

The Short Term Stock Market Reactions to Covid-19 Outbreak in Casablanca Stock Exchange

Amal Driouache

Submitted to the
Institute of Graduate Studies and Research
in partial fulfillment of the requirements for the degree of

Master of Science
in
Banking and Finance

Eastern Mediterranean University
August 2022
Gazimağusa, North Cyprus

Approval of the Institute of Graduate Studies and Research

Prof. Dr. Ali Hakan Ulusoy
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science in Banking and Finance.

Prof. Dr. Nesrin Özataç
Chair, Department of Banking and
Finance

We certify that we have read this thesis and that in our opinion it is fully adequate in scope and quality as a thesis for the degree of Master of Science in Banking and Finance.

Prof. Dr. Cahit Adaoğlu
Supervisor

Examining Committee

1. Prof. Dr. Cahit Adaoğlu

2. Prof. Dr. Nesrin Özataç

3. Asst. Prof. Dr. Bezhan Rustamov

ABSTRACT

After nearly a decade of growth and high performance, the Casablanca Stock Exchange has gone through a difficult period of recession since the spread of the new coronavirus pandemic the Covid-19. This investigation evaluates the short-term performance of the Casablanca Stock Exchange, by considering the effect of the Covid-19 first case declaration in Morocco. The study is based on the event study methodology, considering data from the 6th of August 2019 to the 27th of April 2020. The empirical results, reveal the significant negative response of the Casablanca Stock Market to the outbreak, over the 6 months estimation window.

Keywords: Casablanca Stock Exchange, Recession, Short Term, Performance, Event Study.

ÖZ

Yaklaşık on yıllık büyüme ve yüksek performansın ardından Kazablanka Menkul Kıymetler Borsası, yeni koronavirüs pandemisi Covid-19'un yayılmasından bu yana zor bir durgunluk döneminden geçti. Bu inceleme, Fas'taki Covid-19 ilk vaka bildiriminin etkisini dikkate alarak Kazablanka Menkul Kıymetler Borsası'nın Kısa vadeli performansını değerlendirmektedir. Çalışma, 6 Ağustos 2019'dan 27 Nisan 2020'ye kadar olan verileri dikkate alan olay çalışması metodolojisine dayanmaktadır. Ampirik sonuçlar, Kazablanka Borsasının 6 aylık tahmin penceresi boyunca salgına verdiği önemli tepkiyi ortaya koymaktadır.

Anahtar Kelimeler: Kazablanka Menkul Kıymetler Borsası, Durgunluk, Kısa Dönem, Performans, Olay Çalışması.

ACKNOWLEDGEMENT

First and foremost, I thank God for giving me straight and patience to complete such a great work.

I would like to record my gratitude to my supervisor Prof. Dr. Cahit Adaoğlu for his overall guidance, comments and supervising through this journey. The completion of my thesis wouldn't be possible without his expertise.

This wholeheartedly dedicated to my beloved parents, and brother being my source of inspiration by giving me straight, and who continually provided their moral, spiritual, and financial support.

This piece of work won't be enough to thank them for their sacrifices. They did not only raise, and nurture me they taxed themselves to provide me with the best education over years. I'm grateful and proud to have them as my parents.

TABLE OF CONTENTS

ABSTRACT	iii
ÖZ.....	iv
ACKNOWLEDGEMENT	v
LISTE OF TABLES	viii
LIST OF FIGURES.....	xi
1 INTRODUCTION.....	1
1.1 Background.....	1
1.2 Objectives	3
1.3 Data and Methodology	4
1.4 Thesis Structure	5
2 THE CASABLANCA STOCK MARKET AND LITERATURE REVIEW OF SHORT-RUN STOCK MARKET REACTIONS.....	6
2.1 Overview of the Casablanca Stock Market before the Covid-19 Pandemic .	6
2.2 The Covid-19 Pandemic	8
2.3 The Evolution of the Covid19 Crisis.....	9
2.4 The Short-run Stock Market Reactions to Covid-19	12
3 EMPIRICAL ANALYSIS.....	21
3.1 The Casablanca Stock Market (CSE)	21
3.2 Empirical Methodology and Data.....	23
3.2.1 Methodology: Event Study	23
3.2.2 The Event Study Periods and Data.....	25
3.2.3 Estimating the Abnormal Returns and Testing Statistical Significance	26

3.3 Empirical Event Study Results: Moroccan All Shares Index (MASI)	29
3.4 The CSE Sector Indices	32
3.4.1 Insurance Index (ASSUR:MA)	33
3.4.2 Distributors Index (DISTR:MA)	36
3.4.3 Banks Index (BANK:MA)	38
3.4.4 Food Producers And Processors Index (AGRO:MA)	41
3.4.5 Real Estate Investment Companies Index (SPI:MA)	43
3.4.6 Mining Index (MINES:MA)	46
3.4.7 Real Estate Participation & Promotion Index (IMMOB:MA)	49
3.4.8 Construction & Building Materials Index (B&MC:MA)	51
3.4.9 Materials, Software & Computer Services Index (L&SI:MA)	54
3.4.10 Oil & Gas Index (P&G:MA)	57
3.4.11 Investment Companies & Other Finance Index (SF&AF:MA)	59
3.4.12 Comparative Analysis	61
4 CONCLUSION	67
REFERENCES	70

LISTE OF TABLES

Table 1. Event Studies Related to The Covid-19 Impact on Stock Markets.....	19
Table 2. Mean-Market Adjusted ARs and CARs over The Event Window: The Masi...	30
Table 3. Cumulative Abnormal Returns of Masi Index.....	31
Table 4. The List of the Casablanca Stock Exchange Sectors.....	32
Table 5. Mean-Market Adjusted ARs and CARs over The Event Window: The Insurance Index.....	33
Table 6. Cumulative Abnormal Returns Reaction over The Event Windows: The Insurance Index.....	35
Table 7. Mean-Market Adjusted ARs and CARs over The Event Window: Distributors Index	36
Table 8. Cumulative Abnormal Returns Results of Distributors Index.....	37
Table 9. Mean-Market Adjusted ARs and CARs over The Event Window: Bank Index.....	38
Table 10. Cumulative Abnormal Returns of Banks Index.....	40
Table 11. Mean-Market Adjusted ARs and CARs over The Event Window: Food Producers & Processors Index.....	41
Table 12. Cumulative Abnormal Returns of Food Producers & Processors Index.....	42
Table 13. Mean-Market Adjusted ARs and CARs over The Event Window: Real Estate Investment Companies Index.....	43
Table 14. Cumulative Abnormal Returns Results of Real Estate Investment Companies Index	45
Table 15. Mean-Market Adjusted ARs and CARs over The Event Window: Mining Index.....	46

