed. In the second stage, the same mechanism will be applied to a set of exogenous variables specific to the aggregate supply to quantify the impact on the supply side. In the third stage, we quantify the impact of the two previously calculated shocks on the proxy variable for the green economy based on the level of greenhouse gas emissions. All these macroeconomic links are analyzed in the context of the COVID-19 health crisis. Based on the results obtained, it will be possible to determine whether, from the point of view of climate risk, the effect of the pandemic was positive, negative, or neutral.

Figure 2 illustrates that millions of tonnes of greenhouse gases are emitted by each Member State in the European Union each year. This is why the potential climate problems are increasing every year.

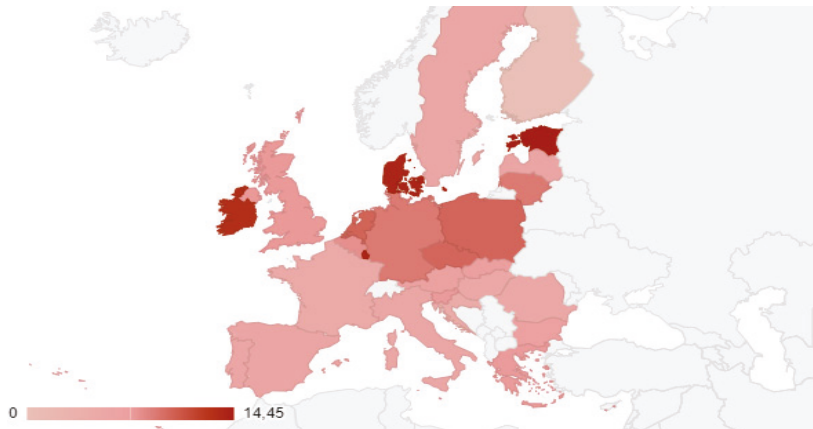


Figure 2. The level of greenhouse gas emissions in the EU Member States in 2018 [59,60]. Note: Greenhouse gas emissions are expressed as millions of tons per million inhabitants.

The current crisis has once again demonstrated how vulnerable humanity is to an unforeseen shock of global proportions. One of the areas that would have the potential to create global problems of a similar magnitude is climate risk.

In the first stage of the analysis, we quantify the shock on the demand side felt as a result of the socio-economic context generated by the pandemic. Thus, in the econometric model, a proxy variable was selected in the first phase to illustrate this shock as accurately as possible. Following the analyses, the most appropriate choice was the turnover index. This variable directly illustrates the level of sales made by companies in the industry and is strongly influenced by macroeconomic variables that determine aggregate demand—namely, private consumption and government consumption. Following the econometric analysis, at the level of the European Union countries during the last financial cycle, the link between the exogenous variables and the proxy variable illustrating the shock on the demand side took the following form (Table 2).

Table 2. Econometric results of the first regression model.

Dependent Variable: $TURNOVER_INDEX (TI_{t+1}^{\nabla})$				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
PRIVAT_CONSUMPTION (CP_{t+1}^{∇})	0.941655	0.136238	6.911833	0.0000
BUDGETARY_DEFICIT (DB_{t+1})	−0.391679	0.139234	−2.813106	0.0053
C	0.003682	0.007428	0.495606	0.6206
R-squared	0.115788			
Adjusted R-squared	0.111976			
F-statistic	30.38044			
Prob(F-statistic)	0.000000			

Source: authors' processing based on data provided by Eurostat [59].

According to the results in Table 2, all coefficients of the independent variables are statistically significant at probability levels of 90, 95, and 99%. This fact highlights the existence, scope, and direction of the link between these macroeconomic variables. From the perspective of the direction of these links, an increase in the dynamics of private consumption also generates an increase in the dynamics of the turnover index. Analyzing the impact of the second component, the budget deficit (which is a proxy for the level of public consumption above the equilibrium level), shows that an increase in this indicator leads to a decrease in the level of the turnover index.

In quantitative terms, however, the variable that replaces the private consumption component tends to show a much stronger impact than that represented by public consumption on the dynamics of the turnover index—i.e., on aggregate demand. If a budget equilibrium were to be reached (zero budget deficit), and the level of private consumption remained unchanged ($CP_{t+1}^{\nabla} = 0$), then the dynamics of the turnover index would be only 0.36% and could be based on macroeconomic elements outside the national economy. However, taking into account the results of the statistical test t, this last parameter can vary significantly in the real economy compared to the level recorded in the analysis.

From a mathematical point of view, the relation illustrated above can be written as follows:

$$TI_{2020}^{\nabla} = 0.003682 + 0.9416 \times \overline{CP_{t+1}^{\nabla}} - 0.391679 \times \overline{DB_{t+1}}. \tag{9}$$

Following the analyses carried out by the European Commission for the first set of estimates of the dynamics of the most important macroeconomic variables for 2020 (the spring forecast) [61], the estimated level expected to be reached by the independent variables within the model was published as $\overline{CP_{2020}^{\nabla}}$ and $\overline{DB_{2020}}$ in 2020 (Table 3).

Table 3. European Commission spring forecast for independent variables in the model.

	2019	2020	2021
Annual dynamics of private consumption at the EU level	1.3%	−9.0%	7.1%
The deficit budget at the EU level	0.6%	8.3%	3.6%

Source: authors’ processing based on data provided in [61].

Figure 3 provides a graphical representation of the expected dynamics of the budget deficit along with the effects of these dynamics on the formation of public debt. An important factor to note here is that the level of both deficit and public debt forecasting for 2020 are well above the levels recorded in the previous economic crisis but also above the level recorded during the sovereign debt crisis.

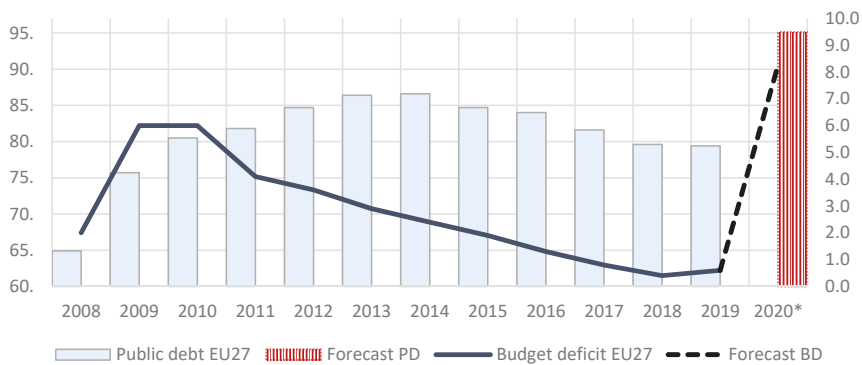


Figure 3. The evolution of the EU budget deficit and public debt (27) in the pre- and post-pandemic period. Source: authors’ processing based on data provided by Eurostat [59]. * estimated values.

Starting from the coefficients estimated by the previous econometric model and including the values forecasted by the European Commission for the independent variables, a preliminary forecast was made for the proxy variable related to the shock on the demand side. Thus, following the calculations, by the end of 2020, this variable should register the following dynamics: $TI_{2020}^{\nabla} = -11,3571\%$. This result illustrates that, in terms of the level of the turnover index and considering the projected developments in private consumption

alongside the budget deficit, a decrease of around 11.35% is expected by the end of 2020, which would be equivalent to the demand shock created by the COVID-19 crisis.

In the second stage of the analysis, the form of the supply shock felt as a result of the economic context and the measures generated by the pandemic is calculated. The macroeconomic variable used as a proxy and a true illustration of this shock in the analysis is the industrial production index. The macroeconomic variables that determine this shock are the unemployment rate, the dynamics of labor productivity, and the rate of change in the value of exports. Each of these three elements are known for their very important contribution to both capacity and production needs, ultimately affecting the aggregate supply. Following the econometric analysis performed for the last financial cycle, the following macroeconomic links were discovered (Table 4).

Table 4. Econometric results of the second regression model.

Dependent Variable: IND_PROD_INDEX (PI_{t+1}^{∇})				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
UNEMPLOYMENT (UR_{t+1})	-0.092195	0.051555	-1.788303	0.0750
LABOUR_PRODUCTIVITY (LP_{t+1}^{∇})	1.204282	0.139974	8.603602	0.0000
EXPORT (EX_{t+1}^{∇})	0.075970	0.020335	3.735959	0.0002
C	0.016788	0.005837	2.875980	0.0044
R-squared	0.341767			
Adjusted R-squared	0.333181			
F-statistic	39.80674			
Prob(F-statistic)	0.000000			

Source: authors' processing based on data provided by Eurostat [59].

Similar to the first and second econometric models, the coefficients of the dependent variables are significantly different from zero, with some showing a significance level of 90% and others as high as 99%. For this reason, the three variables indicate a significant impact on the dynamics of the industrial production index. Regarding the direction of influence in this situation, there are two variables that generate an increase and one that causes a decrease of the proxy variable for the aggregate supply. Specifically, an increase in the unemployment rate has the effect of lowering the industrial production index, which is an economically sound situation given that the main factors of production are labor and capital. Thus, when either of these two factors decreases, the level of production also decreases, generating a decrease in aggregate supply.

As materialized in the dynamics of exports, an increase in the second variable has a direct proportional effect on the industrial production index. Again, this effect was also predictable from an economic point of view because when the level of exports increases, higher production must be achieved to cover domestic demand, giving the industrial production index important potential for growth.

The third variable has a dynamic that is also positively correlated with a change in the dependent variable. Thus, an increase in labor productivity has a direct effect, according to economic theory, leading to an increase in the production capacity and ultimately the aggregate supply in industry. However, among the three factors whose impacts were explained earlier, the effect of a marginal increase in labor productivity tends to be the element through which a much stronger result is expected than an equivalent marginal increase in exports or an equivalent decrease in labor productivity or unemployment rate. Given that the labor market would be in equilibrium (without unemployment) with a constant level of labor productivity, and exports would also remain constant, the industrial production index would increase by 1.67%, an increase that would be achieved based on the dynamics of other factors, either production or macroeconomics, in the domestic economy.

Mathematically, the above relation takes the following form:

$$PI_{t+1}^{\nabla} = 0.016788 + 0.07597 \times \overline{EX}_{t+1}^{\nabla} - 0.092167 \times \overline{UR}_{t+1} + 1.204282 \times \overline{LP}_{t+1}^{\nabla}. \quad (10)$$

The forecast values for the independent variables for 2020 are also found in the European Commission's spring forecast outlined in Table 5 [61].

Table 5. European Commission spring forecast for independent variables in this model.

	2019	2020	2021
Expected annual dynamics at the level of exports	2.2%	−11.5%	8.4%
Projected level of unemployment rate at the EU level	6.7%	9.0%	7.9%
Projected annual labor productivity dynamics	0.5%	−3.2%	2.7%

Source: authors' processing based on data provided in [61].

One of the macroeconomic variables that was strongly affected by the current health crisis was the unemployment rate because, unlike other global economic crises, to reduce the number of infected people, public authorities have engaged social distancing measures since the virus began to spread. This fact, in addition to the social implications, also had strong economic implications, as for many employees, it was impossible to substitute their daily activities with work from home, the main alternative during the pandemic. As a result, the unemployment rate has risen sharply, as can be seen in Figure 4. In countries such as the Czech Republic, the projected unemployment rate by the end of 2020 has been estimated to be more than double the level recorded in 2018, indicating that the effects of the pandemic on the labor market have been very strong.

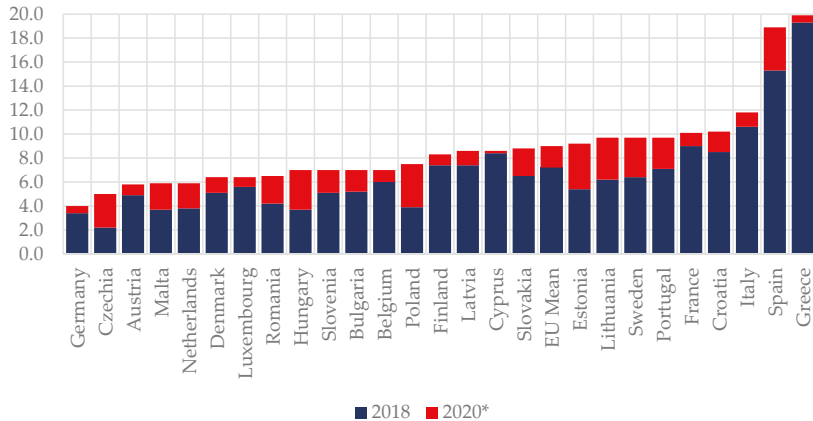


Figure 4. Evolution of the unemployment rates in the Member States of the European Union in the pre- and post-pandemic period. Source: authors' processing based on data provided by Eurostat [59]. * estimated values.

Replacing the values forecasted by the European Commission in the relationship resulting from the econometric model illustrated above, the industrial production index is estimated to record the following dynamics: $PI_{2020}^{\nabla} = -5.54\%$. According to the estimates of the econometric model, a decrease of 5.54% is expected by the end of 2020 as a result of the impact of the three macroeconomic factors mentioned above. An important factor that emerged from the econometric model is that, in terms of quantity, the impact of the demand shock was much higher than that of the supply shock as a result of the economic context generated by the COVID-19 pandemic.

The third stage of the analysis brings together the results obtained in the first two stages to illustrate the impact of the economic shocks generated by the COVID-19 crisis on the climate to answer the fundamental issue addressed in this analysis. From an econometric point of view, the estimated effect of supply and demand shock on the level of greenhouse gas emissions was analyzed at this stage to ultimately provide a quantitative forecast of the impact of the current macroeconomic context in the climatic sphere. The third econometric model illustrates the link between the turnover index, the proxy for the economic effect on demand, and the level of greenhouse gas emissions (Table 6).

Table 6. Econometric results of the third regression model.

Dependent Variable: GREENHOUSE_GAS (GS_{t+1}^{∇})				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
TURNOVER_INDEX (TI_{t+1}^{∇})	0.273918	0.049696	5.511846	0.0000
C	−0.018436	0.003773	−4.886260	0.0000
R-squared	0.115788			
Adjusted R-squared	0.111976			
F-statistic	30.38044			
Prob(F-statistic)	0.000000			

Source: authors' processing based on data provided by Eurostat [59].

Firstly, this model is also statistically significant, with all its coefficients significantly different from zero at a confidence level of 99%. The sign of the factor variable coefficient is positive, so increases in the dynamics of the industry turnover index are increased in the dynamics of greenhouse gas emissions. This link is also visible in the real economy, where the increase in demand leads to an increase of production and greater potential in this process, thereby increasing the level of greenhouse gas emissions. Table 7 illustrates the quantitative results of the economic impact generated by the supply area on greenhouse gas emissions.

Table 7. Econometric results of the third regression model.

Dependent Variable: GREENHOUSE_GAS (GS_{t+1}^{∇})				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
IND_PROD_INDEX (PI_{t+1}^{∇})	0.489545	0.064872	7.546359	0.0000
C	−0.021383	0.003555	−6.014404	0.0000
R-squared	0.197086			
Adjusted R-squared	0.193625			
F-statistic	56.94754			
Prob(F-statistic)	0.000000			

Source: authors' processing based on data provided by Eurostat [59].

This model is similar to the previous model, and all parameters within it are statistically significant. Regarding the sign of this link, the results of the econometric model show that an increase in the dynamics of the industrial production index leads to an increase in the dynamics of greenhouse gas emissions. The econometric link is also confirmed in the real economy by the fact that an increase in the level of production generates a higher consumption of material resources, indicating the potential to increase the level of greenhouse gas emissions.

Taking into account the results obtained from the last two regression models, presented in Tables 6 and 7, together with the results obtained from the previous regression models (Tables 2 and 4), a preliminary estimate can be made regarding the dynamics able to be recorded by the greenhouse gas emissions indicator in 2020 as an effect of the economic transformations generated by the COVID-19 pandemic.

Considering the fact that both the industrial production index and the turnover index showed a decreasing trend, this variable may also have a downward dynamic. In quantitative terms, following the calculations, the index's dynamics take the value $GS_{2020}^{\nabla} = -9.8\%$.

Finally, following the results obtained in previous econometric models used as the basis for the forecast calculations, it is estimated that by the end of 2020, the level of greenhouse gas emissions will decrease by about 10% (Figure 5).

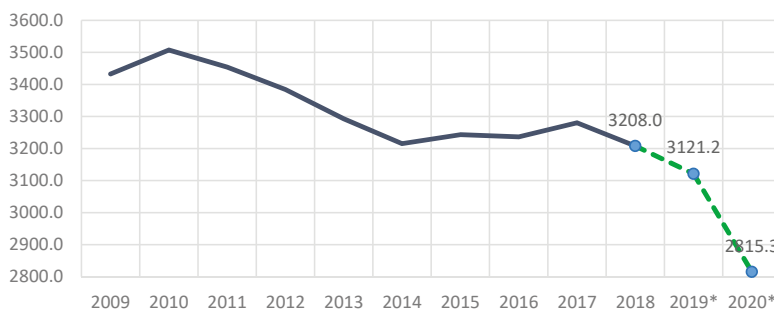


Figure 5. Forecast of the dynamics of greenhouse gas emissions, following the COVID-19 crisis. Source: authors' processing based on data provided by Eurostat [59]. * estimated values.

Through our analysis, we observed important effects in the direction of mitigating climate risk, a risk that currently has significant potential to generate unanticipated systemic shocks in the global economy. We hope that our study will lay the foundation for further research in this area and foster enhanced understanding and closer cooperation between the scientific community and policy makers at the level of greenhouse gas emissions and other critical matters. There is much to be gained by facilitating effective decision-making that can help identify actions to avert and both address and minimize the levels of greenhouse gas emissions.

During this period, a slightly different perspective appeared and the current crisis also shows us why it is necessary for the transition to be fair, in order to provide new opportunities and support to those most affected. In addition, a socially equitable transition, planned and implemented in the long run, is the only way to build a resilient society with a strong and sustainable economy.

As a result of the study, one question should be added to future research: What happens beyond the adaptation to the COVID-19 pandemic? Clearly, more studies on the climate change impacts faced by vulnerable communities are needed. Learning from the COVID-19 pandemic could, moreover, be a precursor to the international debate on decreasing the levels of greenhouse gas emissions. Taking into account the particularities of 2020, and the fact that among all the negative effects, this situation has the potential to generate a reduction of the greenhouse gas emissions and noise, our recommendation is to implement a legislative framework through which the employees of the companies continue to work from home one or two days a week, even when the COVID-19 pandemic will be over. This recommendation could give an incentive to reduce the pollution that is created through the daily commute that must be made between home and work.