Table 16. Cumulative Abnormal Returns of The Mining Index.....	48
Table 17. Mean-Market Adjusted ARs and CARs over The Event Window: Real Estate Participation & Promotion Index	49
Table 18. Cumulative Abnormal Returns of Real Estate Participation & Promotion Index.....	50
Table 19. Mean-Market Adjusted ARs and CARs over The Event Window: Construction & Building Materials Index.....	51
Table 20. Cumulative Abnormal Returns of Construction & Building Materials Index.....	53
Table 21. Mean-Market Adjusted ARs and CARs over The Event Window: Materials, Software & Computer Services Index.....	54
Table 22. Cumulative Abnormal Returns of Materials, Software & Computer Services Index.....	55
Table 23. Mean-Market Adjusted ARs and CARs over The Event Window: Oil & Gas Index.....	56
Table 24. Cumulative Abnormal Returns of The Oil & Gas Index.....	58
Table 25. Mean-Market Adjusted ARs and CARs over The Event Window: Investment Companies & Other Finance Index.....	59
Table 26. Cumulative Abnormal Returns of Investment Companies & Other Finance Index.....	60
Table 27. CAR of Industries Within The Event Windows (-20, -1), (-10, -1) and (-5, -1).....	61
Table 28. CAR of Industries Within The Event Windows (0, +1), (0, +5) and (0, +10).....	62

Table 29. CAR of Industries Within The Event Windows (0, +20), (0, +30) and (0, +40).....	64
---	----

LIST OF FIGURES

Figure 1. A Timeline of Important Announcements During The Time of Crisis.....	11
Figure 2. Timeline for The Event (in days).....	25
Figure 3. Daily Abnormal Returns Cumulative Abnormal Returns (-20, +40): The Masi Index.....	30
Figure 4. AR and CAR of The Insurance Index During The Estimation Window: Insurance Index.....	34
Figure 5. Daily Abnormal Returns Cumulative Abnormal Returns (-20 , +40): Distributors Index.....	36
Figure 6. Daily Abnormal Returns Cumulative Abnormal Returns (-20 , +40): Banks Index.....	39
Figure 7. Daily Abnormal Returns Cumulative Abnormal Returns (-20, +40): Food Producers & Processors Index.....	41
Figure 8. Daily Abnormal Returns Cumulative Abnormal Returns (-20, +40): Real Estate Investment Companies Index.....	44
Figure 9. Daily Abnormal Returns Cumulative Abnormal Returns (-20, +40): Mining Index.....	47
Figure 10. Daily Abnormal Returns Cumulative Abnormal Returns (-20, +40): Real Estate Participation & Promotion Index	49
Figure 11. Daily Abnormal Returns Cumulative Abnormal Returns (-20, +40): Construction & Building Material Index	52
Figure 12. Daily Abnormal Returns Cumulative Abnormal Returns (-20, +40): Materials, Software & Computer Services Index.....	54

Figure 13. Daily Abnormal Returns Cumulative Abnormal Returns (-20, +40): Oil & Gas Index.....	57
Figure 14. Daily Abnormal Returns Cumulative Abnormal Returns (-20, +40): Investment Companies & Other Finance Index.....	59
Figure 15. ARs Performance During The Estimation Period.....	65

Chapter 1

INTRODUCTION

1.1 Background

The Covid-19 pandemic has provoked a major global fluctuation in the stock markets over a short period of time. This reminds us of the 2008 sub-prime mortgage crisis which had prompted the global financial crisis which comes as a result of a combination of poor macroeconomic conditions, poor corporate governance, and lax regulatory oversight. The volatility of the credit default swaps mortgage bubble in 2006-2007 is widely regarded as the ultimate cause of the financial sector's collapse in 2008. Indeed, the Covid-19 pandemic is a global health crisis that has triggered harsh repercussions by affecting all dimensions of life, mainly human and economic dimensions. The upshots outscore the 2008 financial crisis (Friedman, 2011, 2).

Multiple international financial organizations and monetary assemblies have alerted of the damaging and critical consequences generated by the Covid-19 pandemic on the global economy. Correspondingly, the World Economic Form (2020) proclaimed that “the coronavirus shock is severe even compared to the great world economic crisis in 2007-2008, as it hit households, businesses, financial institutions, and markets all at the same time, first in China and now globally” (pp 5-25). This pandemic has traumatized the entire world economy and has negatively impacted the functioning of all financial aspects on a global scale because of the containment measures taken by most countries.

The pandemic has two consequent effects. According to Ozkanlisoy (2021), the snowball effect which is materialized by the Covid-19 sway on numerous sectors such as baking, insurance and the stock market. The Bullwhip effect can be explained as the final demand shock, which is resulting in a sequences of inconsistent and unjustified pronouncements, from intermediaries in the supply chain such as retailers, semi-wholesalers, wholesalers, importers, and manufacturers. This results in disrupting the supply chain, possibly causing stock shortages and cancellations of orders (pp 76-88).

In China, specifically in the Hubei Province the Covid-19 was originated before spreading throughout the world. Through the circulation of people in early 2020, the virus outbreak sustained its expansion more widely in China then all over the world, and has occurred in an ongoing epidemic. The Chinese government had promulgated quarantine measures to stop the spread of the virus, leading to a slowdown in economic activity. Correspondingly, many countries were exhibited to the stagnation of the economic activity in China, this is mainly due to their imports of Chinese intermediate products, and also due to the Chinese value added incorporated into other production inputs (Gerschel, Martinez, & Mejean, 2020). To mobilize international forces and coordinate to counter the virus, the World Health Organization (WHO) announced on the 30th of January 2020, the Covid-19 being a Public Health Emergency of International Concern.

After Wuhan Municipal Health Commission in China had declared several cases of pneumonia in late December 2019 that were eventually identified as a new member of the coronavirus family, the global stock markets were the first financial victim of this

pandemic resulting in widespread and noticeable shockwaves in all capital markets. Morocco had recorded the first case of Covid-19 on the 2nd of March 2020, this has upset the course and functioning of all economic and financial activities in the country (Kasraoui, 2020).

This is the first time in its history that the Casablanca Stock Exchange (CSE) has been affected by a health crisis. The fall in world stock markets is disproportionate. The onset of the pandemic had caused significant losses in the stock exchanges such as Paris, London, Spain, Frankfurt, and Casablanca (e.g., -7.9% on the Frankfurt Stock Exchange; -7% on the London Stock Exchange; -8.3% on the Paris Stock Exchange;.....). Wall Street has also plummeted, recording its worst session since the 2008 financial crisis (“Covid-19”, 2020). The Dow Jones closed with a -7.83% loss, the Nasdaq dropped by -7.29% and the S&P 500 with a -7.64% loss. Global financial markets have shown sensitivity regarding the fluctuations and global indices of stock market collapsed significantly and consistently (Nedelec & Rolland, 2020).

1.2 Objectives

In the legal form of a public limited company with a board of directors and general management, the Casablanca Stock Exchange is responsible for ensuring the operation, development, and promotion of the Moroccan exchange through the monitoring and management of quotation sessions, the publication of market information and the interposition during the settlement of transactions concluded between the various stakeholders.

Due to the Covid-19 pandemic being an overall health emergency of global concern on the 30th of January 2020. The Moroccan Stock Exchange Market had reacted to the

announcement of the first case of corona virus on the 2nd of March 2020. Our objective is to investigate the pandemic crash on stock indices by considering the impact of the outbreak on the Moroccan All Shares Index (MASI) as well as sector indices by responding to the following questions: How did the Casablanca Stock Exchange react to the spread of Covid-19 in the short term? Which sectors are most affected by this outbreak?

1.3 Data and Methodology

This research provides insights into the short-run response of the CSE to the Covid-19 outbreak. The total number of data points used in this study includes daily market data from the Casablanca Stock Exchange from the 5th of August 2019 to the 27th of April 2020. Additionally, required data of Covid-19 first case declared by the Moroccan government a regular basis is collected from the following website <https://www.casablanca-bourse.com/bourseweb/en/index.aspx>. The Moroccan All Shares Index (MASI) daily prices are deemed as Morocco's primary bourse index, tracking the effectiveness of all listed companies on the CSE. Throughout this research, we take a glance at eleven industries of the Casablanca Stock Exchange: Insurance, Real Estate Investment Companies, Banks, Food Producers & Processors, Distributors, Mining, Real Estate Participation And Promotion, Construction & Building Materials, Materials, Software & Computer Services, Oil & Gas Sector, and the Investment Companies & Other Finance indices. Based on the event study methodology, the empirical work in this study seek to reveal the behavior of financial markets, following the outbreak of the Covid-19 news, notably stock markets.

The event study methodology considered to be as one of the effectiveness and approved methods, for the seek to investigate events consequences on securities

returns over an estimated period. The stocks prices can be impacted positively or negatively following the event announcement. Overall, the event study methodology is used to evaluate the relationship between the stock market performance and the occurrence of corporate events (mergers, acquisitions, splits, stock dividends, bonus shares, amalgamation, etc...). However, this methodology is used by multiple researchers to analyze non-corporate events as well, such as the disease outbreak on stock markets (Chen et al, 2017, 2018; Liu et al, 2020; Pendell & Cho, 2013). Accordingly, with the prior investigation the event study methodology is considered as the most efficient method for the estimation of the abnormal returns (ARs) following an event announcement. (Brown & Warner, 1985; MacKinlay, 1997). As suggested by Bowman (1983), the ARs are estimated based on an event study, in addition to the decisions over choice of the event of interest, the event window, the estimation window as well as the estimation model (Singh, Dhall, Narang, & Rawat, 2020).

1.4 Thesis Structure

In the next chapter, a brief literature review will be conducted discussing the CSE performance before the Covid-19, presenting the health crisis and its evolution, and lastly the Short-run Stock Market Reactions to the outbreak. On the 3rd chapter we will proceed with a sectoral review of the Covid-19 shock, and expose the empirical results and performances of the different quotations at the CSE. This involves particularly the variations in the period of the announcement of the first covid19 case in Morocco performance of all sectors. On the last chapter, we will conclude and sum up our findings.

Chapter 2

THE CASABLANCA STOCK MARKET AND LITERATURE REVIEW OF SHORT-RUN STOCK MARKET REACTIONS

2.1 Overview of the Casablanca Stock Market before the Covid-19 Pandemic

The Casablanca Stock Exchange is one of Africa's ancient exchanges, established in 1929, after the initiation of the Johannesburg stock market in 1887. The CSE also represents the first financial market in the Maghreb region. Major reforms were implemented in 1967, providing an improved legal framework to an increasing number of domestic investors. Subsequently, in 1993, corrections were undertaken in order to improve the protection of investors, also promoting transparency and the electronic trading was placed. Those reforms shuttered due to the launch of Maroclear in 1997 by the clearing house of the Casablanca Stock Exchange. The progress of foregoing reforms indicator is mainly observed in the market capitalization valuation, knowing for a fact that the stock market capitalization value expanded drastically between 2002 and 2006 from 23.8% to 86.1%. In 2012, CSA was entitled as the 4th top Africa's stock market following the global traded value in USD as well as the market capitalization. Regarding the economic growth, Morocco resisted and has dealt with social problems in the Middle East fairly better in comparison to other North African countries. Over the period between 1980 and 2010, Morocco's growth rate reached an average of 4%,

and attained 3.5% for all the other emerging and developing economies (Wild & Lebdaoui, 2014).

Regardless, the Moroccan economy growth began to act on a postpone trend by the beginning of 2008. Among other reasons, this growth decelerates appear to be ascribed to onset of the worldwide financial crisis and the ensuing spread of major trade partners in Europe namely France. Based on a current study by the International Monetary Fund (IMF), the economic growth since 1980 up till 2010 has been restrained by capital accumulation on the supply side, which highlights the importance of the stock exchange as a secondary source of capital accumulation for economic growth (Furceri et al., 2013).