A limitation of this article is that the analysis did not include the component of private investment strictly for econometric reasons, by including a large number of variables, based on a relatively small data range only decreases the significance of the parameters, which is why we selected only the most important variables, whose impact was very strongly noticed during the COVID-19 pandemic period. We need to mention that the impact of the COVID-19 crisis on private investment is a research topic that could be addressed in a future article.

5. Conclusions

The COVID-19 pandemic ended the last economic cycle, generating strong repercussions in all countries of the world. The first effects felt were sanitary ones, but with the implementation of social distancing measures, the impact was quickly reflected in the economic system, through shocks at both the level of demand and at the level of aggregate supply.

Economic developments are closely linked, *inter alia*, to climate effects, which is why the impact of the COVID-19 pandemic has been indirectly felt in this area, as well. Thus, the goal of this research was to analyze the effects of the economic supply and demand shocks on the environment generated by the COVID-19 crisis, precisely to determine whether, in addition to the known negative effects of the health crisis, there are other sectors in which opportunities have materialized during this period.

The first part of this analysis quantified the shock at the level of aggregate demand, conditioned by the socio-economic context of the pandemic. Using both private sector and government sector variables, a preliminary measurement of the economic shock was estimated. At the EU level, current estimates show that, as a result of the demand shock, the turnover index will decrease by about 11.35% by the end of 2020.

The second part of the analysis quantified the shock at the level of aggregate supply, starting both from the context of labor market dynamics at the national level and from the evolution of transactions with foreign economies. In this way, both the internal and external elements of national economies were included, allowing a measurement of the supply shock at the level of the economy to be estimated. At the EU level, the model estimates illustrate that due to the supply shock, by the end of the year, the industrial production index will decrease by about 6%.

The third part of the analysis brought together the results obtained in the first two stages to illustrate the impact of the economic shocks generated by the COVID-19 crisis on the climate sphere. At this stage, the estimated effect of the supply and demand shock on the level of greenhouse gas emissions was particularly focused upon.

The results of the model also show that, during the current year at the level of the European Union, the amount of greenhouse gas emissions will decrease by about 9.8%. This climate change mitigation effect currently has significant potential to generate unanticipated systemic shocks in the global economy. These results are also in line with the findings of other previous studies that highlighted the increased focus on adapting economies to the negative effects of climate change and achieving the goal of reducing greenhouse gas emissions [62–65]. Thus, achieving climate neutrality will require contributions from all economic sectors.

Taking into consideration all previous arguments, one of the recommendations of the research question is to take advantage of the current opportunity to rethink how the economy of the future will function, being an important opportunity to pay more attention to the green economy, which could lead to other unforeseen shocks in the future, which may occur as a result of climate risk. It is a reality that the COVID-19 pandemic has generated the strongest economic shock of the 21st century. However, in addition to the pandemic's negative elements, the world now has the opportunity to rethink how the economy of the future will work. This represents an important opportunity to give a much higher level of attention to the green economy, which could save humanity from other unforeseen shocks and the magnitude of the health crisis that could occur as a result of climate risk.

Author Contributions: Conceptualization, I.O. and R.G.; methodology, I.O., R.-A.G., I.D., and G.C.G.; validation, I.O. and R.-A.G.; formal analysis, I.O., I.D., M.A.P., G.C.G., R.G., and R.-A.G.; writing—original draft preparation, I.D., M.A.P., G.C.G., R.G., and R.-A.G.; writing—review and editing, I.O. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

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Article

The Asymmetric Impact of Funding Liquidity Risk on the Volatility of Stock Portfolios during the COVID-19 Crisis

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Abstract: In this study, we identify economic transmission channels through which changes in funding liquidity conditions in interbank markets asymmetrically affect volatilities of stock portfolios during the COVID-19 crisis. For the purpose of this study, the quantile regression approach is utilized. Controlling for macroeconomic factors, we document that volatilities of high-risk portfolios increase more in response to a deterioration in funding liquidity conditions compared to less risky portfolios. More importantly, this increase intensifies in high-volatility periods of high-risk portfolios, which implies the impact is stronger during uncertain economic environments, such as the one caused by the COVID-19 outbreak.

Keywords: funding liquidity; volatility; asymmetric relationship; COVID-19; quantile regression

JEL Classification: E44; G10; G20

Citation: Kocaarslan, B.; Soytaş, U. The Asymmetric Impact of Funding Liquidity Risk on the Volatility of Stock Portfolios during the COVID-19 Crisis. *Sustainability* **2021**, *13*, 2286. <https://doi.org/10.3390/su13042286>

Academic Editor: Darko Vukovic

Received: 26 December 2020

Accepted: 15 February 2021

Published: 20 February 2021

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



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1. Introduction

The ongoing COVID-19 pandemic is still adversely affecting people's lives (e.g., lockdowns, stay-at-home orders, sealing off cities, and closing borders), as well as economic activities and, hence, business conditions all over the world. The IMF's (the International Monetary Fund's) April 2020 report predicted a global growth rate of -3% in 2020, which is worse than that during the global financial crisis (2008–2009) (IMF, World Economic Outlook, April 2020.). Governments have taken several measures (e.g., monetary and fiscal stimulus programs) to mitigate the adverse effects of the pandemic on the economy and to maintain financial stability. As a result of the uncertain economic environment caused by the COVID-19 pandemic, it is inevitable to see enormous impacts of the pandemic on financial markets via its long-lasting and far-reaching effects on the overall economy [1].

Some recent studies investigated the impact of the COVID-19 pandemic on the real economy and stock market behavior. The COVID-19 outbreak led to a tremendous impact on the stock market volatility and, ultimately, the volatility levels reached critical levels shortly thereafter, exceeding those observed during both the 1987 and the 2008 crises [2]. Using wavelet coherence analysis, Choi [3] demonstrated a strong impact of economic uncertainty on sector volatility of the S&P 500 index in the COVID-19 period. Albuлесcu [4] showed that the prolongation of the COVID-19 pandemic is a crucial factor affecting financial market volatility and making risk management difficult. Zhang et al. [5] pointed out that the great uncertainty caused by the COVID-19 outbreak led financial markets to become unpredictable and highly volatile via its adverse impacts on the real economy. The results of Mazur et al. [6] indicated the extreme volatility of loser stocks, which was negatively associated with stock returns in the COVID-19 outbreak. Engelhardt et al. [7] found lower stock market volatility for high-trust countries (in response to COVID-19 case

announcements). In another interesting study, Engelhardt et al. [8] showed that declining stock market returns were strongly related to news attention and weakly related to rational expectation during the COVID-19 crash. Overall, the related studies did not uncover how a risk factor affects the volatility of high-risk and low-risk stock portfolios depending on volatility levels in uncertain times. To fill this information gap, the debt constraint of financial intermediaries is considered as a risk factor in this study because financial intermediaries are the biggest speculators in global markets [9,10].

Uncertainty plays a crucial role in affecting hedging demands and market volatility, especially during economic recessions [11,12]. Financial intermediaries are important types of investors with the ability to quickly trade various asset classes [13]. Despite the serious theoretical arguments about the key role of financial intermediaries in asset markets in [9], to the extent of our knowledge, there is no empirical study investigating the asymmetric dependence structure between changes in the risk-bearing capacity of financial intermediaries and the volatilities of stock portfolios during uncertain times (e.g., the COVID-19 pandemic times). The changes in the funding liquidity conditions in interbank markets (especially in high-uncertainty periods) can be used as a proxy for the changes in the risk-bearing capacity of financial intermediaries according to the theoretical insights of Brunnermeier and Pedersen [9]. To model the relationships in financial markets in tough times (such as the COVID-19 pandemic crisis period characterized by nonlinear shifts) correctly, one needs to consider the structure of nonlinear dependence between the variables in the model [14]. Considering the economic transmission channels, the main purpose of this paper was to study the asymmetric dependence between funding liquidity conditions and the volatilities of stock portfolios (including low-risk and high-risk portfolios) during the COVID-19 pandemic crisis. We also controlled for monetary conditions, exchange rate dynamics, and business cycle fluctuations via additional variables (e.g., default spread, term spread, reserve currency (United States dollar (USD)), and federal funds rate).

This study is grounded on an economic mechanism through which financial intermediaries provide market liquidity and, hence, affect the volatility of assets in global markets. In our investigation, we take into consideration the availability of funding constraints faced by financial intermediaries, who act as speculators in stock markets, leading to lower market liquidity and, therefore, inducing higher risk premium, especially for high-risk assets. This role played by financial intermediaries is expected to be intensified during high-uncertainty periods (see more details about the theoretical arguments in [9]). Hence, we hypothesize that the volatility of a high-risk portfolio is more sensitive to funding conditions in interbank markets than that of a low-risk portfolio during the COVID-19 pandemic. We further hypothesize that this sensitivity is more pronounced during high-volatility periods of high-risk portfolios. The economic mechanism behind our hypotheses is discussed in detail in Section 2.

In sum, this paper examines how the dynamic relationship between the risk-bearing capacity of financial intermediaries and the volatilities of stock portfolios varies during the COVID-19 pandemic, controlling for business cycles, exchange rate dynamics, and monetary conditions. The quantile regression (QR) framework enabled us to observe whether this dynamic link depends on the volatility levels. Our baseline findings suggest that the volatilities of high-risk portfolios are more vulnerable to the deterioration of funding liquidity conditions compared to low-risk portfolios. This vulnerability is more pronounced during high-volatility periods. An increase in the funding liquidity risk intensifies portfolio volatilities (especially the volatilities of high-risk portfolios) during high economic uncertainty caused by the COVID-19 pandemic. Overall, our study shows that financial intermediaries play an important role in risky portfolio volatility spikes during the pandemic.

We contribute to the literature in three unique ways. First, we develop a scientific explanation of how the tightening funding constraints of financial intermediaries play a critical role in driving the volatility of stock portfolios during an uncertain period (the COVID-19 pandemic period). Second, we suggest that the funding liquidity risk should

be regarded as a major risk factor influencing the volatility of stock portfolios depending on their volatility levels in an uncertain economic environment. Third, we emphasize the importance of the precautionary measures taken by financial intermediaries in tranquil periods to increase their resilience to negative shocks in global markets, such as the one caused by the COVID-19 outbreak. These measures are quite likely to enhance the financial stability of global markets in bad economic conditions.

2. Hypothesis Development

Various studies documented correlations between trading volume (a proxy for liquidity risk) and asset volatilities [15–17], whereas some others related market liquidity to asset prices [18–21]. Intuitively, one could argue that investors require risk premium induced by illiquid markets leading to lower prices in order to compensate for their inability (increased cost of trading) to trade quickly in these markets. The presence of illiquid stocks could strongly inflate portfolio-level volatility, especially for equally weighted portfolios [22].

The impact of funding liquidity on portfolio volatilities has not received any attention in the literature and, to the extent of our knowledge, has not been formally tested by considering asymmetric impacts in an uncertain economic environment. Financial intermediaries are active market players simultaneously impacting the volatility of many markets. They use both their own capital and their collateralized borrowing from other financiers to finance their trading activities [9]. Hence, the debt constraint of financial intermediaries is of central importance for their trading activities and, therefore, in influencing asset prices. Brunnermeier and Pedersen [9] established a link between funding liquidity and an asset's market liquidity in their model. According to their model, if market liquidity is sourced from funding liquidity, market volatility could be a direct proxy for fluctuations in market liquidity. They argued that the existence of funding constraints for financial intermediaries, who act as speculators in stock markets, leads to lower market liquidity and, consequently, induces higher market volatility. This process shows that market liquidity (and, hence, market volatility) is mainly driven by the speculators' funding constraints. The speculators' margins are related not only to the fundamental-based volatility but also to the liquidity-based volatility in the presence of uninformed financiers. Uninformed financiers could consider price volatility induced by market illiquidity as fundamental volatility, leading to higher margins [9].

A high level of uncertainty leads to limited market participation by investors [23]. In return, low market participation induces an increase in market volatility due to reduced market liquidity, which creates a need for hedging by market players. Mele [24] documented increased market volatility induced by fluctuating uncertainty in bad times. Financial intermediaries' capital and market uncertainty are interdependent factors simultaneously influencing the equity markets [9]. In an uncertain period (e.g., the COVID-19 pandemic period), tightening funding constraints of financial intermediaries, due to higher destabilizing margins, substantially decrease market liquidity [9]. Hence, market volatility driven by the worsening funding conditions, in an uncertain economic environment, increases more compared to tranquil periods. In light of the above information, we argue that negative shocks to funding liquidity are transmitted to the volatility of stock portfolios via reduced market liquidity. Furthermore, this transmission is stronger when there is increased uncertainty in the stock market (e.g., high economic uncertainty caused by the COVID-19 pandemic) during high-volatility periods. These economic mechanisms influence high-volatility assets more strongly than low-volatility ones because the difficulty of determining the fundamental value of high volatility (illiquid) assets increases the margin requirements caused by market illiquidity [9]. Taking the above arguments into consideration, the following testable hypotheses are suggested:

Hypothesis 1. *The deterioration in funding conditions in interbank loan markets significantly increases the volatility of portfolios during the COVID-19 pandemic.*

Hypothesis 2. *This increase is stronger for the volatility of high-risk portfolios.*

Hypothesis 3. *The impact of this increase is greatly amplified for the upward periods of high-risk portfolio volatilities.*

3. Data and Volatility Measures

The sample period ranged from 2 January 2020 to 30 June 2020. Many researchers accept the date of 2 January 2020 as the beginning of the COVID-19 pandemic crisis (e.g., Goodell and Goutte [25]; Erdem [26]). Many studies considered the time-series property of the volatility of stock portfolios and employed the exponential generalized autoregressive conditional heteroskedastic (EGARCH) model [27] to measure the volatilities of assets. Using the EGARCH model, Fu [28] emphasized the importance of time-varying characteristics of the conditional volatility in predicting expected returns. Therefore, we first estimated the EGARCH model to obtain portfolio-level volatilities. The EGARCH (1,1) model, which is one of the simplest and most robust specifications among volatility models, considers the asymmetric impact of positive and negative news and the time-varying behavior of portfolio volatilities [29].

We used standard sets of four portfolios (small-growth, small-value, large-growth, and large-value portfolios) sorted by market capitalizations (ME) and book-to-market ratios (B/M). Daily portfolio-level returns were used to estimate the volatilities of portfolios. We used both value-weighted and equally weighted portfolio returns. The equally weighted portfolios, which consist of relatively smaller and illiquid stocks, may be affected more by the bid-ask bounce problem, inflating volatility [22]. Portfolio returns were sourced from Kenneth French's online data library for the volatility estimations. Some studies, for example [28], used the Fama-French three factors [30] in the mean equation. We adopted the Carhart [31] four-factor model (including market, size, value, and momentum factors) to provide a better adjustment for risk in the mean equation of EGARCH specification, and we regressed daily excess returns of size-value portfolios on four factors. For robustness, we also used the Fama-French [32] five factors in the mean equation and obtained very similar results (We thank Kenneth French for kindly providing the data for the mean equation estimates; we do not report the results herein to save space; the results can be provided upon request). The estimated variance equation is represented as follows:

$$\ln(h_t) = \beta_0 + X \left| \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} \right| + \gamma \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} + \beta_h \ln(h_{t-1}), \quad (1)$$

where β_h and X refer to GARCH and ARCH parameters, respectively, and γ refers to the asymmetry parameter. The derived conditional variance is employed as a proxy for the volatility of stock portfolios, as commonly used in the relevant literature. For brevity, we do not report the variance equation coefficients. Some of our findings are worth mentioning. Compared to ARCH parameters, larger GARCH parameters indicate more significant impact of long-run volatility on the volatility of high-risk portfolios. Furthermore, not surprisingly, the sign of the asymmetry parameter (γ) is negative, indicating significant leverage effects for high-risk portfolio volatilities. To put it in different words, negative shocks affect highly risky portfolio volatilities more than positive shocks compared to less risky portfolio volatilities due to low information quality. The results can be provided upon request.

The descriptive statistics of derived portfolio volatilities are presented in Table 1. VOLSGEP, VOLSGVP, VOLSVEP, VOLSVVP, VOLLGEP, VOLLGVP, VOLLVEP, and VOLLVVP represent the volatilities of small-growth equally weighted, small-growth value-weighted, small-value equally weighted, small-value value-weighted, large-growth equally weighted, large-growth value-weighted, large-value equally weighted, and large-value value-weighted portfolios, respectively. The portfolio volatilities exhibit leptokurtic behavior with extreme values in tails and are not normally distributed according to Jarque-Bera statistics. These characteristics indicate tail events in volatilities and, thus, support the use of the QR approach.

Table 1. Descriptive statistics of derived portfolio volatilities.

	VOLSGEP	VOLSGVP	VOLSVEP	VOLSVVP	VOLLGEP	VOLLGVP	VOLLVEP	VOLLVVP
Mean	0.5134	0.2048	0.4677	0.0185	0.1181	0.0210	0.4823	0.1570
Median	0.2286	0.1553	0.3246	0.0115	0.0993	0.0187	0.1721	0.1128
Maximum	3.2661	1.0006	4.9160	0.1672	0.6541	0.0725	9.0281	0.9568
Minimum	0.0734	0.0126	0.0888	0.0074	0.0061	0.0046	0.0195	0.0594
SD	0.6695	0.1864	0.5609	0.0201	0.0953	0.0120	1.1468	0.1467
Skewness	2.5116	1.6481	5.1217	4.8301	2.4763	1.8847	5.1393	3.4704
Kurtosis	8.8997	5.9565	36.4576	30.7382	12.1917	7.4606	32.9453	16.0921
Jarque–Bera	307.6971	100.4783	6274.7260	4421.4730	558.7030	174.7940	5137.1270	1125.3440
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Notes: Table 1 presents descriptive statistics of portfolio volatilities. VOLSGEP, VOLSGVP, VOLSVEP, VOLSVVP, VOLLGEP, VOLLGVP, VOLLVEP, and VOLLVVP represent the volatilities of small-growth equally weighted, small-growth value-weighted, small-value equally weighted, small-value value-weighted, large-growth equally weighted, large-growth value-weighted, large-value equally weighted, and large-value value-weighted portfolios, respectively.

As expected, the equally weighted portfolios are riskier than the value-weighted portfolios due to market microstructure problems, such as lower trading ability and, hence, the bid–ask bounce problem. This is because of larger weights allocated to smaller stocks in the equally weighted portfolios compared to the value-weighted portfolios. The risk of a portfolio increases with an increase in the weight of small companies in the portfolio due to imperfect information, higher business risk, and greater cost of capital, which make the volatility of equally weighted portfolios more cyclically sensitive. Furthermore, small-growth portfolios appear to be riskier than small-value portfolios. The main reason behind this result is that although small-growth firms have higher growth opportunities than their value peers and large firms, they are exposed to more volatile business environments due to some disadvantages, such as lack of know-how, funding deficiency, poor brand recognition, and uncertain long-run prospects. Furthermore, large-value portfolios are riskier than large-growth portfolios. It appears that large-value companies are more vulnerable to exogenous shocks during economic downturns than large-growth companies, which can be attributed to the higher cash-flow risk of large-value firms.

We use the TED spread (TED) to consider funding liquidity conditions in interbank markets. The TED spread (the difference between 3 month LIBOR (London Inter-Bank Offered Rate) based on US dollars and 3 month Treasury bill rates) is commonly used as a measure to take funding illiquidity into consideration. Higher values of the TED spread show a deterioration of funding liquidity conditions in interbank markets. The TED spread data were collected from the Federal Reserve Bank of St. Louis. Macroeconomic risk factors, i.e., default spread (DEF), term spread (TERM), exchange rates, and federal funds rate (FF) are important for asset returns and volatilities [33–36]. Therefore, we used DEF, TERM, FF, and USD (trade-weighted US dollar index) to control for business cycle fluctuations, exchange rate dynamics, and monetary conditions. While default spread (DEF) reflects changes in long-term business conditions, the term spread (TERM) has been shown to be a better proxy for explaining short-term business cycles [33]. During periods of weak economic conditions, default spread and term spread are expected to be high. Federal funds rate (FF) is considered to examine the impact of interest rates on the US economy since it is widely accepted as the most influential interest rate affecting financial and monetary conditions [34,36]. A significant US dollar appreciation is one of the important indicators of worsening economic conditions affecting volatilities in the stock markets in crisis periods with high uncertainty [35]. Daily data on the 10 year Treasury bond yields, 3 month Treasury bill, Moody’s AAA-rated and BAA-rated corporate bond yields, trade-weighted US dollar index, and federal funds rate were sourced from the Federal Reserve Bank of St. Louis. The term spread refers to the difference between the yields on the 10 year Treasury bond and the 3 month Treasury bill. The default spread represents the difference between the yields on the BAA-rated and AAA-rated corporate bonds. Higher values of the trade-weighted US dollar index show a stronger US dollar in

global markets. The percentage change of the trade-weighted US dollar index (Δ USD) was used in the analysis.

4. Quantile Regression Method

To investigate the main determinants of the volatility of stock portfolios at varying volatility levels, we made use of the QR approach [37]. To model the relationships in global markets, some recent studies focused on asymmetric relationships between variables of interest using quantile regressions [38,39]. The QR model relaxes the standard assumptions of linear regression (e.g., homoscedasticity and normality assumptions). The use of the QR approach allows examining the funding liquidity risk–portfolio volatility relationship at different points of the volatility distribution. The QR approach provides a broader picture of how changes in funding liquidity conditions affect the behavior of portfolio volatilities depending on the level of the volatilities. See more detailed explanations about the quantile regression approach in Koenker and Hallock [40].

The QR function was modeled to investigate the effect of the conditional variables on the different quantiles of the dependent variable. The QR model is shown below. We benefited from the pair bootstrapping procedure proposed by Buchinsky [41] to derive the standard errors for the estimated coefficients (to obtain asymptotically valid standard errors under misspecifications of the QR function).

$$Q_y(\tau|x) = \omega(\tau) + \sum_k \beta_k(\tau)x_k, \quad (2)$$

where x_k represents the macroeconomic risk factors (TED, USD, DEF, TERM, and FF). The dependent variable in Equation (2) is $Q_y(\tau|x)$, which refers to the quantile of time-varying volatilities of stock portfolios derived by the EGARCH model. β_k gauges the impacts of the conditional variables (TED, USD, DEF, TERM, and FF) on the volatilities of stock portfolios for all quantiles. We tested the equality of coefficients at low and high quantiles using the F-test. The findings suggest that the estimates for the lower and upper quantiles were statistically different. The results can be provided upon request. We focused our attention on high, intermediate, and low quantiles (0.10; 0.25; 0.50; 0.75; 0.90). The model helped us to test whether the dependence structures between the related variables change with the value of (τ) , via the effects of different conditional variables. For robustness, we also used the implied volatility of the gold, oil, currency, and stock prices from options markets (GVZ, OVX, EVZ, and VIX) to control for the impact of uncertainty in commodity and financial markets on portfolio volatilities. We did not find significant results and our main findings were not changed. The results can be provided upon request.

5. Empirical Results and Discussion

We used daily data of funding liquidity and other control variables and daily volatilities of stock portfolios from 2 January 2020 to 30 June 2020. The findings are presented to indicate the main determinants of the volatilities of small-growth, small-value, large-growth, and large-value portfolios in Tables 2–5, respectively. The results from the QR model indicate a strong right-tailed asymmetric dependence structure between funding liquidity risk and portfolio volatilities. In other words, the degrees of dependence between funding liquidity risk and portfolio volatilities increased in the higher quantiles. Consistent with our hypotheses, we observed that reduced funding liquidity (an increase in TED spread) had an adverse effect, especially on the volatilities of high-risk portfolios (increasing volatilities of portfolios), and this effect was stronger at the times of extreme volatility during the COVID-19 pandemic period.

Table 2. Quantile regression estimates for the volatility of small-growth portfolios.

Panel A. Small-Growth Equally Weighted Portfolio.					
	Q(0.10)	Q(0.25)	Q(0.50)	Q(0.75)	Q(0.90)
TED	0.234721	0.236688	0.721903	1.942046 ***	2.247730 ***
△USD	0.047474	0.035525	0.149601	0.295085 **	0.220796
DEF	0.074881	0.306602	−0.146603	−1.08314	−0.677091
TERM	0.793346 *	0.837615	1.247038	3.176875 **	3.907195
FF	0.094832	0.178546	0.08265	0.118996	0.377945
Constant	−0.379109	−0.664984	−0.261139	−0.046989	−0.914749
Pseudo R ²	0.12734	0.129388	0.209409	0.452856	0.567077
Panel B. Small-Growth Value-Weighted Portfolio.					
	Q(0.10)	Q(0.25)	Q(0.50)	Q(0.75)	Q(0.90)
TED	0.184540 ***	0.187256 ***	0.293062 ***	0.373977 ***	0.362896 **
△USD	0.013031	0.022646	0.060762 **	0.077211	0.160972 **
DEF	−0.280845 **	−0.293485 **	−0.359546 **	−0.12897	0.0452
TERM	0.02314	0.03546	0.138531	0.167228	0.464921
FF	−0.163038 ***	−0.170151 ***	−0.198686 ***	−0.157414 *	−0.073605
Constant	0.462714 **	0.495022 **	0.564078 **	0.300383	−0.007143
Pseudo R ²	0.334442	0.388128	0.423552	0.455643	0.505884

Notes: DEF and TERM refer to the default and term spreads, respectively. FF is the federal funds rate. TED is the difference between 3 month LIBOR based on United States (US) dollars and 3 month Treasury bill rates. △USD is the percentage change of the trade-weighted US dollar index. *** Significant at the 1% level; ** significant at the 5% level; * significant at the 10% level. Bootstrapped standard errors can be provided upon request.

Table 3. Quantile regression estimates for the volatility of small-value portfolios.

Panel A. Small-Value Equally Weighted Portfolio.					
	Q(0.10)	Q(0.25)	Q(0.50)	Q(0.75)	Q(0.90)
TED	0.376354 ***	0.317908 ***	0.410693 ***	0.718187 ***	0.978881 **
△USD	0.000548	0.00373	0.008434	0.087652	0.313113
DEF	−0.238898 *	−0.208575	−0.488392 **	−1.090692 ***	−1.258328
TERM	0.271271	0.558057 *	0.857002 **	1.093685	2.0372
FF	−0.049035	−0.05052	−0.160062	−0.437519 *	−0.399688
Constant	0.278615	0.224728	0.569798	1.421968 *	1.33733
Pseudo R ²	0.217063	0.257554	0.239325	0.231789	0.270825
Panel B. Small-Value Value-Weighted Portfolio.					
	Q(0.10)	Q(0.25)	Q(0.50)	Q(0.75)	Q(0.90)
TED	−0.000752	−0.000743	0.0000585	−0.008194	−0.002665
△USD	−0.00000262	0.000287	−0.001054	0.005543	0.008296
DEF	0.001029	0.001119	0.001099	0.020052	0.059845
TERM	0.000602	0.000329	0.006501	0.065065 *	0.129994
FF	0.000716	0.000724	0.000637	0.011039	0.029894
Constant	0.008017 *	0.008519 **	0.007949	−0.030327	−0.103881
Pseudo R ²	0.010066	0.008512	0.010173	0.057574	0.136328

Notes: DEF and TERM refer to the default and term spreads, respectively. FF is the federal funds rate. TED is the difference between 3 month LIBOR based on United States (US) dollars and 3 month Treasury bill rates. △USD is the percentage change of the trade-weighted US dollar index. *** Significant at the 1% level; ** significant at the 5% level; * significant at the 10% level. Bootstrapped standard errors can be provided upon request.

Table 4. Quantile regression estimates for the volatility of large-growth portfolios.

Panel A. Large-Growth Equally Weighted Portfolio.					
	Q(0.10)	Q(0.25)	Q(0.50)	Q(0.75)	Q(0.90)
TED	0.057825 **	0.059409 ***	0.085593 ***	0.116622 **	0.263153 ***
△USD	0.020687 **	0.014007 **	0.005258	−0.00285	−0.025197
DEF	0.04513	0.049136	0.107896 **	0.120761 *	−0.051614
TERM	0.030569	−0.016687	0.122692	0.211246 *	0.11847
FF	−0.039047	−0.036754	0.016993	0.03922	−0.023951
Constant	0.00464	0.030539	−0.114772	−0.158364	0.097188
Pseudo R ²	0.479252	0.498959	0.451702	0.511832	0.591971
Panel B. Large-Growth Value-Weighted Portfolio.					
	Q(0.10)	Q(0.25)	Q(0.50)	Q(0.75)	Q(0.90)
TED	−0.001756	0.003299	0.011282	0.024566 ***	0.030680 ***
△USD	0.003354	0.002095	0.002067	0.005567 *	0.000559
DEF	−0.003612	−0.006916	−0.024166	−0.035958 **	−0.036660 *
TERM	−0.024407	−0.01805	−0.020038	−0.004958	0.0113
FF	−0.00972	−0.010383 *	−0.015627 **	−0.017006 *	−0.016994
Constant	0.031545	0.034851 *	0.060843 ***	0.070789 **	0.071852 **
Pseudo R ²	0.231057	0.200836	0.155465	0.264051	0.40097

Notes: DEF and TERM refer to the default and term spreads, respectively. FF is the federal funds rate. TED is the difference between 3 month LIBOR based on United States (US) dollars and 3 month Treasury bill rates. △USD is the percentage change of the trade-weighted US dollar index. *** Significant at the 1% level; ** significant at the 5% level; * significant at the 10% level. Bootstrapped standard errors can be provided upon request.

Table 5. Quantile regression estimates for the volatility of large-value portfolios.

Panel A. Large-Value Equally Weighted Portfolio.					
	Q(0.10)	Q(0.25)	Q(0.50)	Q(0.75)	Q(0.90)
TED	0.167429 *	0.254026	0.727135	1.899838 **	3.267949 ***
△USD	−0.029857	0.007557	0.030555	0.341193	0.775099 **
DEF	−0.155227	−0.234264	−0.437051	−1.751534	−3.526708 ***
TERM	0.118714	0.124401	0.004214	2.109121	6.369875 *
FF	−0.089173 *	−0.122854	−0.237384	−0.363936	−0.384064
Constant	0.235083	0.348287	0.628144	1.396381	1.943676
Pseudo R ²	0.135034	0.145326	0.171951	0.29532	0.51744
Panel B. Large-Value Value-Weighted Portfolio.					
	Q(0.10)	Q(0.25)	Q(0.50)	Q(0.75)	Q(0.90)
TED	0.01937	0.034151	0.102227 **	0.120011	0.201852 *
△USD	0.00563	0.005978	0.030819	0.107029 **	0.180916 **
DEF	−0.013253	−0.02057	−0.095394	−0.059272	−0.247992
TERM	0.014616	0.172264 **	0.235401	0.667151 *	1.105126 **
FF	−0.008836	0.011705	−0.011096	0.038622	−0.017313
Constant	0.083138	0.029942	0.113101	−0.063273	0.102046
Pseudo R ²	0.045351	0.075252	0.065723	0.162049	0.297955

Notes: DEF and TERM refer to the default and term spreads, respectively. FF is the federal funds rate. TED is the difference between 3 month LIBOR based on United States (US) dollars and 3 month Treasury bill rates. △USD is the percentage change of the trade-weighted US dollar index. *** Significant at the 1% level; ** significant at the 5% level; * significant at the 10% level. Bootstrapped standard errors can be provided upon request.

The strong asymmetric association between funding liquidity risk and high-risk portfolio volatilities appeared to be due to the COVID-19 crisis having a large effect on uncertainty perceptions of financial intermediaries. The adverse impacts of deteriorated funding liquidity conditions on the volatilities of stock portfolios during high-volatility episodes were stronger because perceived equity risk was high in these episodes. Financial intermediaries (such as speculators in financial markets) appeared to be more attentive to the volatilities of high-risk portfolios in the high-volatility periods. It was apparent that the

increased risk aversion of financial intermediaries coincided with the high-volatility periods of more risky portfolios, which was the main reason behind the asymmetric dependence. The intermediaries tended to reevaluate the downside risks of their investment strategies considering the level of portfolio volatilities during the economic slowdown in the COVID-19 crisis period.

As for the impact of other control variables, we observed that an increase in the value of the US dollar (Δ USD) significantly increased the volatilities of some portfolios, particularly for the high periods of high-risk portfolio volatilities. This could be due to the fact that the US dollar is a valuable hedge against worsening economic conditions, and significant US dollar appreciations represent one of the indicators of these conditions [35]. Similar to the impact of the US dollar, it was observed that an increase in TERM spread (TERM) intensified the volatility of high-risk portfolios, especially in the upward periods of the volatilities. The main reason behind this result is that the TERM spread is associated with short-term business cycles and is expected to be high in tough times [33]. Another interesting finding is that reduced interest rates (the decreases in FF) led to increasing volatilities for some portfolios (with more increase for small-growth value-weighted and small-value equally weighted portfolios). During recessions, interest rate cuts by monetary authorities can lead to expectations for further cuts [42]. This could be the probable reason for the impact of interest rate cuts during the COVID-19 crisis. Last but not least, we also found that the increased default spread reduced the volatility of some portfolios (e.g., small-growth value-weighted, small-value equally weighted, large-growth value-weighted, and large-value equally weighted portfolios), while it increased the volatility of the large-growth equally weighted portfolio. The differential impacts of default spread suggest that the widely used default spreads (e.g., the default spread used in this study) could not be related to the real default risk since individual companies in different portfolios have different and time-varying default probabilities [43].

6. Conclusions

During periods of extreme uncertainty (such as the uncertain COVID-19 pandemic period), a better understanding of economic mechanisms affecting the volatilities of stock portfolios is of immense importance for determining effective investment strategies. The limited risk-bearing capacity of financial intermediaries, which depends on the changes in funding liquidity conditions in interbank markets, affects global market dynamics [9]. The behavior of financial intermediaries (speculators in financial markets), buying and/or selling volatile stocks, influences the demand–supply mechanism in stock markets due to the large holdings they have at their disposal. This behavior varies with changing global economic circumstances. Risky portfolios can be immediately affected by market news in an uncertain economic environment, which leads to risk-adjusting changes in the asset allocation decisions of financial intermediaries. In this paper, we analyzed the asymmetric dependence structure between funding liquidity risk and the volatilities of low- and high-risk stock portfolios during the COVID-19 period. Specifically, we tested whether the significance and magnitude of the effects of funding liquidity risk on the volatilities of stock portfolios changed during the high-volatility periods with high uncertainty that coincided with the COVID-19 period.

Our baseline results indicate two important findings. First, the deteriorated funding liquidity conditions had serious adverse effects on the volatilities of high-risk portfolios (increasing volatilities of high-risk portfolios) compared to low-risk portfolios during the COVID-19 pandemic. Second and more importantly, these effects were more significant and stronger in the upward periods of the volatilities of high-risk portfolios, which inherently have more information risk. The findings imply that the volatilities of high-risk portfolios were strongly associated with worsening funding liquidity conditions in interbank markets, especially during the panic periods of the COVID-19 crisis. It appears that a decline in the risk-bearing capacity of financial intermediaries increased the volatilities of high-risk portfolios more strongly when financial intermediaries related an increase in volatility

to worsening investment opportunities in global markets. This economic mechanism especially reduces the diversification capacity of, the high-risk portfolio investments in high-uncertainty environments. To sum up, our main findings provide valuable insights to asset managers into how funding liquidity risk drives the volatility of stock portfolios in an uncertain economic environment. Baseline results suggest the use of dynamic asset allocation strategies to reduce volatility exposure against funding liquidity risk during uncertain times. Tactical asset allocation strategies can be used to successfully manage significant fluctuations in the volatility of stock portfolios. Employing a tactical asset allocation strategy, the global asset managers might form their asset allocation decisions to change their position in stock markets depending on portfolio volatility levels and on the changes in funding liquidity risk.

Our results imply that increased financial constraints of financial intermediaries are causing market inefficiency due to increased financial frictions (e.g., informational loss, information asymmetry) during the turbulent and uncertain COVID-19 pandemic. The uncertain pandemic crisis increases information risk, as well as liquidity risk and, hence, transaction costs, which are considered as speculators' shadow cost of capital [9], leading to more illiquid stock markets and higher hedging motives. As a result of this mechanism, illiquid and highly volatile stocks are especially strongly influenced by a negative shock to interbank loan markets in high volatility periods. Overall, we provide evidence on the role of hedging demands in determining the asymmetric impacts of the reduced risk-bearing capacity of financial intermediaries on portfolio volatilities through uncertainty during the COVID-19 pandemic crisis. Following a negative shock to the global economy, larger losses are observed because of the high-risk positions of US financial intermediaries, since they tend to make risky investments in good times [35]. The precautionary measures taken by financial intermediaries (e.g., safer US dollar liabilities) in good times might increase their resilience to negative global economic conditions [35] and lessen the adverse impacts of funding liquidity risk on the volatilities of high-risk portfolios in bad times (e.g., the COVID-19 related financial turmoil).