After occupying three structures, the current stock exchange, created in 1929, experienced a real change in 1993 with the promulgation of three legal texts which organize its activity. In 2019, the Casablanca stock market reached a turnover of 148 million dirhams, an increase of 44% compared to 2018, with a net result of 36 million dirhams, which reflects an annual increase of 116%. In terms of capitalization, the CSE with a value of 627 billion dirhams achieved an international performance of 7.1%, exceeding the majority of North African stock exchanges. The main stock market index of this financial center (MASI) achieved a significant growth of 26.2% between 2014-2019. This is mainly due to investors' repositioning operations on the large caps, namely the banking and telecommunications sectors. It should be noted that during the same period of the last year, the CSE recorded fairly high underperformance linked to various reasons, such as the decline in the activity of listed companies or the multiplication of tax audits, etc. During the year 2019, the Moroccan

Stock Exchange only recorded capital increase operations which totaled a value of 7.6 billion dirhams, the CSE therefore experienced a total absence of issues of listed bond loans and IPOs (Casablanca Stock Exchange, 2019).

According to the annual report of the Casablanca Stock Exchange (2019), it is important to note that the CSE recorded a volume of 60 billion dirhams in terms of transactions (block market and central market) during the year of 2019 against only 47 billion dirhams in 2018. For the year 2020 and until the end of June, the CSE experienced only three capital increase operations, knowing that these three operations were carried out before the end of February, that is to say before the announcement of the state of health emergency in Morocco. In terms of market size, it should be recalled that the CSE currently has 76 listed shares and 39 bonds. With the spread of this pandemic and the worsening of the health situation in Morocco, the report for the first three months of 2020 of the CSE, underlines that it recorded a significant average drop of 17.33% at the level of its five stock market indices. All of the 76 stocks listed on the CSE form 24 sub-sectors of activity, namely: Agrifood and production, Building and Building Materials, Distributors and Hardware, Software and IT Services, etc. This configuration can be summarized by two compartments, respectively called “Principal A” which consists of the 20 securities and “Principal B” which contains the other 56 remaining securities.

2.2 The Covid-19 Pandemic

The economic and financial crisis resulting from the Coronavirus disease (Covid-19) pandemic would be novel with regard to several criteria. First of all, it is a global and generalized crisis affecting almost the entire world economy. Both developed and developing countries have been severely affected by the sudden suspension of all

forms of activity. This situation remains vague for the moment, undoubtedly it will depend on the duration of the crisis. Then, the Covid-19 crisis will mark history by its exogenous character. The contemporary economic history specifically the real and financial spheres, suffered for the first time from an exogenetic shock, highlighting the health crisis. The dysfunction of the economic system wasn't the cause behind the imbalance. Those variations were generated throughout the imposition of this external event by the public health constraints. Finally, the Covid-19 crisis would be unprecedented in terms of the scale of its disastrous consequences both for real activity and incomes as well as the financial markets (Papava & Charaia, 2020).

The economic thinking is doubly spoiled: firstly, this new crisis is added to the list of the unexpected crisis. No one was able to anticipate or prevent the burst of this major event. On the other hand, the accumulated knowledge and know-how are completely irrelevant regarding the atypical situation of the Covid-19 crisis. It is clear that no one can describe with precision the propagation of the Covid-19 crisis, nor quantify its direct and indirect effects on the world economy. Accordingly, none of the economists nor the policymakers have the required knowledge or skills to manage this new emergency crisis. Correspondingly, no one today has an immediate response to cushion the effect of the economic shock of the Covid-19 crisis (leconomistemaghrebin, 2020).

2.3 The Evolution of the Covid19 Crisis

In the beginning of March, mainly with the appearance of the first infected cases in Morocco. The panic associated with this situation has created an effect of massive sell-offs of the shares of the main Moroccan stock market indices. Due to the timely responsiveness of the Moroccan Capital Market Authority (AMMC), the advent of a

systemic risk introduced by Covid-19 has been slowed down. The variations limitation rehearsed by this authority is really seen in the number of trading sessions for certain shares. For example, during the first half of 2020 the shares of some listed companies as, Auto Nejma, MaghreBail and Rebab Company were listed only twice against 127 sessions for AFMA, Alliances and other companies after declaring the state of emergency (See figure1).

Following the 2nd quarterly report on the stock market investors, the Moroccan Capital Market Authority, (2020), it is significant to mention that from its appearance in Morocco in March 2020, the coronavirus began to lean slightly on the MASI, which was caught in a downward spiral, until reaching a low of 8,987.89 points, on March 18. Despite the worsening of the health situation in May 2020, the stock market began to experience a certain lull, followed by a positive trend, due to the partial resumption of economic activity, the announcement of the gradual end of the quarantine plan and mainly the monetary policy decisions, in particular the reduction of the key rate to 1.5% by Bank Al-Maghrib (Moroccan Central Bank). In sum, MASI and MADEX had lost 16.5% and 16.8% respectively during the first half of 2020. The upcoming phase was triggered on June 19 with the recording of 539 cases of contamination in a single day. Normally, this kind of announcement is supposed to panic investors given the collapse of the protective measures put in place by the Moroccan authorities, but on the contrary, the market capitalization has surged from 521.25 billion dirhams today to 530.67 billion dirhams on July 16, 2020. Which leads us to admit that the measures taken by the AMMC (Moroccan Capital Market Authority) and the CSE in terms of raising investor awareness through a series of regulatory notes and remote awareness actions (webinars) aimed to clarify the ambiguity around investment choices in times

of crisis, were the key aspects of the first layer of defense against the repercussions of Covid-19.



Figure 1. A Timeline of Important Announcements During The Time of Crisis.