As an extension to this study, rather than size and value strategies, the volatility of portfolios formed based on other investment strategies (e.g., size and profitability strategies) may be further studied. Future research may also concentrate on the role of the equity constraints of financial intermediaries in determining the volatilities of stock portfolios instead of the debt constraints examined in this study. For additional extensions, the effects of positive and negative changes in funding liquidity risk on other asset markets could be tested. For example, a future study might investigate the effects of positive and negative changes in funding liquidity risk on the volatility of portfolios, including assets with different risk profiles in developed and/or developing markets. Such a study may yield important insights for asset managers and policymakers.

Author Contributions: All authors contributed equally to this work. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Publicly available datasets were analyzed in this study. Portfolio returns can be found in Kenneth French's online data library: [https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html] (accessed on 7 February 2021). Other variables are sourced from Federal reserve Bank of St. Louis: [<https://www.stlouisfed.org/>] (accessed on 7 February 2021).

Acknowledgments: This paper is a revised version of a part of the first author's PhD dissertation submitted to the Middle East Technical University, Ankara.

Conflicts of Interest: The authors declare no conflict of interest.

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Article

COVID-19 Pandemic: Is the Crypto Market a Safe Haven? The Impact of the First Wave

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Abstract: The present study investigated whether the crypto market is a safe haven. The study argues that during the first wave of the COVID-19 crisis, gold and oil, as typical global commodities, could have been diversifiers. The study developed a unique COVID-19 global composite index that measures COVID-19 pandemic time-variant movements on each day. The study used OLS (ordinary least squares), quantile, and robust regressions to check whether the COVID-19 crisis has had any significant direct influence on the crypto market. The OLS, quantile, and robust regressions estimates confirmed that there was no statistically significant direct influence of the COVID-19 crisis on the crypto market in the first wave period. However, the study found spillovers from risky assets (S&P 500) on the crypto market, with Tether as an exception. Due to this special characteristic, Tether might present a safe haven within the crypto market.

Keywords: cryptocurrency; COVID-19; safe haven; quantile regression; tether

Citation: Vukovic, D.; Maiti, M.; Grubisic, Z.; Grigorieva, E.M.; Frömmel, M. COVID-19 Pandemic: Is the Crypto Market a Safe Haven? The Impact of the First Wave. *Sustainability* **2021**, *13*, 8578. <https://doi.org/10.3390/su13158578>

Academic Editor: Antonio Boggia

Received: 25 June 2021

Accepted: 26 July 2021

Published: 31 July 2021

Corrected: 12 November 2021

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1. Introduction

The coronavirus disease of 2019 (COVID-19) was detected in Wuhan, China at the beginning of December 2019. However, it was officially reported for the first time to the world by the World Health Organization (WHO 2020) on 31 December 2019. Within a month, WHO declared the COVID-19 outbreak as a public health emergency of international concern at their second meeting of the Emergency Committee (WHO, 2020). The virus had already spread to all parts of the world, and on 11 March 2020, WHO declared it as a global pandemic. Fear and panic did not bypass the world economy. The Dow Jones Industrial Average Index downscaled more than 40% from 29,348 on 19 February to 18,591 on 23 March 2020 (MarketWatch 2020). A similar trend was observed for S&P 500 (downscaled from 3,386 to 2,237) and other well-known world indices during the same period.

The global scientific and business community believes that the world economy will have one of the biggest crises ever. Financial markets, airline industries, SMEs, tourism and hospitality, services, construction, and mortgage sectors all recorded a large drop in the first quarter of 2020. According to [1], this crisis is a “Black Swan” event, as originally described by [2]. The study by [1] argued that this event was expected to have an extreme

impact that lies outside the area of regular expectations. Several studies have focused on the existence of this issue during crises [3–5] and epidemic diseases [6,7].

The global demand for many goods and services has plummeted due to a large portion of the population is in quarantine across the globe. The government imposed strict social distancing measures in an attempt to prevent the spread of the disease. The recession has hit many sectors and businesses. In the first quarter of 2020, the world oil and gas sectors faced a deep recession due to its falling demand caused by the ongoing pandemic and policy failures of the OPEC countries. On 20 April 2020, the West Texas Intermediate futures (WTI futures) contract had slumped from \$17.85 a barrel to −\$37.63 (Bloomberg, 2020). For the first time in history, oil futures became negative and oil prices dropped below 1985's minimum. However, gold shows a different trend. According to Bloomberg, after a short fall in gold's price in early March (\$1500 and less per ounce). The gold price rose continuously and exceeded \$1700 within a month after. The Bank of America raised its 18-month gold price target to \$3000 (Bloomberg).

It is important to look at how cryptocurrencies behave in this situation. The greatest challenge that lies in the context of the ongoing COVID-19 crisis is to find a “safe haven”. A safe haven is supposed to be immune to this crisis and protect the value of assets of investors. Several studies have shown that cryptocurrencies (especially Bitcoin) have no hedging or safe haven capabilities [8,9]. According to the study of [10], Bitcoin has fewer characteristics as a hedge and safe haven compared to gold. Moreover, it is not the best instrument to hedge structural crude oil price shocks (compared to gold) [11]. Cryptocurrencies showed a higher correlation with riskier assets between the period of March and April 2020 (Bloomberg). Bitcoin slumped from \$8000 to −\$4000 in a few days in mid-March 2020. However, within a month, Bitcoin hit strong resistance around \$7500, as market players reacted positively to the news that COVID-19 outbreaks had started to stabilize in some of the worst affected countries. This is in accordance with the authors of [12], who stated that Bitcoin is a highly volatile asset with extreme price dynamics and price clustering. It shows a positive correlation with downward markets [10]. This unique situation will stimulate numerous studies in the future to test the speculative activity of investors and their real influence on global market prices [13]. According to preliminary data, investors have no strong speculative impact on global market prices during a pandemic crisis.

The present study was inspired by the following two questions: “Is there any safe haven for cryptocurrencies during a pandemic crisis?”, and “Which cryptocurrency can be used for hedging?” The study investigated the connection of cryptocurrencies to gold and oil during the first wave of the pandemic (the first 6 months) along with the response of financial markets to these variables. To examine the impact, the study used mean-based OLS regression, conditional median-based quantile regression, and robust regression for additional robustness checks. Moreover, depending on the regression results, the study applied the model that was most suitable for the tested variables (in the case of high tail value estimations). The study also examined the co-movement and contagion effect between cryptocurrency pairs using wavelet coherence diagrams. Thus, the goal of the study was to examine all such interdependencies that arose (in the first wave of the crisis) due to the ongoing COVID-19 crisis to support future studies. The COVID-19 crisis seems to be ongoing and is about to reach its three highest peaks across the globe. The present study developed a composite COVID-19 index to answer the fundamental question “How should one measure the effect of COVID-19 globally?” The study findings have both scientific and practical significance, bearing in mind the development of financial theory in the field of crises and cryptocurrencies (theoretical), on the one hand, and investor reactions to the shocks (practical) on the other. The study adds value to the existing literature by creating a COVID-19 global composite index and examining the impact of the ongoing COVID-19 crisis on the crypto market. More specifically, the present study contributes by investigating more specific crypto market issues, such as if the crypto market is a hedge or safe haven.

2. Theoretical Background

The influence of the COVID-19 crisis on cryptocurrency has been studied by several authors in the last few months [6,12]. The study by [6] considered five cryptocurrencies to investigate herding biases by quantifying the self-similarity intensity of cryptocurrency returns' during the COVID-19 pandemic. The study found that the COVID-19 crisis has had a positive impact on the efficiency of the cryptocurrency market. To test the influence of the COVID-19 pandemic on cryptocurrency market efficiency, the study used the following methodologies: a multifractal detrended fluctuation approach, the Magnitude of Long memory index, and the generalized Hurst exponent. The study also highlighted that Bitcoin was more efficient before the COVID-19 crisis. Likewise, Ethereum was more efficient during and after the outbreak of the COVID-19 crisis. The study by [14] analyzed the impact of the COVID-19 crisis on 15 equity indices, 4 bond benchmark indices, 9 precious metals, and 3 cryptocurrencies (Bitcoin, Ethereum, and Litecoin) using a quantile autoregression model. The study found that the COVID-19 crisis could be a "Black Swan" event, especially for cryptocurrencies. Corbet et al. [12] found that there is negative sentiment toward COVID-19 and cryptocurrency returns. The study also highlighted that investors could have benefitted from the investment diversification, as digital assets (social media) acted as a safe haven in comparison to precious metals during previous crises (similar to the case of a "Black Swan"). The study used a standard GARCH model (generalized autoregressive conditional heteroskedasticity) and the Python package to derive the above inference. The study by [15,16] forecasts the impact of COVID-19 will be significant, both economically and socially. However, the study does not entirely support the findings of the previous studies that the COVID-19 pandemic can be seen as a "Black Swan" event. This is due to the fact that this crisis is totally unexpected, with strong impacts not only on the global economy and finance but also a health crisis. In the study of [17], wavelet methods were applied to examine the impact of COVID-19 on Bitcoin prices. The study used daily data of COVID-19 world deaths and daily Bitcoin prices from 31 December 2019 to 29 April 2020. The study found that the COVID-19 pandemic affected the price growth of Bitcoin. Hereafter, this section additionally discusses the theoretical explanations concerning cryptocurrency behavior, methodologies, and studies that analyzed precious metals and cryptocurrencies.

The crypto market is very volatile, especially with its most famous currency, Bitcoin. Bitcoin is mostly used for speculative purposes, which causes high volatility and market bubbles [17–19]. Given the growing interest in Bitcoin, it is important to choose a reliable model to forecast the risk of such an investment. By using specifications that can account for structural breaks in GARCH, namely Markov switching GARCH models, the authors of [20,21] analyzed Bitcoin daily log returns exhibiting regime changes in their volatility dynamics. Because of such dynamics, it is important to explore ways to reduce the level of risk of an investment in Bitcoin and to hedge or discover some factors that can influence the price movement of Bitcoin.

Tether is the only important stable coin on the crypto market with significant market capitalization. Tether is purportedly backed by USD (US dollar) reserves, but there is no clear evidence of it. The study by [22] tested two hypotheses regarding the role of a Tether in the crypto world, especially on Bitcoin. The first hypothesis put forward was that demand is driven by the idea that Tether is being used as a medium of exchange for fiat currency's entry into the crypto world. The second hypothesis was that Tether flows cause positive Bitcoin returns. The obvious argument behind this is that Tether is being printed, without support, in USD, and is pushed out into the market with an inflationary effect on asset prices. This is in accordance with the study of [22], which has shown that none of the exposures to macroeconomic factors, stocks markets, currencies, or commodities can explain cryptocurrency prices. On the other hand, ref. [20] found in their study that Tether has a sizable impact on Bitcoin prices. These findings are generally consistent with the evidence that sophisticated investors may earn profit from the bubbles [23].

This is interesting due to the fact that [24–26] claim that in some situations, the speculative activity of investors will not be the main reason for volatilities on global market prices. Similarly, according to [18,27,28], cryptocurrencies are characterized by extreme volatilities and bubbles, price jumps [29], co-explosivity [30], and strong speculative targets (especially Bitcoin, Ethereum, and similar cryptocurrencies). However, cryptocurrencies are not only currencies but also assets [28,31,32] and an investment destination for investors [12]. The study by [33] analyzed returns and volatility spillovers between Bitcoin and four major global asset classes (stocks, commodities, currencies, and bonds). The study used the VAR GARCH-in-mean model (value-at-risk in generalized autoregressive conditional heteroskedasticity) and concluded that the Bitcoin market is not completely isolated. The sign of spillovers exhibited some differences in the two market conditions, with greater evidence that Bitcoin receives more volatility than it transmits.

As Bitcoin and gold are often looked at as safe havens, the relationship between these assets is important for discovering if there is any hedge option between them. There is always a question of the hedging capabilities of Bitcoin regarding some stock exchange indices. Baek and Elbeck [32] explored the financial asset capabilities of Bitcoin using GARCH models. The initial model showed several similarities to gold and the USD, indicating hedging capabilities and advantages as a medium of exchange. By applying the asymmetric GARCH methodology [34], Bitcoin can be used to hedge its position against FTSE 100, and in the short term, against the USD. In another study, ref. [35] based their findings on this original sample and an extended sample period. The study showed that Bitcoin exhibits distinctively different return, volatility, and correlation characteristics compared to other assets, including gold and the USD. The study by [9] proposed new definitions of weak and strong safe havens within a bivariate cross-quantilegram approach to explore whether Bitcoin can improve hedging strategies for stock market investments during extreme market conditions, and to examine whether this function is similar to gold hedging strategies. The study results show that Bitcoin and gold play the role of a weak safe haven asset in a few cases. Besides gold, oil has always played a significant role in the global commodity market in investors' hedging strategies against stock exchange indices. The study by [36] used the GARCH model based on 5 years of sample data to explore Bitcoin's volatility effect on crude oil and gold. The study found that Bitcoin volatility had a negative impact on gold and crude oil volatility. The study's estimates clearly indicate that Bitcoin and gold can be used as hedging instruments.

Gold has always played an important role in the global commodity market. The explanation behind the global economy today is that gold is an inflation hedge. It is commonly believed that in a time of crisis, gold is a typical example of a safe haven. However, it can always be put into question from a dynamic point of view; is there only one safe haven for all time? The study by [37,38] analyzed the dynamic role of gold as a safe haven and found that investors' behavior can destroy this role in practice.

The analysis by [39] seems to support this finding by applying a VAR-ADCC-BVGARCH (vector autoregressive asymmetric dynamic conditional correlation bivariate generalized autoregressive conditional heteroskedasticity) to the US financial market during the period of 2007–2017, although there is consensus in the literature that gold could be a risk-diminishing instrument against stocks. The findings of the previous studies suggest that the hedging characteristic of gold tends to mitigate against US stocks as market capitalization increases, implying there is a large proportion of funds invested in gold, against stocks. The study by [39] examined the hedge or safe haven role of the gold relative to the Dow Jones stock industry indices by using quantile GARCH analysis. However, the study findings are dubious depending on the time frame, whether it is the whole sample period (1980–2017) or each sub-period separately (1980–1995 and 1996–2017). Furthermore, it differs across different sectors. The study by [40] applied different methodologies in their robust analysis, indicating the weak hedge and safe haven role of gold for stocks. The study by [41] applied a wavelet decomposition with a copula approach to analyze the dependence between returns of gold and other assets (bonds, stocks, and exchange rates).

The study found that everything changed after the 2008 crisis. Before the crisis, gold was able to shield investors. However, in the aftermath, gold is unable to serve as a hedge or safe haven in the classical sense.

According to the existing literature, most of the studies measure volatility and connectedness using the GARCH models. Some of the very recent studies found that GARCH models are not appropriate for tail values of skewed distribution. Similarly, many studies [42–45] argue that tail risk modeling is very important to consider in cryptocurrency value regressions. For example, the authors of [44] suggest a bivariate copula approach for tail risk modeling, the authors of [44] propose a linear bivariate quantile regression (bivariate CoVaR) as the most appropriate model, and [43] (based on the work of [46,47]), used a tail-event driven network to analyze the tail-risk interdependence among 23 cryptocurrencies. One of the biggest advantages of such models in tail value measures is in the description of the complexity of the crypto market, especially for the conditional tail-risk and tail-event driven networks used by [43,44]. Most importantly, it turns the distributional effect of the independent variables on the dependent variable into different quantile ranges. According to [48], the most significant characteristic of quantile regression is to make a classification of the heterogeneous effects of heterogeneous cross-sectional ranges. The median is a more appropriate measure than the mean in the case of conditional quantile estimations [49,50]. This technique is the most effective in tail value estimations (extremes of a dataset).

In estimations of the mean value of the dependent variable for particular levels of the independent variables, generally, the OLS (ordinary least square) [51,52] is used. The OLS is an appropriate model for the conditional mean function to describe how the mean of the response variable changes with the covariates [53]. The main limitations of the OLS are (1) that it is often confronted with the heteroscedasticity, focusing on the means as measured facts for tails values are lost, (2) it fails to recognize the source and nature of heterogeneity, and (3) it is inappropriate for extreme observations. Studies by [49,50] argue that quantile regression provides essential information about the relationship between the response variable and covariates on the entire conditional distribution. According to [53–56], such a model visualizes heteroscedasticity in the dataset. Similarly, the model determines the influence of covariates on the shape and scale of the entire response distribution [53]. Quantile regression models are mostly used in portfolio studies and different financial analyses. This technique was popularized by [53], who found that it is possible to model the relationship between returns and beta for companies that overperform and underperform relative to the mean. In the study of [57], it was shown that quantile regression is the most appropriate model in the study of the sensitivity of cryptocurrency returns to changes in gold price returns. A similar technique was previously used by [44] to study hedging strategies against global uncertainty based on cryptocurrency. Great attention has been paid to the tail behavior of values in their studies.

3. Data and Methodology

3.1. Data

The study dataset consisted of the following variables for studying the impact of the first wave of COVID-19 between 22 January 2020 and 11 April 2020: daily returns of five cryptocurrencies (Bitcoin, Ethereum, XRP, Tether, and Bitcoin Cash) (data source: <https://coinmarketcap.com/>) (accessed on 15 April 2020), google trends of searches (data source: Google); gold daily returns (data source: Yahoo); crude oil daily returns (Data Source: Yahoo); VIX index daily returns (Data Source: Yahoo); S&P 500 index daily returns (Data Source: Yahoo), and COVID-19 global index (data source: <https://data.humdata.org/dataset/novel-coronavirus-2019-ncov-cases>) (accessed on 15 April 2020). All daily returns were calculated using the HPR (Holding Period Returns) formula. To capture the time-varying effect of COVID-19, the study created the COVID-19 global index (explained in detail in Section 3.2). The study variables were as follows: (a) the dependent variable is the cryptocurrency daily average returns; (b) the independent variable was COVID-19 global

index (COVID-19), developed to measure the effect of COVID-19 and daily movements of COVID-19; GOLD: important global commodity; GT: Google trend on how much a particular cryptocurrency was searched during the study period; OIL: another important global commodity, the S&P 500 index is a good indicator of how financial markets are doing; VIX is intended to provide an instantaneous volatility measure regarding how much the market believes that the market index will fluctuate in the short term.

3.2. Methodology

3.2.1. COVID-19 Global Index Construction

For the present study, we constructed a composite COVID-19 index following [58–60] to answer the fundamental question of how one should measure the effect of COVID-19 globally. The construction of the composite COVID-19 global index requires three stages. The first stage of the composite COVID-19 global index development started with the normalization of the data points, followed by a weighting of the data points and weighted aggregates of three variables: confirmed cases of COVID-19; deaths due to COVID-19, and recovered cases of COVID-19. We used z-scores and rescaling methods for normalization with the following expression:

$$z = \frac{x - \bar{x}}{s}$$

Then, the rescaling method was deployed on all the normalized data for a linear transformation of the data into a scale of 1–100. The 1–100 scale was determined by the following equation:

$$y = \frac{x - \min(x)}{\max(x) - \min(x)}$$

We used these steps due to the fact that the effects of COVID-19 cannot be measured by a single indicator and requires the composite index used by the World Bank and the UN. Likewise, we normalized and standardized the data by creating a COVID-19 global index. The COVID-19 global index was constructed from three weighted components—confirmed cases of COVID-19; deaths due to COVID-19 and recovered cases of COVID-19—which were collected from the humanitarian data exchange (<https://data.humdata.org/dataset/novel-coronavirus-2019-ncov-cases>) (accessed on 15 April 2020). The dataset consisted of 81 daily observations from 22 January 2020 to 11 April 2020.

There is a high probability that a high level of multicollinearity exists among these three variables that are important measures of the impact of COVID-19. It is also true that the weights of these three variables are not uniform across all countries. Such issues could result in a distortion of the overall calculation of these variables. To avoid such errors in this estimation study, we normalized and standardized the data by constructing a COVID-19 global index. All these three variables were converted to a scale of 1–100 points, where 100 denotes the best score and 1 denotes the worst. Equal weights were assigned to all three variables in preparation for the aggregate COVID-19 global index. Figure 1a shows the daily movements of the independent variables. The primary axis represents the COVID and VIX daily movements, and the secondary axis represents the GOLD, OIL, and S&P 500 daily movements. Figure 1b shows the daily movements of the dependent variables. The Tether daily movements are represented on the secondary axis and the rest are on the primary axis.

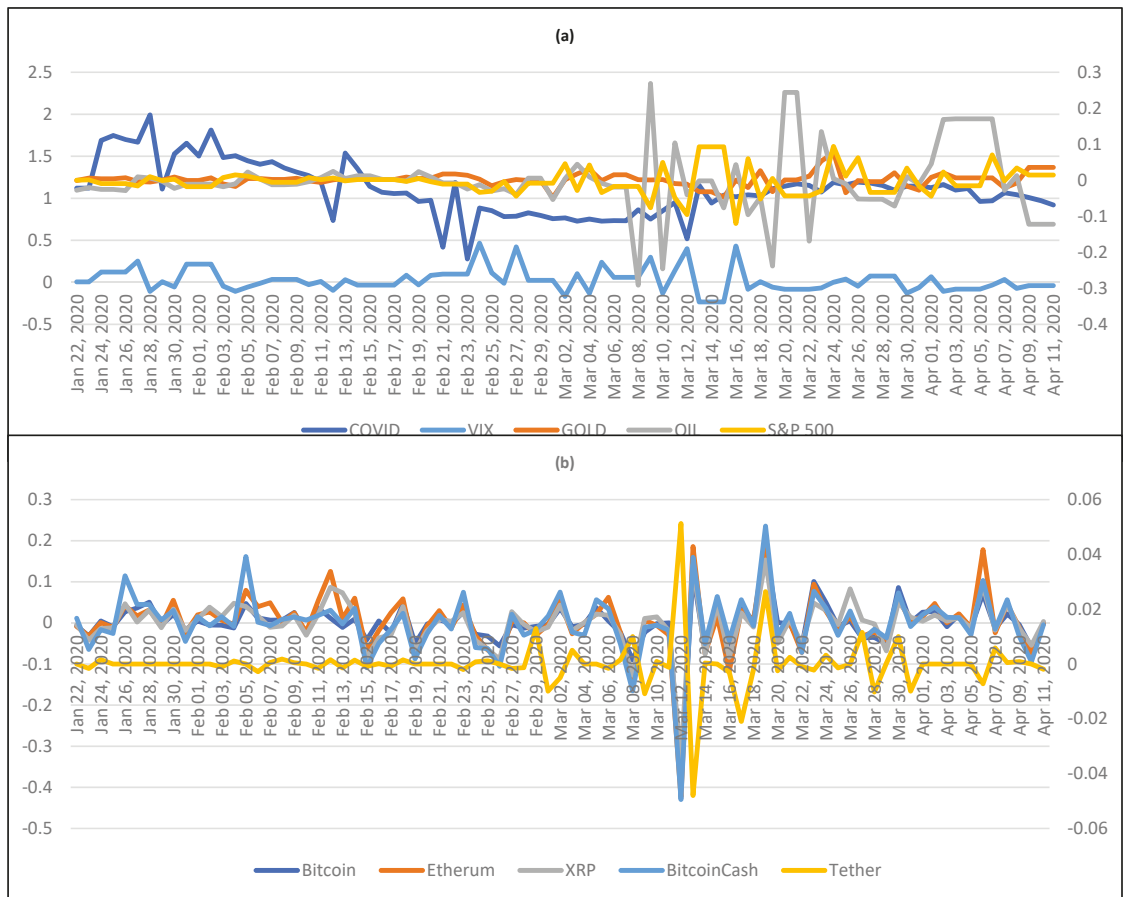


Figure 1. (a,b): Variables' daily movements.

3.2.2. Wavelet Coherence

To study the co-movement between the cryptocurrencies' daily returns, a wavelet coherence diagram was plotted using the "biwavelet" R package, similar to the studies of [61,62]. We analyzed the continuous co-movement between the pairs at different times and frequency domains using a wavelet coherence diagram. The wavelet coherence could be perceived as a measure of a local correlation of the two time series, both in time and scale. This procedure is analogous to coherence in Fourier analysis. It is defined as the squared absolute value of the smoothed cross wavelet spectra normalized by the product of the smoothed individual wavelet power spectra of each series:

$$R^2(u, s) = \frac{|S(s^{-1}W_{xy}(u, s))|^2}{S(s^{-1}|W_x(u, s)|^2)S(s^{-1}|W_y(u, s)|^2)} \quad (1)$$

3.2.3. Regressions

We deployed two versions of regressions: (1) mean-based OLS regression, and (2) conditional median-based quantile regression.

OLS Regression

The OLS regression is expressed as the following:

$$R_{it} = a + b \text{ COVID-19} + s \text{ GOLD}_t + g \text{ GT}_{it} + p \text{ OIL}_t + d \text{ S\&P 500}_t + f \text{ VIX}_t + \varepsilon_{it} \quad (2)$$

where i represents five cryptocurrencies ($i = 1$ to 5); t represents the period from 22 January 2020 to 11 April 2020; R_{it} represents daily cryptocurrency returns; a is the intercept; ε_{it} is the error term; $b, s, g, p, d,$ and f are the sensitivity coefficients for the independent variables of the regression.

Quantile Regression

Following [49], we deployed quantile regressions for conditional median-based estimation. The loss function in statistics or mathematics is presented below.

$$dT = \begin{cases} \tau u & \text{if } u > 0 \\ (\tau - 1)u & \text{if } u \leq 0 \end{cases} = u(\tau - I(u < 0)) \quad (3)$$

The τ th quantile minimizes ξ , as shown in the equation below (univariate):

$$R(\xi) = \sum_{i=1}^n \varrho_T(Y_i - \xi) \quad (4)$$

The special feature of the above function is that it has a bidirectional derivative but is not differentiable, as shown below:

Right derivative

$$\begin{aligned} R'(\xi+) &= \text{Lim}_{(h \rightarrow 0+)} (R(\xi + h) - R(\xi))/h \\ &= \text{Lim}_{(h \rightarrow 0+)} \sum_{i=1}^n \frac{\varrho_T(y - \xi - h) - \varrho_T(y - \xi)}{h} \\ &= \sum_{i=1}^n (I(y_i \leq \xi) - \tau) \end{aligned} \quad (5)$$

Left derivative

$$\begin{aligned} R'(\xi-) &= \text{Lim}_{(h \rightarrow 0+)} (R(\xi - h) - R(\xi))/h \\ &= \text{Lim}_{(h \rightarrow 0+)} \sum_{i=1}^n \frac{\varrho_T(y - \xi + h) - \varrho_T(y - \xi)}{h} \\ &= \sum_{i=1}^n (\tau - I(y_i < \xi)) \end{aligned} \quad (6)$$

Point ξ minimizes the objective function if $R'(\xi+) \geq 0$ and $R'(\xi-) \geq 0$. Hence, the optimized problem defined the unconditional quantile above. In a similar way, the conditional quantile can be defined analogously by OLS, as explained below. If $[Y_1, Y_2, \dots, Y_n]$ is a set of random variables from it, we get

$$R(\mu) = \sum_{i=1}^n \varrho_T(Y_i - \mu)^2 \quad (7)$$

The unconditional population mean is estimated from the above Equation (7). Then, the parametric function $\mu(x, \beta)$ replaces the scalar μ in the above equation to get Equation (8).

$$R(\mu) = \sum_{i=1}^n \varrho_T(Y_i - \mu(x, \beta))^2 \quad (8)$$

Similarly, the conditional median function can be obtained by replacing the scalar variable ξ with the parametric function $\xi(x, \beta)$ and by setting the τ th quantile as $\frac{1}{2}$. Other conditional function values can be obtained by replacing absolute values with ϱ_{τ}^* , as follows:

$$R(\xi) = \sum_{i=1}^n \varrho_T(Y_i - \xi(x, \beta))^2 \quad (9)$$

Further, using linear programming, the minimizing problem can easily be solved by formulating $\xi(x, \beta)$ as linear parameters. The authors of [63–65] and others extensively used this method recently to derive the study estimates.

4. Results and Discussion

4.1. Preliminary Analysis

Tables 1 and 2 show descriptive statistics and correlation estimates for the independent variables. Most of the data series have higher levels of Kurtosis and correlation coefficients within the acceptable range. Looking at the independent variables' descriptive statistics separately and their standard deviations as a measure of the absolute risk level of the assets, it is obvious that gold, as a typical global commodity, has the lowest risk compared to all other assets. The correlation analysis, with negative coefficients between gold and oil and S&P 500 is a sign that these two global commodities could serve well in this COVID-19 crisis as hedge instruments against risky assets represented by the most famous stock exchange index. The ADF test confirms that there is no unit root in the series.

Table 1. Descriptive statistics.

	COVID-19	GOLD	GT *	OIL	S&P 500	VIX
Mean	0.279	0.002	38.531	−0.002	−0.003	0.025
Std. Dev.	1.105	0.019	11.943	0.093	0.038	0.141
Skewness	2.911	0.451	2.526	0.242	0.328	1.098
Kurtosis	11.559	6.118	11.271	5.510	4.708	4.640

* Note: Google trend for Bitcoin.

Table 2. Correlation analysis.

	COVID-19	GOLD	GT *	OIL	S&P 500	VIX
COVID-19	1.000					
GOLD	−0.011	1.000				
GT	0.029	−0.233	1.000			
OIL	−0.057	0.107	0.083	1.000		
S&P 500	0.096	−0.095	0.110	−0.191	1.000	
VIX	0.058	0.091	−0.147	0.009	−0.692	1.000

* Note: Google trend for Bitcoin.

4.2. Wavelet Coherence

Figure 2 shows the wavelet coherence diagram for different cryptocurrency pairs. The horizontal axis represents a daily timeline for one year, starting in May 2019. Our study considers the COVID-19 period to be from 22 January 2020 and onwards in the horizontal period axis (labeled 250 and onwards). The vertical axis represents scales at 2, 8, 16, 32, 64, and onwards. The right-hand side vertical axis is the color axis: the brighter the color (red), the more the coherence, and the lesser bright the color (blue), the lesser the coherence. The Bitcoin–Ethereum, Bitcoin–XRP, Bitcoin–Bitcoin Cash, Ethereum–XRP, Ethereum–Bitcoin Cash, and XRP–Bitcoin Cash pairs show very high levels of persistent coherence at all scales during the COVID-19 period as compared to the pre-COVID-19 period. The wavelet coherence diagrams of Tether with the other cryptocurrencies show interesting results, especially during the COVID-19 period. During the COVID-19 period, especially on the scale at around 16, Tether shows low levels of coherence with the other cryptocurrencies, with no contagion effect. The direction of the phase arrows is not consistent across the scales and periods.

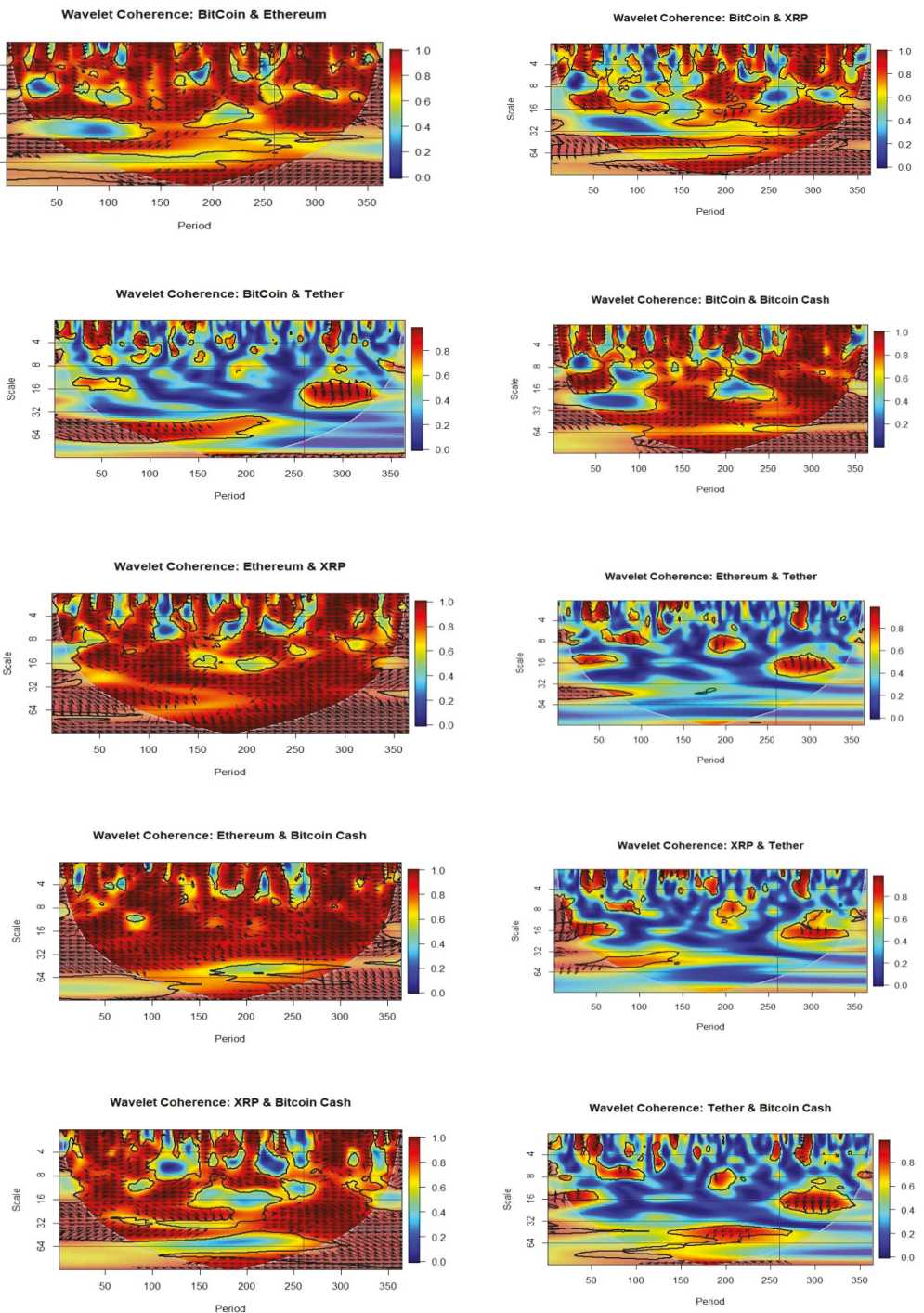


Figure 2. Wavelet coherence diagram among the cryptocurrency pairs.

During the COVID-19 period, all pairs show a strong level of coherence with a short contagion effect that starts around mid-February 2020 and lasts until April 2020 (Figure 2). Such behavior supports the findings of [21], which show that Tether had a sizable impact on Bitcoin prices. However, their findings were from before the COVID-19 period (we found low levels of coherence for all cryptocurrencies before the COVID-19 pandemic), therefore, our results have similar characteristics only during the pandemic. During the COVID-19 period, at a scale of 64 and above, Tether shows lower coherence with the other cryptocurrencies as compared to before the COVID-19 period. In addition, the contagion effects that existed before the COVID-19 period at a higher scale of 64 and above disappeared during the COVID-19 period. The above estimates highlight two important things. First, during the COVID-19 period, the estimates are different, and secondly, they are not uniform. The wavelet coherence diagrams for different cryptocurrency pairs have clearly presented that all pairs, without the presence of Tether, show a very high level of persistent coherence at all scales during the COVID-19 period. The behavior of Tether regarding all the other cryptocurrencies in the crypto pairs is very specific, as these are the only pairs with a low level of coherence with no contagion effect. Going further, during the COVID-19 period, Tether shows lower coherence with the other cryptocurrencies as compared to before the COVID-19 period. Therefore, it is obvious that Tether is a typical stable coin and could present a safe haven for the entire crypto market because all other cryptocurrencies used in the analysis present more than 80% of the total crypto market capitalization. According to this, Tether is the only stable currency, while Bitcoin, Ethereum, Bitcoin Cash, and XRP were affected by COVID-19's influence. In the case of Bitcoin, this study shows a similar behavior of this cryptocurrency as previously analyzed by [16]. Moreover, our results support more findings of [10,44], in which there is no evidence that Bitcoin serves as a safe haven for global assets.

4.3. OLS Estimates

Table 3 shows the results obtained from the OLS estimates.

Table 3. OLS regression estimates.

	C	COVID-19	GOLD	GT	OIL	S&P 500	VIX	R ²
Bitcoin	0.029	0.005	0.017	−0.001	0.116 **	0.570 *	−0.068	0.260
Ethereum	0.005	0.006	0.174	0.000	0.190 *	0.822 *	−0.057	0.274
XRP	−0.009	0.008	−0.033	0.000	0.112 **	0.673 *	−0.034	0.274
Tether	−0.004	−0.002 *	0.036	0.000	−0.027 *	−0.076 *	0.005	0.218
Bitcoin Cash	0.004	0.003	−0.178	0.000	0.156 **	0.790 *	−0.044	0.210

Note: * Significant @ 5% & ** Significant @ 10%.