Lastly with the deterioration of the health situation on a national scale, leading to the recording of a severe acceleration of the contaminated cases detected by the organizations in charge. Indeed, during the period which extends from July 17, 2020 to October 2, 2020, the market capitalization experienced some deterioration (from 529.39 billion dirhams to 522.57 billion dirhams), or even stagnation, in regard to the poor health situation. that our country has gone through during this period. Once again, the economic operator's behavior was essentially based on economic and financial parameters criterion more than social ones. In other words, signs such as the resumption of the trend of export activities mainly from the automotive and agricultural sectors, as well as the overall financial stability of the Kingdom after the adoption of the Amending Finance Law of 2020, have played a decisive role in the favorable sense at the level of the decision-making of the stakeholders on the Moroccan stock exchange. Generally, despite the drop in all the stock market indices and the majority of the sector indices, the situation in the Casablanca stock market

remains manageable due to the monitoring practiced by the authorities in charge of the market supervision.

2.4 The Short-run Stock Market Reactions to Covid-19

The Covid-19 pandemic one of the most serious crises since 1929, sudden and unprecedented, thus engendered a crisis of historic proportions in the world economy. It brutally paralyzed the economy on a divergent scale, also induced significant vagueness in the world economy (Baker et Al. 2020). Several scientific papers appeared during a short period of time to investigate the economic repercussions regarding the health global crisis. Starting with the Jordà, Singh and Taylor (2020) study, which analyzes the medium and long term impact of Covid-19 on the global economy. The results of this study assumed that the health crisis should lead to an increase in public debt and a fall in the national savings rate.

Moser and Yared (2020) also analyzed the economic consequences linked to the application of health restriction measures and show that these measures reduce economic production but improve health prospects.

Ibenrissoul, N., & Aouragh, N. (2022), suggest that the fear generated by the covid-19 outbreak is linked to market volatility. The increase of uncertainty in financial markets, caused investors to react quickly and irrationally. This index named “fear index” is a variable that explains the overreaction of investors to global stock markets, particularly the Moroccan market, in a context marked by a health-care crisis.

From the same perspective, Salisu and Akanni (2020) found, through the number of cases and deaths due to Covid-19 and based on the construction of a new global fear

index (GFI), that the fear index is a good prognosticator in exchange market yields in OECD and BRICS countries during the spread. In general, this negative response on the real economic activities adjusts directly into a significant negative impact on stock markets.

Vasileiou (2020), also indicated through an investigation on the US stock market. By analyzing the US market efficiency during the coronavirus pandemic using a financial analysis approach and a behavioral analysis and based on Google Trends fear index. It demonstrated that the market was inefficient through some phases, when the health risk was significantly underestimated and ignored by investors.

On the other hand, Benmelech and Tzur-Ilan (2020) conducted a study related to budgetary and fiscal policies announced by governments in time of the health crisis. The results showed that high-income countries declared larger monetary policies compared to the low-income countries, and that a country's credit rating is the most important factor in determining its budgetary expenditure during the epidemic. These findings raise concerns that countries with poor credit histories those with lower credit ratings and, in particular, low income countries will be unable to deploy fiscal policy tools during economic downturns.

Regarding the stock markets response to the health crisis, Baker and Al. (2020) showed, following a textual analysis carried out on the American market, that stock market volatility reached a highest level during the Covid-19 crisis. He argued that the covid-19 news had a large impact on stock market volatility than other previously infectious recorded diseases, such as EBOLA and SARS epidemics.

Ramelli and Wagner (2020) for their part, also proved that the US stock market reacted negatively to the evolution of the health situation, resulting in high volatility at the start of the pandemic in the United States.

For their part, Ru et al. (2021) agreed that the stock markets of countries that did not have SARS infections in 2003 under-reacted at the beginning of the pandemic in Wuhan, to the health risks associated with Covid-19. Began to pay more attention much later, in March. Furthermore, governments in these countries were much lower to implement social distancing policies to combat domestic Covid-19 outbreaks than governments in SARS affected countries.

Ortmans and Tripier (2021), confirmed that the Covid-19 shock on the trading floors turned out to be even more severe than that of the economic collapse after the Lehman Brothers bankruptcy in September 2008.

Similarly, Zhang and Al. (2020) confirmed, following a statistical survey on the equity risk reaction to the Covid-19 outbreak in 12 developed countries including China, that this health crisis created, between February and March 2020, an unprecedented level of risk in global stock exchanges. According to the findings, the outbreak had a significant negative impact cross all the affected countries. Asian stock markets reacted quickly and suffered a significant drop in abnormal returns when compared to the other countries.

In terms of the hypothesis of efficient financial markets in times of Covid-19, an empirically study ran by Phan and Narayan (2020) examined the over-reaction hypothesis of equity markets to Covid-19. The results of this study confirm the

presence of the phenomenon of overreaction of investors to information related to the Covid-19 pandemic. This over-reaction was followed over time by an upward correction phase.

Thus, Capelle-Blancard and Desroziers (2020) assessed the reaction of exchange markets in regard to the Covid-19 public information, health restriction measures and government announcements using a panel of 74 countries with daily information on health and financial crisis from January to April 2020. The findings suggest that, as a consequence of stock markets ignorance of pandemic (until February 21), until reacting firmly to the rising number of people affected (From February 23rd to March 20), meanwhile volatility increased and pandemic concerns emerged after central bank interventions.

Yilmazkuday (2020) examined the Covid-19 related cases impact on the S&P 500 Index in the United State, using daily data from 31st of December 2019, to the 1st of May 2020. The empirical findings, based on a vectorial structural autoregression model, indicate that when decomposing the negative consequences of the Covid-19 cases on the S&P500 index will be noticeable amid March 2020.

In a similar context, Onali (2020) used data starting from the 8 of April 2019, to the 9 of April 2020, adopting the GARCH(1,1) model, to evaluate the US stock market response (Dow Jones and S&P500 indices) to the Covid-19 related cases and deaths, while accounting for variations in trading volume and volatility prospects. The analysis reveal that the fluctuations in Covid-19 associated cases and deaths in the United State and six other countries heavily impacted by the coronavirus outbreak have no impact on the US Stock Market returns, with the exception of Covid-19 related cases in China.

However, for some countries, there is evidence that the S&P500 and Dow Jones returns conditional heteroscedasticity was positively affected. Using VAR models, the empirical results indicate a negative impact on the indexes returns however the VIX returns were positively affected considering the number of reported deaths in Italy and France. Latest, using the Markov-Switching models, the results show that by the end of February 2020, the value of the VIX's negative effect on United State market returns has tripled.