The OLS estimates show that for all five cryptocurrencies, oil, and the S&P 500 index, the variables are statistically significant at the 5% and 10% levels in explaining average returns, as shown in Table 3. The COVID-19 variable is statistically significant only for Tether at the 5% level in explaining average returns. Looking at the OLS estimates, it seems that risky assets measured by S&P 500 have statistically significant influence at the 5% level in explaining average returns of all five cryptocurrencies used in the analysis. As one could expect, there is a positive change to S&P 500 on average returns for all other cryptocurrencies except Tether (in the range of 0.57 for Bitcoin to 0.822 for Ethereum), which is a clear sign that all these assets are typical examples of risky assets. The only reaction of Tether to the change of S&P 500 is opposite to the other cryptocurrencies. This coefficient is slightly negative (−0.076), which is one more piece of evidence for a typical stable coin that is not directly influenced by the strong reaction of risky assets. The OLS estimates show that apart from S&P 500, only oil, as a typical global commodity, has statistically significant influence at the 5% and 10% levels on the average returns of all five cryptocurrencies. The

explanation for this is very similar to the previous one; the only reaction of the price of Tether was negative but close to zero (-0.002). The only difference is that this influence is much lower than for the case of S&P 500, with the other four cryptocurrencies in the range of 0.112 for XRM to 0.19 for Bitcoin, which shows that oil still can be a diversifier. The COVID-19 crisis seems to be statistically significant only for Tether, once again with a negative reaction very close to zero (-0.002).

4.4. Quantile Regression Estimates

Table 4 shows the quantile regression coefficients of the right-hand side variables for different quantiles, along with their associated p -values.

Table 4. Quantile regression estimates.

		Coefficient Values							
	C	COVID-19	GOLD	GT	OIL	S&P 500	VIX		
0.05	0.145	-0.001	-0.581	-0.006	0.295	1.696	0.166	Bitcoin	
0.25	0.015	0.001	-0.151	-0.001	0.180	0.652	0.008		
0.5	0.016	-0.002	0.008	0.000	0.123	0.620	0.022		
0.75	-0.019	0.001	0.067	0.001	0.085	0.517	0.019		
0.95	-0.076	-0.008	0.358	0.004	-0.145	0.487	-0.003		
0.05	-0.092	0.024	1.630	-0.001	0.224	-0.221	-0.533	Ethereum	
0.25	0.007	0.000	-0.024	-0.001	0.194	0.718	0.021		
0.5	0.001	-0.001	-0.188	0.000	0.184	0.862	0.052		
0.75	0.013	-0.007	0.321	0.001	0.114	1.207	0.062		
0.95	0.045	0.002	0.680	0.001	-0.072	0.444	-0.158		
0.05	-0.022	0.016	1.325	-0.002	0.162	0.192	-0.214	XRP	
0.25	0.002	0.004	-0.350	-0.001	0.204	0.826	0.062		
0.5	-0.028	0.003	-0.170	0.001	0.130	0.572	-0.008		
0.75	0.004	0.003	-0.361	0.001	0.090	0.760	0.064		
0.95	0.032	0.006	0.118	0.001	-0.012	0.432	-0.041		
0.05	0.015	0.000	0.183	0.000	-0.035	-0.143	-0.007	Tether	
0.25	0.002	0.000	0.036	0.000	-0.010	0.007	0.002		
0.5	0.000	0.000	0.011	0.000	-0.003	0.005	0.000		
0.75	-0.002	0.000	0.012	0.000	-0.009	-0.018	0.000		
0.95	-0.002	-0.003	-0.193	0.000	-0.019	0.009	0.058		
0.05	-0.164	0.022	0.934	0.001	0.306	-0.040	-0.460	Bitcoin Cash	
0.25	-0.011	0.004	-0.235	0.000	0.238	0.750	-0.050		
0.5	0.012	-0.001	-0.405	0.000	0.177	0.755	0.028		
0.75	0.034	-0.006	0.118	0.000	0.135	0.734	0.012		
0.95	0.153	-0.019	-0.722	-0.001	-0.210	0.810	-0.166		
p values									
	C	COVID-19	GOLD	GT	OIL	S&P 500	VIX		
0.05	0.000	0.802	0.247	0.000	0.026	0.000	0.044	Bitcoin	
0.25	0.745	0.763	0.641	0.568	0.034	0.000	0.851		
0.5	0.495	0.392	0.963	0.536	0.002	0.000	0.507		
0.75	0.354	0.854	0.840	0.091	0.354	0.075	0.730		

Table 4. Cont.

0.95	0.316	0.065	0.595	0.076	0.293	0.375	0.966	
0.05	0.013	0.007	0.016	0.300	0.057	0.679	0.061	Ethereum
0.25	0.655	0.970	0.932	0.120	0.021	0.003	0.749	
0.5	0.947	0.775	0.726	0.818	0.054	0.051	0.439	
0.75	0.502	0.101	0.707	0.125	0.254	0.003	0.298	
0.95	0.088	0.842	0.340	0.077	0.622	0.489	0.085	
0.05	0.761	0.111	0.026	0.319	0.058	0.626	0.254	XRP
0.25	0.972	0.499	0.207	0.733	0.038	0.004	0.461	
0.5	0.071	0.502	0.509	0.047	0.044	0.006	0.893	
0.75	0.828	0.651	0.568	0.198	0.106	0.001	0.202	
0.95	0.323	0.703	0.866	0.339	0.903	0.128	0.458	
0.05	0.008	0.763	0.005	0.000	0.014	0.016	0.540	Tether
0.25	0.635	0.826	0.466	0.517	0.463	0.844	0.647	
0.5	0.979	0.881	0.718	0.965	0.544	0.846	0.922	
0.75	0.563	0.226	0.763	0.411	0.428	0.658	0.990	
0.95	0.888	0.001	0.113	0.157	0.362	0.934	0.154	
0.05	0.000	0.003	0.283	0.052	0.019	0.944	0.114	Bitcoin Cash
0.25	0.523	0.399	0.494	0.562	0.003	0.009	0.490	
0.5	0.347	0.818	0.295	0.531	0.019	0.003	0.748	
0.75	0.003	0.153	0.841	0.430	0.149	0.006	0.864	
0.95	0.000	0.002	0.385	0.074	0.116	0.068	0.043	

Next, we plotted the quantile coefficient variations for all variables for each cryptocurrency, as shown in Figure 3.

Figure 3 shows that Google trend searches have minimal loading among all factors, followed by the global COVID-19 index changes. For the Bitcoin, Ethereum, and XRP cryptocurrencies, Google trend searches were negatively related to the average returns at the lower quartiles, whereas it became more positive at the higher quartile. Only Bitcoin Cash shows a negative coefficient for Google trend searches at the highest quartile (0.95) and it is statistically significant at the 10% level. Interestingly, in the case of Tether, Google Trends search coefficients are statistically insignificant for all quartiles. The COVID-19 coefficient is statistically significant (10%) at the lower tail for Ethereum and at the higher tail in the case of Bitcoin. In the case of Bitcoin Cash, the COVID-19 coefficient is statistically significant (5%) at both tails. Gold coefficients vary both in magnitude and direction significantly across the quartiles for all five cryptocurrencies. Oil coefficients are negative in all quartiles for Tether, with the negative value only in the highest (95th) quartile for all other cryptocurrencies. S&P 500 coefficients are positive and statistically significant in most of the cases. In the cases of Ethereum and XRP, the S&P 500 coefficients are statistically insignificant at the two extreme ends of the tail. Conversely, in the case of Bitcoin and Tether, the S&P 500 coefficients are statistically insignificant at the higher end of the tail. In the case of Bitcoin Cash, S&P 500 coefficients are statistically significant at the higher quartile, except for the extreme lower end of the tail (5th quartile). VIX coefficients are statistically insignificant in all quartiles for two cryptocurrencies, namely XRP and Tether. The VIX coefficient is statistically significant at the 5% level at the extreme lower end (5th quartile) of Bitcoin and the highest (95th quartile) end of Bitcoin Cash, whereas, in the case of Ethereum, the VIX coefficient is statistically significant at the 5% level at both the extreme ends (5th and 95th quartiles).

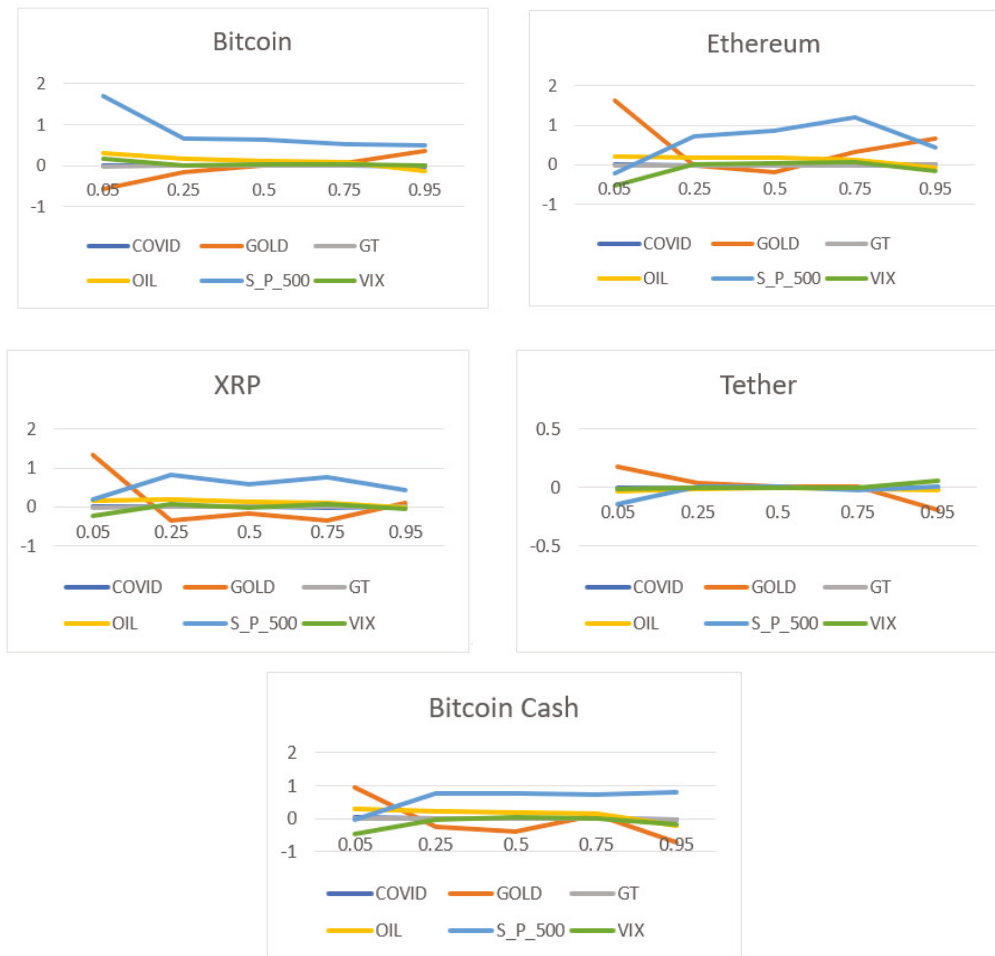


Figure 3. Quantile coefficient variations.

The quantile regression appears to be a confirmation of the key findings of the previous OLS estimates, with some improvements. It is evident by looking at the influence of S&P 500 on the crypto market that the situation only slightly differs across the quartiles. For example, at the lower quartile, this influence is highly strong on Bitcoin and it remains strong at the higher quartile. It is evident that Google trends and the COVID-19 crisis (represented by the global COVID-19 index) have minimal loading effects on the crypto market, with slight changes in the magnitude and direction of coefficients across the quantile. Oil coefficients are negative in all quartiles for Tether, whereas oil coefficients are negative only in the highest (95th) quartile for all other cryptocurrencies. It is clearly confirmed, once again, that Tether's behavior is very specific in the crypto market, as it shows some characteristics of a safe haven within a market. Additionally, our findings differ from those of [7]. We cannot find any safe haven characteristics (only Tether is near) in comparison to their work and findings of diversification benefits and digital assets (social media) acting as safe havens.

Additionally, the present study deployed robust regression with M-estimations. The M-estimation addresses dependent variable outliers, where the value of the dependent variable differs markedly from the regression model norm (large residuals). The obtained

estimates of the robust regression are presented in Table 5. The obtained robust regression estimates confirm the robustness of the OLS estimates except for the Tether. The effect on the coefficient estimates of moving from least squares to robust M-estimation (see Tables 3 and 5) does not produce many distinct coefficient values (that are statistically significant at the 5% level) than the OLS estimates, except for Tether.

Table 5. Robust regression estimates.

	C	COVID-19	GOLD	GT	OIL	S&P 500	VIX	R ²
Bitcoin	0.059	−0.002	−0.055	−0.016	0.142 *	0.656 *	0.045	0.229
Ethereum	0.016	−0.001	0.160	−0.003	0.231 *	0.869 *	0.049	0.138
XRP	−0.117	0.002	−0.175	0.033	0.148 *	0.730 *	0.027	0.225
Tether	0.000	0.000	0.007	0.000	0.001	0.018 *	0.002	0.031
Bitcoin Cash	−0.091	−0.001	−0.521	0.024	0.216 *	1.097 *	0.060	0.194

* Note: Google trend for Bitcoin.

5. Conclusions

Risk and returns are inseparable from each other in the financial markets [66–69]. In terms of the impact of the first wave, gold and oil, as typical global commodities, could have been diversifiers, with some characteristics of gold as a hedging instrument against risky assets represented by S&P 500. The OLS, quantile, and robust regressions estimates show that there was no significant direct influence of the COVID-19 crisis on the crypto market. However, it seems there were spillovers from risky assets on the crypto market. Looking at S&P 500 as the typical representative of risky assets on the global market and its influence on the crypto market, there was a strong direct influence on all the cryptocurrencies except Tether. In this way, it is largely clear that the crypto market cannot be either a safe haven or hedge in this ongoing COVID-19 crisis. On the other hand, all analyses that have been used (OLS, quantile regression, and robust regression estimates) have confirmed the very specific behavior of Tether. The wavelet coherence analysis shows that only in crypto pairs (which include Tether), there is a low level of coherence, with no contagion effect. It appears that Tether is the only important stable coin in the crypto market and because of this characteristic, it can present a safe haven within a crypto market. Its role in the crypto market seems to be very similar to the role of gold as a typical global commodity on the global market.

Even though the results of our study differ from those of [7], in that only Tether has near safe haven characteristics (while the other cryptocurrencies cannot be recognized), such studies have academic importance in analyzing assets in terms of major crises, and providing methodological, theoretical, and applicative experience in investment finance issues. Moreover, policymakers and investors cannot accept cryptocurrencies (especially Bitcoin) as safe havens, but only as highly volatile and speculative assets (which is in line with the work of [10,16,44]). Finally, the study does not come to an ultimate consensus on whether the ongoing COVID-19 crisis is a “Black Swan” event [1–3,14] or not. Since it is too early to comment on it, it is left for future studies to further examine the issue.

Author Contributions: Conceptualization, D.V., M.M. and Z.G.; formal analysis, D.V., M.M. and Z.G.; investigation, D.V., M.M. and Z.G.; writing—original draft preparation, D.V., M.M. and Z.G.; writing—review and editing, D.V., M.M., Z.G., E.M.G. and M.F.; funding acquisition, D.V., M.M., Z.G., E.M.G. and M.F. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the RUDN University Strategic Academic Leadership Program.

Data Availability Statement: Publicly available datasets were analyzed in this study. This data can be found as mentioned in Section 3.1 of the study.

Conflicts of Interest: The authors declare no conflict of interest.

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Article

Understanding the Survival Ability of Franchise Industries during the COVID-19 Crisis in Malaysia

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Abstract: Since the world was hit by the COVID-19 pandemic crisis that began in December 2019, many industries have been affected, including the franchise industry in Malaysia. Thus, the COVID-19 pandemic has had a great impact on business survival. Direct effects can be seen in reduced income, job losses, changes in customer preferences, and business relationships between franchisors and franchisees. Some franchisees have had to close their operations, and others still struggled to survive during the pandemic crisis. In addressing this situation, the role of government is crucial in supporting the resilience of these franchisor entrepreneurs in an increasingly worrisome situation around the world. However, the existing literature that focuses on the role of government in developing countries such as Malaysia is still poorly understood. In addition, a study of the Malaysian franchising industry during the pandemic crisis is still inadequate, especially concerning the government's role in the survival of local franchises during the pandemic era. Therefore, understanding the role of the government in advocating the survival of local Malaysian franchises is worth studying. A qualitative research approach was applied through multiple cases involving twelve (12) franchise business owners and four (4) franchise-related agencies in Malaysia. In-depth interviews were conducted in exploring this topic. Thematic analysis has been used by applying "Atlas.ti" in analysing the data. Hence, the findings have indicated four themes from the grounded data. There are: (i) financial assistance; (ii) virtual franchise exhibition; (iii) training and support; and (iv) business development grants. This study is expected to highlight the role of government as well as agencies involved with the franchising industry in improving policies, strategies, and programs to ensure the viability of the franchise industry during periods of pandemic outbreaks.

Keywords: COVID-19; financial crisis; franchise industries; survival ability

Citation: Abd Aziz, N.A.; Hizam-Hanafiah, M.; Hasbollah, H.R.; Aziz, Z.A.; Hussin, N.S.N. Understanding the Survival Ability of Franchise Industries during the COVID-19 Crisis in Malaysia. *Sustainability* **2022**, *14*, 3212. <https://doi.org/10.3390/su14063212>

Academic Editors: Darko Vukovic, Moinak Maiti and Michael Frömmel

Received: 18 February 2022

Accepted: 6 March 2022

Published: 9 March 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



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1. Introduction

The COVID-19 virus has shaken the world for the past two years. The pandemic broke out in China in December 2019 and spread across the world since March 2020. As of 8 February 2022, 225 countries were affected, 398,093,224 people had been infected, with 5,768,797 deaths, and 317,637,345 patients recovered [1]. In addition to the serious implications for people's health around the world, this pandemic has had a huge impact on businesses and the economy. According to Alves et al. [2], small businesses are generally vulnerable to the crisis, yet there is still much that is not known about how their businesses survived throughout the pandemic crisis of COVID-19. Furthermore, the ongoing pandemic led to the bankruptcy of many well-known brands in many industries as economic transactions between countries were put on hold. According to the information shown in Figure 1 released by the Malaysian Insolvency Department (MDI) in December 2020,

overall Malaysian bankruptcy data was reported at 711,000 units in December, up from 419,000 units in November. The information is classified as part of the Malaysian Global Database (Impact COVID-19) [3].

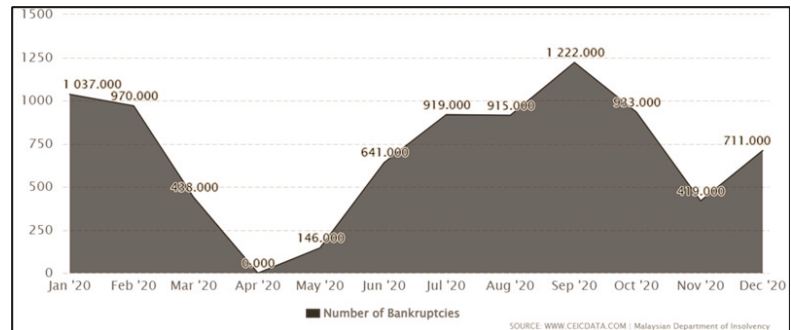


Figure 1. Number of Bankruptcies. Source: Malaysian Department of Insolvency.

There were no more customers, as all residents were instructed to remain at home during the lockdown [4]. The pandemic has harmed most countries' economies, but perhaps has been even more critical to emerging economies. Although Malaysia's economy appears to be heterogeneous, it has some general characteristics as well, such as weak institutions and legal provisions, lower economic development levels, and higher levels of financial and social risk [5,6].

For the franchising industry, the COVID-19 outbreak also dealt a huge blow to the survivability of franchise businesses. As a commercial and social model, franchising has a variety of economic and social benefits, including employment creation, economic development, and the growth of entrepreneurship [7,8]. Additionally, the immediate effects on income, employment, and social goals are most visible in growing and developing markets [7,9,10]. Furthermore, Bretas and Alon [11] claimed that the COVID-19 pandemic had an effect on political as well as societal ramifications throughout the world. The franchising industry, which is mostly comprised of retail and service enterprises, is an example of one that has been severely affected. The experiences of franchising stakeholders show the franchising model's capabilities in such scenarios.

According to the International Franchise Association [12], roughly 32,700 franchised businesses in Malaysia have shut down in the first six months following the COVID-19 outbreak as of August 2020. A total of 21,834 enterprises were partially shuttered, with 10,875 remaining closed permanently. In every twenty (20) small firms there will be one (1) firm that permanently closes down for the following six (6) months. Hence, it is predicted that without major government advocacy, another 36,000 franchised units will not be able to survive. While most franchise businesses are related to services and retail, they cover a wide spectrum of business activities and are affected to different degrees by the crisis [6,13]. As suggested by Fabeil, Pzim, and Langgta [14], further analysis is needed with other respondents in future studies to fully understand the survival mechanisms adopted by businesses in response to the pandemic crisis. Furthermore, a better understanding of how pandemics affect entrepreneurship and entrepreneurs ability to cope with various pressures is needed. Due to the increasing emphasis on the knowledge economy, the role of government institutions is important, and this needs to be explored further. Future studies could develop a more inclusive support model to demonstrate the role of government in supporting schemes geared toward business survival [15,16]. Meanwhile, Boiral, Brotherton, Rivaud Leo, and Guillaumie [17] emphasized the uncertainty about the pandemic, and its implications and the likelihood that it will ensue. Hence, it is important for organizations to plan measures that can be adopted in the event of another pandemic outbreak in the future. Therefore, the role of organizations needs to be explored more widely in helping businesses

to survive. Thus, an understanding of the role, factors, and effects of pandemic on the survival of Malaysian home-grown franchises are vital to research. Therefore, this research is guided by a broad research question: “How do franchise-related agencies play their roles in the survival of the Malaysian home-grown franchises during a pandemic crisis?”

2. Literature Review

2.1. *The Development of Franchising in Malaysia*

According to George [18], franchising is the fastest method to grow and expand a business, whereby this is the easiest way to do a business. In addition, franchising means growing and expanding one’s own businesses by letting other people invest and hence, it is the best method to cut short the learning curve. In Malaysia, franchising began in the early 1940s with Bata and Singer, and then was followed by automobiles and petrol station dealers. Nevertheless, the development of franchising proceeded faster when fast food service restaurants such as A&W (since 1963), Kentucky Fried Chicken (since 1970), and McDonalds (since 1981) opened their business operations rapidly in Malaysia. The development of Malaysian franchises began in the early 1980s with a focus on the food and beverage sectors (e.g., Sate Ria, Marrybrown), petrol stations (e.g., Petronas), the automotive sector (e.g., EON) and craft companies (e.g., Royal Selangor). To support the development of Malaysian franchises, the government appointed Majlis Amanah Rakyat (MARA) to facilitate the activities and tasks related to these efforts [19].

Furthermore, in supporting the development of Malaysian franchising, the Franchise and Vendor Division was authorized on 8 May 1999 under the Ministry of Entrepreneur Development (MED), previously known as the Ministry of Public Enterprises. In addition, under this division, there was a Franchise Unit and a Vendor Unit. Moreover, the Franchise Unit had managed the Franchise Development Programme, which was transferred from the Implementation Coordination Unit of the Prime Minister’s Department, while the Vendor Unit managed the Vendor Development Programme under the Ministry of International Trade and Industry [20].

According to the records of the Franchise Development Division [20], these two programmes were then transferred to establish the Ministry of Entrepreneur and Cooperative Development in order to meet governmental policy requirements and to accelerate the accomplishment of goals in creating Bumiputera Commercial and the industrial community. Later, when the Ministry of Entrepreneurism and Cooperative Development was dissolved in 2008, the Franchise Development Division’s role was transferred to the Ministry of Domestic Trade, Co-operatives, and Consumerism (MDTCC), which is now known as the Ministry of Domestic Trade and Consumer Affairs (MDTCA).

2.2. *Institutional Theory*

This study adopted institutional theory in order to get a fundamental understanding of the research question. In this theory, Di Maggio and Powell [21] highlighted the role and function of government agencies and trade associations, both of which are vital to industry definition, and the emergence of networks, mutually formal and informal, which support policies regarding the industry. Barthélemy [22] explained that institutional theory highlighted the differences in the usages of franchises where to some extent, while institutional judgment also simplifies the relationship between agency considerations and franchise decisions. Clearly, through educational programmes, franchisors offered systematic education for prospective master franchisees and potential franchisees. In addition, through financial assistance for franchises from financial institutions, it enabled the easy entry of potential franchisees. Without doubt, it explained the importance of the government’s function in helping franchising businesses that expands into the international market [23,24].

2.3. *Survival of Franchise Business*

As the franchise has grown to become a well-known and prominent business platform throughout the world, it has piqued the interest of scholars and policymakers. The

decision of entrepreneurs to engage in franchise businesses improves their chances of survival in a saturated market [25–28]. The primary goal of entrepreneurship is to generate jobs and improve the economy [29]. According to Michael and Combs [30], it is vital to have a better understanding of the factors influencing franchise survivability in order to encourage satisfaction in franchise relationships. Furthermore, Kosonova and Francine Lafontaine [31] asserted that the contract term of a chain may impact the growth and survival of franchise chain, and that certain attributes may be influenced by other variables. Bordonaba-Juste, Lucia-Palacios, and Yolanda Polo-Redondo [32] also highlighted that these additional variables may affect franchise survival by relying on the features of the franchisee's experience.

In general, the COVID-19 pandemic has a direct influence on the economy, particularly the franchise industry's sustainability. The franchising business will not be the same after the pandemic, even if the business reopens. While the immediate repercussions might have passed, the long-term economic consequences will continue to fluctuate for years [11,13,33,34]. Some franchising brands may go out of business, while others may be severely impacted and might have to shut several of its franchisees. On the other hand, despite the COVID-19 pandemic that continues to spread over the world, numerous brands are prospering. In the context of this pandemic, for franchisors and franchisees need to work together, in addition to receiving support from certain parties to continue to survive [34].

Meanwhile, Bretas and Alon [11] highlighted that franchising businesses in Brazil proved the franchise model's strength in a COVID-19 pandemic situation. This is based on significant data from webinars with businesses in the food services, education, retail, and business-to-business service sectors in Brazil, as well as reports from commercial and franchise entities. Scholars have explained how the COVID-19 pandemic has impacted the franchising industry. They explain the processes performed, the talks between the supplier and the landlord, the business model modification, the influence on franchisor-franchisee relationships, and long-term survival [11,35].

Moreover, the COVID-19 pandemic has affected the business climate and commercial management practices around the world because it is unpredictable [36]. The pandemic issue directly resulted in the closure of the hotel and tourism sectors. This has resulted in a company failure rate that has increased exponentially. The franchise hospitality business now has a huge influence and challenges with the basic concepts of knowledge management implementation in facing the COVID-19 pandemic to survive. Strategic knowledge management implementation strategies may not only lead the particular franchise, but also transform an organisation's performance and competitiveness for long-term sustainability [36].

3. Research Methodology

3.1. Study Design

In identifying cases and specific types of case studies to be implemented in a study, researchers should consider whether to conduct a single or multiple case studies in order to gain an in-depth understanding of the phenomena that will be studied. Additionally, context is also another matter to be considered [37–40]. Furthermore, Baxter and Jack (2008) described that researchers study various cases to understand the differences and similarities between cases. When making comparisons between cases, researchers can also provide literature of important influences from the differences and similarities for these cases [41]. Vannoni [41] argued that the evidence made from various case studies needs to be and reliable. Moreover, by studying various case studies, researchers can build a more convincing theory when the proposal is based on empirical evidence.

Obviously, many cases provide the opportunity to explore research questions and the evolution of a broader theory, as claimed by Eisenhardt [42]. For collective or multiple case studies, data collected should be sufficient and flexible to enable each case to be described in detail. This needs to be done by the researcher before considering the similarities and differences that arise in cross-case comparisons. It is vital that data sources from

different cases, as much as possible, are comparable, even though they may differ in some ways [43]. The present study adapted a multiple case study approach, as these create a more convincing theory when the suggestions are more deeply grounded in empirical evidence. As mentioned before, this study's main aim is to identify how the government plays a role in the survival of a Malaysian home-grown franchise during a pandemic. Therefore, the use of qualitative methodology is appropriate for the researcher in to achieving the objectives.

3.2. Setting and Participants

Fundamentally, the sampling frame in a qualitative study is a combination of convenience and purposive and theoretical sampling. According to Dornyei [44], convenience sampling is a category of nonprobability sampling where the target population meets a certain criteria, namely: it is easy to access, available at a given time, or a person is willing to participate in the study. Purposive sampling is a technique used in qualitative research to identify and select information-rich cases for the most effective use of limited resources [45]. In line with this, multiple cases consisting of thirteen (13) franchising companies and three (3) government agencies related to franchise development in Malaysia were selected for the study. The researcher interviewed the prominent top management of these franchising companies and agencies as individuals who could provide the required information such as the role of government, incentives and support given to franchise entrepreneurs during a pandemic crisis.

Individuals, groups, or organisations would be the unit of analysis for this research. The unit of analysis is determined at the preliminary phase in the study since the conceptual framework, data collecting procedures, and sample size are all dependent on it [46–48]. In this research, the franchisors and top management from the franchise development-related agencies are the key informants as well as decision makers, and are also actively engaging in the franchise industry. Charmaz [49] highlighted that a very small sample could still produce an important study, and the factors influencing this study could include a quality interview and an in-depth analysis. The following factors could also affect the sample size: (i) the researchers' experience and expertise in interviews and subject areas are important components in reducing sample size and in achieving saturation [50,51]; and (ii) the appropriate selection of participants [52,53]. Boddy [54] argued that qualitative research is often associated with the development of a deeper understanding rather than a broad one, especially when conducted under a non-positivist paradigm, as it involves in-depth psychology or a constructivist approach to the research.

Meanwhile, the sample size is sufficient with the strength of information, depending on the purpose of the study, the specificity of the sample, the sustainable use of theory, the quality of dialogue, and the analysis of strategies [55]. Furthermore, Vasileiou, Barnett, Thorpe and Young [56] have claimed that the provision of sample size in qualitative research is limited and does not depend on the number of interviews. Defensive sample sizes are most often supported by references to saturation principles and pragmatic considerations [57,58]. The data of saturation can be accomplished with at least six (6) interviews and small samples, depending on the size of the population sample in the qualitative study [59–61]. For this study, the saturation data was achieved in the 12th interview with franchising business owners and then supported by four (4) interviews with agencies related to franchise development in Malaysia.

This study also used triangulation techniques, where the interviews are made from two sources, namely from franchise companies and agencies related to franchise development, as well as data from printed sources such as annual reports and franchise acts. In qualitative research, triangulation refers to the use of various methodologies or data sources to build a thorough knowledge of phenomena. Triangulation is seen as a qualitative research approach for testing the validity by bringing together data from disparate sources [62,63]. Moreover, triangulation can enhance research by providing a range of datasets in explaining the various elements of an interest topic [64,65].

3.3. Data Collection

For the present study, the primary data collection method is the interview. According to Cassell [66], even though the interview technique can vary widely based on its applicability and structure, this method is widely used in organisational research. Data for this study were gathered through sixteen (16) in-depth interview sessions (details in the supplemental materials). All in-depth interviews were done individually with franchising business owners and franchise development organisations in Malaysia. These interviews took place between September 2020 and October of 2021. A group of researchers guided by the research protocols had performed each in-depth interview session. With the respondents' agreement, audio was captured for later research purposes. In-depth interviewing is a qualitative research approach that entails conducting intense individual interviews with a limited number of respondents in investigating their viewpoints on a certain topic, programme, or issue [67,68]. The goal of these interviews are to learn about how people see, comprehend, and make sense of their lives, as well as how they assign meaning to certain experiences, events, and issues [69].

The lead researcher guided the interview discussion with the respondents for the data collecting method, while other member assistants recorded interviews and jotted down field memoranda, providing information for subsequent research. Each session began with a broad question designed to elicit debate between the researcher and the respondent. "What are the roles of franchise-related agencies in assisting the survival of the franchise business during the pandemic period?" is an example of such a question. The main researcher complimented the respondents and provided tokens to them re for their involvement at the end of the interview session, and conclusions were reported based on the interview findings. As a result, protocol talks were held with franchising business owners and franchise-related agencies for this study, and each interview and discussion lasted from 50 to 60 min.

3.4. Data Analysis

For the present study, thematic analysis was adopted to analyse the data gathered. Thematic analysis is defined as a method that allows researchers to identify and organise relevant themes and subthemes that can later be used as units of analysis [70,71]. Next, the researchers reread the datasets is to familiarize themselves with the data, and then they explore the meanings associated with the concepts that emerged from the statements of participants in the study [72]. Thematic analysis is one of the types of methods in qualitative data analysis for research methods that have taken place in various fields [73]. According to Labra, Castro, Wright, and Chamblas [74], thematic analysis offers flexibility, but a rigorous approach to subjective experience as a method of promoting social justice and combating inequality is ideal for research in social work.

The thematic analysis done in this study involves six phases [74]. The first step begins with the task of transcribing the audio recordings of the individual or group interviews conducted in a study. The next step involves the researcher continuing the initial reading of the transcript to search for the most significant parts of the participant's testimony of the phenomenon being studied. At the level of analysis available, the researcher will use the information identified as relevant in the first step to generate the initial code. Initially, researchers began to collect data elements according to perceived equations or patterns and this was labeled as the initial code [74]. Next, the theme or category is derived from data elements or sequences of words that can serve as synoptic and precise representations of the comments of the participants interviewed with regard to a phenomenon being studied. As such, the theme consists of coded data grouped together according to equations or patterns [48,75].

In the fourth step, a comprehensive description of the phenomena studied requires a systematic review theme to be identified in the third step. However, for discussion purposes, the fourth step is identified as different, and after the third phase, in practice the researchers are already familiar with thematic analysis and will regularly perform

the analysis of two phases simultaneously. The fifth step consists of two main stages. At the first level, themes and subthemes undergo a review. The thematic matrix must be re-analyzed thoroughly to assess the validity of the hierarchical relationship and confirm whether the terms given at both levels are accurate with the meaning indicated by the code. It is important to check that a name is given to the themes consistently, so that there is no ambiguity about their accuracy. The second stage is interpretive and consists of the definition of concepts and subthemes to be applied to a deep analysis in the sixth step. In the sixth step, presentations and discussions that differ from each other are presented [74].

The data analysis was carried out in accordance with these six theme phases. The researchers assessed the data by closely reviewing the transcripts of the interviews word by word. The researchers then re-read the transcript, extracting all themes, and grouped them into main groups with smaller subthemes based on the equation. Finally, each theme was evaluated and interpreted considering the study's setting. Themes and subthemes were chosen with the confirmation of all researchers, validated by the relevant literature, and then presented to respondents for data validation.

4. Finding

The research population included 12 (twelve) franchising business owners from three business categories, as well as four (4) franchise-related agencies in Malaysia. Table 1 provides a summary of the sociodemographic characteristics of the participants in this study.

Table 1. Sociodemographics of Participants.

Participant Code	Category	Role	Participation
P1	Education and learning centre	Franchisor	In-depth interview
P2	Education and learning centre	Franchisor	In-depth interview
P3	Education and learning centre	Franchisor	In-depth interview
P4	Food and beverages	Franchisor	In-depth interview
P5	Food and beverages	Franchisor	In-depth interview
P6	Food and beverages	Franchisor	In-depth interview
P7	Food and beverages	Franchisor	In-depth interview
P8	Food and beverages	Franchisor	In-depth interview
P9	Food and beverages	Franchisor	In-depth interview
P10	Food and beverages	Franchisor	In-depth interview
P11	Self-service Laundry	Franchisor	In-depth interview
P12	Self-service Laundry	Franchisor	In-depth interview
P13	Franchise-related agency	Top Management	In-depth interview
P14	Franchise-related agency	Top Management	In-depth interview
P15	Franchise-related agency	Top Management	In-depth interview
P16	Franchise-related agency	Top Management	In-depth interview

Based on the results of the interviews, the findings show that there are four themes that emerged from the grounded data to meet the objectives of this study. Table 2 shows the distribution of themes.

4.1. Theme 1: Financial Assistance

The beginning of the discussion session was based on the participants' experience with the types of responsibilities that agencies associated to the franchising industry play in order to support the majority of the franchising firms affected by the pandemic attack since the end of 2019. According to the participants, various incentives and stimulus

packages have been implemented by the government to ensure that entrepreneurs affected during the COVID-19 pandemic can survive and continue their businesses. In addition, the franchise-related agencies are committed and concerned to ensuring the viability of business in the country by providing comprehensive business support assistance in meeting the challenges posed by measures to curb the spread of COVID-19. This is aligned with these quotes:

“Franchise-related agencies are very important in helping franchise entrepreneurs by providing various financial incentives . . . these agencies offer financial loans to support our business capital, as well as financial assistance to stay survive in the competitive industry.”—P12

“We agree that many good roles and efforts have been shown by franchise related agencies in Malaysia . . . we are very grateful for their efforts including providing financial assistance . . . to maintain in this franchise industry is not easy and financial support that given like a loan . . . this really motivates us.”—P6

Table 2. Distribution of Themes.