In the same line, taking an estimation period from the 1st to the 25th of March 2020, Sansa & Hasan (2020) analyzed the Covid-19 effect on the United State as well as the Chinese markets (Dow Jones & Shanghai Stock Exchange). According on to the findings of a simple regression model, we can notice the Covid-19 confirmed cases have a positive significant relationship in both financial markets, emphasizing that the virus outbreak impacted significantly the stock markets.

However, Liu et al. (2020) studied the short-term of the Covid-19 crisis over 21 major stock market indices of main affected countries. According to the findings of an event study methodology, the affected countries suffered, the financial markets were severely hit, as stocks dropped quickly after the pandemic. Asian countries in particular, faced higher negative abnormal returns in comparison with the other countries.

In this approach, He et al. (2020) evaluated the direct effects of eight stock markets Covid-19 spillovers noting China, France, Italy, Spain, South Korea, Japan, Germany, and the United State in a recent study. Findings suggest that the pandemic has a negative but short-term impact on stock markets of the affected countries, assumed

from the t-tests and nonparametric Mann Whitney tests, Furthermore, the results reveal that the Covid-19 effect has two-way spread across Asian, European and American stock markets. Nonetheless, there is no evidence that the Covid-19 has a greater negative impact on the previously stated countries markets, more than on the world average (beside the S&P 1200 Global index).

Collecting daily data from the 23rd of January 2020, to 13 of March 2020, Zeren & Hizarci (2020) evaluated each of France, Spain, Germany, Italy, China and South Korea, stock markets performance based upon the Covid-19 related cases and deaths. Accordingly, with the Maki (2012) cointegration test, results show in the long run all stock markets analyzed with total death interact correspondingly. Furthermore, considering the rising in cases and deaths associated with Covid-19 the findings show that investing in the stock market does not seem to be the best decision for investors. However, countries with low Covid-19, on the other hand, may be one of the options for investors looking to avoid risk by investing in gold markets, cryptocurrencies, derivative and stock exchanges. The aim is to identify the connection between investor decisions, the Covid-19 and volatility of stock prices.

Based on the Covid-19 as a proxy indicator of searching term, Papadamou & al. (2020) evaluated the google trend index effects on the implied volatility of thirteen major stock markets, covering Asia, Europe, Australia regions, and the US. The empirical evidence show that increased anxiety caused by the Covid-19 search queries has an indirect impact on stock returns as well as direct impact on implied volatility, outlining a risk-aversion channel performing during pandemic conditions. These direct and indirect repercussions are more pronounced in Europe than elsewhere.

Finally, Alam, M. M., Wei, H., & Wahid, A. N, probed the coronavirus outbreak through eight selected sectors of the Australian Stock Market. The findings suggest that on the day of the announcement, food, pharmaceutical and health sectors responded positively with a significant return level, and continued on this trend even after the declaration. However, industries as transportation and energy performed poorly regarding the outbreak.

Those infectious diseases literature and financial markets, agreed that pandemics often have negative influences on stock markets. Accordingly, the hypothesis of our study is as follow: The Covid-19 pandemic has significant consequences on the Casablanca Stock Exchange.

Table 1. Event Studies Related to The Covid-19 Impact On Stock Markets.

REFERENCE	EVENT	SAMPLE	DEPENDDENT VARIABLE	MODEL	FINDINGS
Pinglin He, Yulong Sun, Ying Zhang & Tao Li (2020)	Covid-19 Outbreak	CHINA	Shanghai Stock Exchange, Shenzhen Stock Exchange	Market Model	The pandemic had a negative impact on the Shanghai Stock Exchange, while having a positive reaction on the Shenzhen Stock Exchange.
Kandil Göker, İ. E. , Eren, B. S. & Karaca, S. S. (2020)	Covid-19 Outbreak	Turkey	The Borsa Istanbul Sector Index	Market Model	The BIST reaction to the outbreak vary by sector in various estimation windows, by reacting negatively and positively to the announcement of the first case of coronavirus in TURKEY.
Sayed, O. A., & Eledum, H. (2021)	Covid-19 Outbreak	Saudi Arabia	Tadawul (The Saudi Stock Market), 21 industry groups	Market Model	The effect of the announcement of fist covid-19 case in China, on the Saudi Stock Exchange had a negative but not significant response. However, the announcement of the first contaminant case on the Saudi Arabia had a significant and negative effect on stocks.
Alam, M. M., Wei, H., & Wahid, A. N. (2021)	Covid-19 Outbreak	Australia	8 industries of the Australian Stock Market	Market Model	The results showed significant variation between sectors. In regard, industry indices showed sensitivity following the declaration. A good performance for pharmaceutical, healthcare, and telecommunication indices, in contrast to a poor performance of the transportation and energy indices.
Varma, Y., Venkataramani, R., Kayal, P., & Maiti, M. (2021)	Covid-19 Outbreak	India	NIFTY50 (The Indian stock market's major index)	Constant return model, Market adjusted model, market model	The findings are divers; all sectors were temporarily impacted the financial sector was hit the hardest. While positive and significant results were seen in industries such as pharmaceuticals, consumer goods and IT.

Liu, H., Manzoor, A., Wang, C., Zhang, L., & Manzoor, Z. (2020)	<i>Covid-19 Outbreak</i>	Japan, Korea, Singapore, the USA, Germany, Italy, and the UK etc.	21 leading stock market indices	Market model and OLS (Ordinary Least Square)	The outbreak had directly affected stock markets worldwide. The Asian countries experienced more negative abnormal returns compared to other countries.
---	------------------------------	--	------------------------------------	---	---

Chapter 3

EMPIRICAL ANALYSIS

3.1 The Casablanca Stock Market (CSE)

Originated in 1929 as a clearing house, the CSE is represented as a monitored market in which securities of Moroccan listed companies are traded. The stock exchange status and institution have gone through considerable structural reforms. Initiated in 1993, the overhaul of the stock exchange was undertaken as part of a comprehensive improvement of the financial markets, with the purpose to endow the stock exchange with modern governance structure and means to bolster its position in the capital markets. In 1995, in pursuant to a set of stipulations approved by the Ministry of Finance, an organization was established and was granted the management of the stock exchange (Moroccan Capital Market Authority, 2011).