Themes	List of Participants															
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16
Financial Assistance						/						/		/	/	
Virtual Franchise Exhibition	/								/	/				/	/	/
Training and Support		/		/			/	/					/			/
Business Development Grant			/		/						/		/		/	

/: This symbol (/) indicates we marked as “tick” and has no other meaning.

Furthermore, the business assistance provided also includes assistance to all entrepreneurs including the franchise industry in managing their cash flow. Among the initiatives introduced were loan moratoriums, salary subsidies and employment incentives designed to maintain the capacity of employees and companies, loan assistance grants and financing guarantees. Importantly, the assistance provided by the government in aid packages and economic stimulus can provide relief to the cash flow pressures faced by traders.

“As a related agency, the development and growth of the franchise industry is also part of our organizational goals . . . during this pandemic season, many businesses are affected and financially unstable . . . what we can offer is financial assistance such as loans . . . this moratorium . . . is to reduce the burden and promote their survival.”—P14

“For us, business survival for franchise businesses is very important when tested by a pandemic . . . many are affected and affected . . . what we offer is intensive financial assistance to encourage them to stabilize the business while reducing the financial burden borne . . . they can apply for a franchise financing scheme . . . ”—P15

4.2. Theme 2: Virtual Franchise Exhibition

The Franchise International Malaysia (FIM) exhibition, which has been held in Malaysia every year since 1994, is a worthwhile effort. It has offered several advantages to the franchising firms because most Malaysian franchisors attended this international show to exhibit their products and services while also hunting for possible business partners. Aside from that, the participants reported that most of them attended international franchise

exhibitions in other countries as a worldwide business platform to develop networking with bigger groups of possible investors or partners that have little or no understanding about the franchise brands. For instance:

“When the movement control order is implemented, our physical movement is limited . . . cannot congregate . . . so we greatly appreciate the efforts of these government agencies in organizing virtual franchise exhibitions . . . even virtually, we can use this platform to look for potential franchisees and new investors.”—P1

“This virtual franchise exhibition is very helpful in connecting us with other countries even virtually . . . on this platform, we can spread information about our brand, find potential franchisees and establish relationships and business networking without borders . . . ”—P10

“Participation in this virtual franchise exhibition means a lot to us . . . although we can’t physically interact, but this platform gives us the best results in finding potential franchisees and investors . . . ”—P9

Based on the participants, organizing a virtual exhibition can save a lot of money on travel, accommodation, promotional items, and other costly expenses typically incurred by franchise businesses. Due to the constraints of the COVID-19 pandemic, various bans, controls, and directives that had been issued by the government resulted in limitations to physical movement and travel. Thus, the organization of virtual exhibitions contributes to cost reduction. This also allows more franchising business owners to participate in the virtual franchise fair, which increases their chances of furthering their business expansion opportunities and finding potential investors. This is in line with this quote:

“We started organizing this virtual franchise exhibition in 2020 . . . this is one of our initiatives to support the involvement of various franchise brands either locally or internationally . . . this virtual exhibition is cost effective, we are compliant . . . in addition we provide a platform for franchise entrepreneurs even in the constraints of the COVID-19 pandemic.”—P16

“The organization of this virtual franchise exhibition benefits the Malaysian franchise industry . . . although there are physical movement constraints, this platform is seen to be cost -effective and effective . . . franchisors and prospective franchisees who participate in this platform do not have to spend a lot of cost . . . they can only communicate online . . . ”—P14

“Our agency is also involved in this virtual Malaysian international franchise exhibition . . . for us, this is a good effort in helping to boost the franchise industry even in a pandemic situation . . . we ourselves offer consulting services if there is a franchisor or this prospective franchisee knows more about the industry.”—P15

4.3. Theme 3: Training and Support

Based on the discussions with the respondents, all of them agreed that most franchising entrepreneurs were highly affected by the COVID-19 pandemic. Due to the outbreak, the government had to implement strict movement control orders and almost all non-essential business sectors were ordered to close. Alternatively, some franchisees, especially in the service sector, such as education and learning centres, have had to switch to online mode. However, it is not as easy as one might think due to their preparation. Thus, among the efforts of franchise-related agencies to support these franchise operators is by organising online training and providing ongoing support.

“During the movement control order, our physical movement is limited . . . if we want to attend or organize training, there are constraints . . . so we really hope if there is a virtual program or training . . . or maybe a forum or webinar organized by the- certain parties can help us to be more motivated and continue our business during this pandemic period . . . ”—P2

“COVID-19 came suddenly and caused most sectors to close . . . we were also impressed . . . alternatively, we had to use an online platform . . . through ongoing training and support from relevant agencies, we got a lot of information on how to run the business online.”—P8

As franchising businesses have been severely affected by the COVID-19 pandemic, the role of relevant agencies in focusing on entrepreneurial development and strategies in business survival were very vital. Therefore, the training process has been highlighted as a way for franchisees to plan how to best conduct their business operations under the constraints of movement order control and limited permitted business operating hours. Additionally, a good training program organised by these franchise-related agencies is seen from a positive angle where it will help develop the franchise businesses affected during this pandemic so that the franchise runs better, and the business owners improve their capabilities and identify the next training steps needed. Most franchise-related agencies agree that this training program is particularly important for franchisees who want to improve their outlet management skills and knowledge during this prolonged pandemic season. Here are the related quotes:

“For now, and since the pandemic crisis, we offer a lot of training, webinar sessions and support online . . . it can be said that quite often we organize webinar sharing sessions . . . we invite industry experts to share how to run a business and what strategy to deal with this situation.”—P13

“On our part, we do our best to help and provide continuous support to the Malaysian franchise sector . . . through cooperation with various other franchise-related agencies, we strive to conduct virtual training . . . with this we can provide input to these franchise entrepreneurs.”—P16

Moreover, part of the ongoing training and supports provided by franchise-related agencies to these franchise businesses is operational management training. Essentially, management training in a franchise business describes the formal and ongoing efforts undertaken by franchise-related agencies to train franchise operators in improving their business performance during pandemic situations through various business methods and programs. In managing a franchise business during this pandemic, entrepreneurs need to have highly specialised management skills for long-term professional development. This is aligned with this quote:

“When we are suddenly hit by this pandemic situation, we only realize that there are things that we have enough skills to handle the operation . . . therefore, training and ongoing support is important . . . for us, it is important to follow any form of training, in order to improve our skills and knowledge.”—P4

“For us, the ongoing support provided by the franchise-related agencies is important . . . through involvement in training, we gain new knowledge, create business networking and subsequently gain new skills that may add value to us.”—P7

4.4. Theme 4: Business Development Grant

The last theme discovered from the grounded data based in this study involves the business grant. According to the participants, a business grant is money given to a franchise business from a franchise-related agency. It is certainly an attractive financial consideration for those with little cash available for start-ups, growth, or expansion. There are grants available for all types of franchise business owners, whether franchisors, franchisees, or the master franchise. Typically, grants are available when a government agency or non-profit agency chooses to help a franchise business start or continue its business. A grant may be provided to encourage minority entrepreneurship in the community. Another can be provided to fund research and development in a particular industry, to reward innovation,

or to promote a franchise business. This is one of the government's initiatives in helping franchise entrepreneurs affected by the pandemic.

"We are offering several incentives including a grant scheme . . . these grants support business continuity among franchise businesses."—P15

"Offering grants to any franchise business is actually an advantage to them . . . this is because they can use the funds provided to develop and ensure their survival ability especially in this pandemic situation . . ."—P13

The participants have explained that financing business operating costs during a pandemic is difficult, and in fact is impossible for most franchisees, as the majority will face issues such as the lack of customers, limited business hours and even strict standard operating constraints imposed by the government. Business grants are seen as one of the initiatives of franchise-related agencies that offer the opportunity to raise seed capital without the financial stress of loans having to be repaid. The business grants offered a variety of advantages to franchising businesses, but these vary depending on the scheme. This financing grant is very helpful especially when the world is hit by a pandemic and they serve to help increase the survivability of the franchise business (e.g., micro and affordable franchise development programmes). In addition, business owners will gain confidence when they know that their ventures have been publicly endorsed by the scheme operator and use the funds to continue business operations, promotion, and business continuity.

"For us, these franchise-related agencies are very helpful to us . . . not only provide financial incentives, but there are also agencies that offer business development grants . . . this is quite helpful and motivates us to continue and grow our business."—P3

"Funding through this business development grant is very good . . . for any franchise entrepreneur who is just starting out, this is a great opportunity to increase survival ability in a competitive market."—P7

"Business development grants are a good effort . . . credit should be given to these agencies who work hard to help the development of Malaysia's franchise industry."—P11

5. Discussion

The aim of this study is to explore and understand the role of institutions and agencies related to franchise development in helping franchising businesses affected by the COVID-19 pandemic. This study was based on the experiences of the institutions and franchisees that were involved in the main challenges for most businesses, including the survival ability of the franchise sector.

According to the respondents, the most important challenge for business survival during the pandemic outbreak is to maintain cash flow. As such, most participants agreed that franchise-related agencies are very helpful in providing financial assistance such as loans and moratoriums. This finding is supported by a previous study by Ismail and Othman [76] on 118 respondents from small and medium enterprises (SMEs) that were surveyed using a structured questionnaire as an instrument. Findings from this study showed that government support programs had a positive effect on business growth among SMEs in Melaka. This research provides insights into SME support agencies in increasing the effectiveness of relevant government support programmes such as financial assistance. Another study by Rungani and Potgieter [77] highlighted that SMEs success is positively and significantly connected with financial support from either the public or private sectors. While financial assistance is critical, it must be reorganised to include practical features.

Furthermore, the private and public sectors should work together to establish an environment that supports the efficient use of finance, which will enhance firm performance. A previous study conducted by Assefa [15] revealed that 44 percent of small enterprises will collapse during the first month of closure restrictions during a COVID-19 pandemic.

Furthermore, just six (6) percent of enterprises have enough cash to survive for a year. In this context, the report recommends that the government should refrain from implementing complete closure measures in the absence of government assistance initiatives. As a result, the study looked at the relevance of COVID-19-based special loans, payment suspensions, limited fund withdrawals, and tax exemptions and penalty payments. The COVID-19-based special loan is the most important government support scheme, followed by the suspension of interest and principal payments.

Next, respondents stressed that the franchise development related agencies were very helpful to them during the pandemic by organising virtual franchise exhibitions. This finding is supported by past studies done by Abou-Shouk, Zoair, Farrag, and Hewedi [78], who claimed that that venue design, facilities, staff, available information and comfort had a positive impact on exhibitors. Furthermore, Pu, Xiao, and Du [79] claimed that price promotions will have a beneficial impact on sales performance, information collecting, and company image construction, and promotions are not exhibitor pricing. Furthermore, the conclusions of these researchers' findings revealed that price exhibitor marketing does not have a beneficial influence on the creation of customer connections, however no price promotion does.

Meanwhile, Pinandita, Nofrizaldi, and Shabiriani [80] discovered that the exhibition is one of the relatively major activities that necessitates direct engagement with a large number of people. The exhibition, which drew a large crowd, could not be held while the outbreak was still underway. It is unclear when the pandemic will cease, but more innovative approaches to present an exhibition are required. Virtual technology is the way out of the traditional showroom's new physical reality constraints. During the epidemic, the virtual exhibition is projected to have the opportunity to sustain the creative process.

The respondents also claimed that franchise development-related institutions greatly assist franchisees by conducting online training and providing ongoing support. This finding is aligned with a past study by Adeiza, Bo, Abdul Malek, Ismail and Mohd Harif [81]. They found that training and support management services have a substantial impact on the success of the franchisees' businesses at both the early and growth phases. However, their research also demonstrated that training has the greatest influence early on, but this benefit fades as the franchisee learns the intricacies of the business. Management of the service, on the other hand, ensures that it remains relevant at all levels of the franchise firm. Thus, Bui, Jambulingam, Amin, and Nguyen [33] supported that franchisor support plays a very important role in simplifying the relationship between entrepreneurial orientation, market orientation and franchisee performance in the COVID-19 pandemic situation. Moreover, franchisor support services may include assistance with site selection, assistance with hiring, the provision of initial and ongoing training, financing support, management services, operations management services, marketing and promotion support, and research and development support [82–84].

On the other hand, the respondents have indicated that franchise related agencies are very important in playing their role to help the franchise industry during the pandemic by offering business development grants, and this is very helpful to the franchisors and franchisees involved. According to a past study by Quintiliani [85], the author discovered empirical evidence that showed a strong relationship between government grants and the diversity of strategies with the growth of enterprise value. Additionally, Srhoj, Lapinski, and Walde [86] revealed that business development grants had a large positive influence on capital shares, bank loans, intermediate inputs, and value added on average, but had no indication of a beneficial effect on productivity metrics, sales, employment, average wages, or inventories. Yet, major outcomes are contingent on the positive impact of small businesses. Furthermore, there are positive effects from winning the business plan competition on a company's capital stock, employment, sales, and profits in previous studies examining the impact of business development grants [87,88].

As highlighted by Srhoj et al. [88], business development grants have favourable impacts on company sales and employment, as well as survival likelihood and access to

bank loans, but only for one-year-old enterprises; no benefits were seen for two-year-old firms. Both studies showed that business development grants are appropriate for small businesses. For instance, research and development (R&D) grants have largely beneficial effects on the company's R&D expenditure, innovation and performance [89,90]. Another past study by Srhoj et al. [88] indicated that grant plans have a favourable effect, which is especially important for small businesses. Estimates of this dose response function have also revealed that the percentage of total grants for business income must be large enough for the grant to be effective. An initial calculation shows that the benefits outweigh the direct program expenses. Moreover, Srhoj et al. [86] claimed that capital-constrained enterprises that can increase their output if their capital or labour constraints are eased. Grant support is given as one of the reasons why firm performance metrics are projected to improve with the lifting of capital limitations. Receiving a grant, on the other hand, verifies a firm's quality to banks and makes it simpler to receive a loan. Based on these findings and discussions, this study proposes several propositions (Table 3).

Table 3. Propositions.

Themes	Propositions
Financial Assistance	P1: Consistent financial assistance by government is positively associated with the survival ability of the Malaysian franchising business community during the pandemic.
Virtual Franchise Exhibition	P2: The better the international exhibitions organized to help Malaysian franchising business, the higher the Malaysian franchising propensity to survive during the pandemic situation.
Training and Support	P3: Training and support activities are positively associated with the survivability of Malaysian franchising businesses during the pandemic.
Business Development Grant	P4: The greater the access to business development grants for Malaysian franchising businesses, the higher their chances of survival during the pandemic.

6. Conclusions

In brief, this study has highlighted the roles played by franchise-related institutions in helping to strengthen the country's franchising industry, especially during the pandemic era. It is clear that these franchise-related agencies advocate for franchising entrepreneurs in continuing and sustaining their businesses. The findings indicated four roles of agencies related to franchise development, which are: (i) financial assistance; (ii) virtual franchise exhibition; (iii) training and support; and (iv) business development grants.

Franchising entrepreneurs received financial assistance and guidance from government agencies as well as from banking and financial institutions. Many business industries were affected by the movement control orders enforced by the government and this resulted in many businesses, including franchises, not continuing their operations. As a result of this, there are franchising entrepreneurs who had encountered financial problems and are burdened with costs to bear, besides not generating incomes similar to those that they did before the pandemic. Thus, most of the franchising businesses depend on financial assistance and incentives provided by the agencies involved. In addition, the effort to organize a virtual franchise exhibition is seen as a very effective effort in assisting franchise entrepreneurs in continuing their business activities during the pandemic. This virtual exhibition is seen as an international platform and can bring together many leading franchising brands despite the constraints of physical meetings.

Physical movement is very limited during a pandemic due to the implementation of movement control orders by government, and this greatly complicates the conduct of training for businesses. However, with many initiatives by various agencies related to franchise development, this constraint was addressed by organizing online training such as webinars. In addition, ongoing support is also provided so that these franchising entrepreneurs can maintain their momentum despite being tested during the pandemic

outbreak. Finally, the provision of a business development grant is also one of the essential roles of franchise-related agencies. For franchising entrepreneurs affected by the pandemic, funding assistance in the form of development grants is perceived as an important mechanism to support their businesses and to help it survive. Moreover, business development grants are also imperative in supporting the growth and expansion of franchising businesses in both the domestic and global markets.

7. Academic and Practical Implications

There are academic and practical implications based on the findings from this study. As for the academic implications, the findings have indicated themes that have enriched the existing theories related to the role of institutions in advocating the survival of the franchise industry as well as becoming a reference in exploring a more robust role of development-related agencies for the survivability of franchisors and franchisees in Malaysia. As for practical implications, the results of this study can be used as a guide for the franchise development agencies in creating more initiatives in boosting and empowering the franchise industry during any pandemic situation. Furthermore, this study has a practical implication for the franchise industry players in increasing their continuation of franchise networking in maintaining the survivability of franchise development in Malaysia.

8. Limitations and Future Research Directions

The findings of this study may not be generalisable for areas other than franchisors and government support agencies. This is due to the research that only focuses on the findings during the COVID-19 pandemic. It is suggested that future studies that explore the survival ability of franchisees or master franchisees in different situations be carried out in order to do a comparison of outcomes based on specific situations. This future study is recommended to be done by using other methodologies such as a grounded theory approach or a phenomenology approach for a more diverse and in-depth exploration of themes as well as through the use of quantitative methods. Thus, it can help researchers to discover and test the relationships of franchise agencies in Malaysia.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/su14063212/s1>, Part A: General Questions; Part B: Roles of franchise-related agencies.

Author Contributions: N.A.A.A. and H.R.H. focused on writing—original draft preparation, methodology, software and analysis. M.H.-H. and Z.A.A. prepared conceptualization and resources. N.S.N.H. and Z.A.A. conducted validation and data accuration. N.A.A.A. and N.S.N.H. managed project administration. M.H.-H. and H.R.H. conducted writing—review and editing. All authors have read and agreed to the published version of the manuscript.

Funding: The publication of this paper is financing by UMK-Fund 2020 (STRG) Grant fund (R/FUND/A0100/01231a/001/2020/00842) from Universiti Malaysia Kelantan, led by Nurul Ashykin Abd Aziz, along with other grant members, namely Nik Syuhailah Nik Hussin, Hasif Rafidee Hasbollah, Zuraimi Abdul Aziz and Mohd Hizam Hanafiah (Universiti Kebangsaan Malaysia).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Acknowledgments: We would like to express our appreciation to Universiti Malaysia Kelantan for the UMK-Fund (STRG) research grant provided. Also, many thanks to all the authors for their efforts and support in the preparation of this article. Hopefully this article will benefit all parties, particularly the franchise industry in Malaysia and all franchise players.

Conflicts of Interest: The authors declare that they have no conflict of interest.

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ISBN 978-3-0365-4404-5