The responsibilities of the managing company are numerous, including:

- To pronounce a listing of securities on the stock exchange and their delisting
- Organize the trading sessions through an electronic system
- To ensure the compliance of the operations carried out by the brokerage companies
- To bring to the knowledge of the CDVM (Moroccan securities regulator), of any infringement it may have noted in the exercise of its mission.

In fact, the stock market is divided into several aspects, starting with the stock and bond market which comprise two compartments, the primary market and secondary market. The former compartment only addresses stocks and bond issues. It facilitates the meeting of applicants for funds that issue securities and investors looking to invest their savings. The latter compartment only addresses the exchange of previously issued securities.

We differentiate between the central and the block-trade markets. On one hand, The Casablanca Stock Exchange manages the central market, which allows for electronic comparison of supply and demand. Brokerage firms enter buy and sell orders via their trading station and the system electronics determine the equilibrium course. The central market trading session lasts from 10 hours to 13 hours, and the share price variation threshold cannot exceed 6% down or up during the same trading session in the stock exchange. On the other hand, a block operation is a transaction that occurs outside the central Market. The block market is an OTC (Over-the-Counter market) market, which means that the exchange company knows who will buy and a sell the same share at the same price ahead of time and registers the transaction with the Casablanca stock exchange. The stock exchange intervenes only for the recording of operations traded in this market. The exchange decided on the minimum block size. Large transactions are typically reserved for the market (fh2mre, 2011).

To acquire high-performance measurement instruments with a view to providing reference tools adapted to a dynamic approach to collective management, since January 1, 2002, the Casablanca Stock Exchange has launched a homogeneous range of capitalization indices complying with international standards, namely MASI and MADEX indices. MASI (Moroccan All Shares index) is considered as a capitalization

index, which includes all the listed equity-type values on the Casablanca Stock Exchange. Also taking to be a broad index, the MASI index monitor the development of the entire population of stocks on the exchange. The Moroccan All Shares index aims to present the evolution of the market as a whole and to provide a long-term reference measure for the management of equity portfolios. Moroccan Most Active Shares Index (MADEX), proves to be an instrument particularly suited to portfolio management. MADEX a compact index, which is consisting of the most active stocks in terms of liquidity measured over the previous half-year, thereby integrating stocks traded continuously on the Casablanca market. The two main indices of this range are so-called "nested" indices, thus allowing to benefit from a more detailed vision of the evolution of the different capitalizations listed on the Casablanca market, and of their contribution to market activity (LeMatin, 2001).

Conforming to the annual report of the CSE (2021), the Casablanca Stock Exchange has a capitalization of 69.1 billion euros, with 76 listed companies and 17 brokerage firms. These publicly traded companies have a monopoly on the negotiation of transferable securities admitted to official stock exchange listing. Their mission compromise as follows:

- The distribution of securities issued by legal persons making public offerings
- The safekeeping of securities
- Advise customers

3.2 Empirical Methodology and Data

3.2.1 Methodology: Event Study

Event studies are commonly adjusted to estimate the behavior of an event on the stock price or return of a company. The event study approach is contingent on the underlying

theory of "market efficiency," which implies that share prices assimilate all significant information possible toward shareholders (McWilliams & Siegel, 1997). As a matter of fact, in accordance with this approach, any distinct event is noticeable in the variations in stock prices along with stock returns, is due to the efficiency of the market (Boufama, 2013).

The event study methodology is also regarded as a technical approach that is primarily based on econometrics and statistics. This methodology also investigates the financial consequences of events related to the company activity. Majority of research using this methodology are concentrated in the finance discipline. The evaluation of the economic impact of various events on the firm as well as on the shareholder is regarded as a primary goal. Furthermore, event studies can help researchers better understand financial market efficiency. Finally, another area of study that can be conducted is evaluating the nature of competition between companies in the financial markets (MacKinlay, 1997).

After publishing their "event study methodology" in the "International Economics Review," Fama, Fisher, Jensen, and Roll (1969) sparked a revolution in the field of research in finance, but also in the fields economic and accounting. This methodology employs stock prices to explain the effects that may appear on the prices of securities following an event that is related to the company's activity. Fama et al. (1969) investigate the impact produced by the stock split transaction announcement on the shareholders "stock split", and the impact is reflected in the price of the shares.

According to Boufama (2013), event studies are concerned with calculating the difference between the securities expected return and current return. This difference is

often referred to as "abnormal profitability", but it can also be referred to as, “abnormal return”, “abnormal performance” or “residual performance”, as there are several synonyms in financial literature, such as excess return, prediction error, abnormal return, abnormal performance and residual. To estimate the abnormal returns, several models are developed to assess the expected returns in the case of no event. The most widely used ones are:

- The market model
- The mean-adjusted return model
- The market – adjusted return model
- The Capital Asset Pricing Model (CAPM)

3.2.2 The Event Study Periods and Data

To determine the event impact on the stock price and return, we pursue the MacKinlay (1997) method to identify two periods; the estimation period and the event period. In our investigation, we opt for an estimation period of 120 trading days (i.e., six months) from $t = -140$ to $t = -21$, covering the dates from August 6, 2019 to January 31, 2020 relative to the announcement day, $t=0$. The $t=0$ is the announcement day which is the announcement of the first case of coronavirus by the Moroccan government. That date is March 2, 2020 (Morocco Health Ministry, 2020). We define 60 trading days as the event window and the event window covers a period from $t = -20$ to $t = +40$ around the event date $t = 0$. Figure 2 depicts the important dates in the event study methodology.

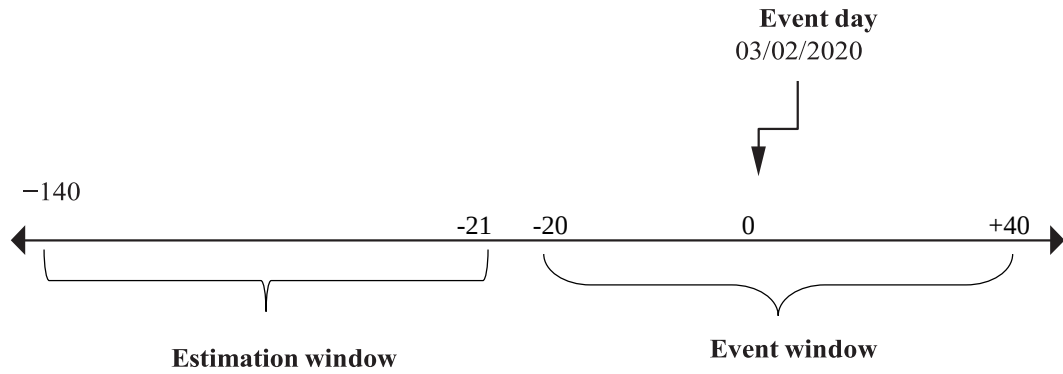


Figure 2. Timeline for the event (in days)

We use Microsoft Excel for the empirical analysis, and we collect our data from the official CSE website (Casablanca Stock Exchange). The data cover eleven industries including the Moroccan All Shares Index (MASI), considering sectoral indices ASSUR:MA (Insurance Sector), SPI:MA (Real Estate Investment Companies Sector), BANK:MA (Banks Sector), AGRO:MA (Food Producers & Processors Sector), DISTR:MA (Distributors Sector), MINES:MA (Mining Sector), IMMOB:MA (Real Estate Participation And Promotion Sector), B&MC:MA (Construction & Building Materials Index), L&SI:MA (Materials, Software & Computer Services Sector), P&G:MA (Oil & Gas Sector), and SF&AF:MA (Investment Companies & Other Finance Sector). The MASI tracks the performance of all companies listed in the Casablanca Stock Exchange. It facilitates the monitoring of the development of the entire population of listed securities. The Moroccan All Shares Index is the internationally accepted index for CAS and measures the overall performance of the market (IMF, n.d.).

3.2.3 Estimating the Abnormal Returns and Testing Statistical Significance

To measure the event effect on stock price, the event study method requires estimating the abnormal returns. If the announcement of the event is good news, the abnormal returns are expected to be positive indicating an increase in the company value. In

contrast, a negative abnormal return indicates bad news and the event reduces the value of the company (Menye, 2018).

Fama et al. (1969) or FFJR propose a definition of abnormal return that incorporates the sensitivity of the securities to market movement as a whole. According to these authors, the impact of an event should be measured not by changes in the total profitability of the security, but by changes in the specific profitability alone. According to Brown and Warner (1980, 1985), abnormal or excess return is the differential in return between the security and the market as a whole. Their simulations reveal that an arbitrarily set sensitivity of one allows a more satisfactory definition of excess return than the approaches derived from the market model or the Capital Asset Pricing Model (CAPM). Brown and Warner's simulations produce an outlandish result due to the difficulties in measuring risk and sensitivity. According to Hamon and Jacquillat (1992), measurement errors on returns complicate estimates according in a context of constant risk.

It is imperative to test for the statistical significance. In the cases of abnormal returns and cumulative abnormal return, the statistical significance test shows whether the estimated return is statistically different from zero. If we detect statistical significance at the conventional levels of 1%, 5% and 10%, we can state that the event has a significant impact on stock prices.

We used the following formula to compute the daily stock return and the daily market index return. In the first place, we determine the logarithmic daily return using the following formula:

$$R_{i,t} = \ln \left[\frac{P_{i,t}}{P_{i,t-1}} \right] \quad (1)$$

where “ln” is the natural logarithm; $R_{i,t}$ represents the index return “i” on day “t”; $P_{i,t}$ indicates the index closing price on day “t”, and $P_{i,t-1}$ represents the index closing price in the previous trading day “t-1”.

To estimate the mean index return for the estimation period, the following equation is used:

$$\bar{R}_i = 1/120 \sum_{-21}^{-140} R_{i,t} \quad (2)$$

where “i” refers to the index, and “ $R_{i,t}$ ” is the daily log index return on day “t” during the estimation window (−140, −21). The mean index return is assumed to be the expected return on any day during the event window.

As we measure the abnormal returns for indices, the mean-adjusted return model is the appropriate one and the abnormal return (AR) using the mean-adjusted return model is calculated as follows:

$$AR_{i,t} = R_{i,t} - \bar{R}_i \quad (3)$$

where $R_{i,t}$ the actual log return index return of “i” index on day “t”, and $\bar{R}_i$ is the mean index return of “i” index calculated from the estimation period.

For testing the statistical significance, researchers have used a standardized abnormal return (SAR or t-test) following Patell (1976) and Dodd and Warner (1983). The AR on day “t” is normalized by the standard deviation of mean-adjusted abnormal returns of the index “i” during the estimation period. The t-test is calculated as follows:

$$t - test \text{ for } AR \text{ for index "i" on day "t"} = \frac{AR_{i,t}}{\hat{\sigma}_{\varepsilon_1}} \quad (4)$$

where $AR_{i,t}$ is the abnormal return for index “i” on day “t”, and $\hat{\sigma}_{\varepsilon_1}$ is the estimate of

standard deviation of the ARs during the estimation window. The null hypothesis of no abnormal return is rejected if the t-test result hits the conventional significance levels 1%, 5% and 10%. In line with the Central Limit Theorem, the standardized t-test converges to unit normal under the null hypothesis of no AR. The standardized t-test assumes that the individual abnormal returns are cross-sectionally independent and identically distributed.

The cumulative abnormal return (CAR) approach includes a multiple period event window. We define $CAR_i(t_0, t_1)$ as the cumulative abnormal return (CAR) of the event window (t_0, t_1) for index “i”. The CAR from t_0 to t_1 represents the summation of the abnormal returns during event window (t_0, t_1) . Lastly, the cumulative mean abnormal return of an index “i” over a window (t_0, t_1) is derived using Equation (5).

$$CAR_i(t_0, t_1) = \sum_{t=t_0}^{t_1} AR_{i,t} \quad (5)$$

Similarly, the test statistic for $CAR_i(t_0, t_1)$ is calculated as follows:

$$t_test = \frac{CAR_{i,t}}{\sqrt{T} \times \hat{\sigma}_{AR}} \quad (6)$$

where $\hat{\sigma}_{AR}$ is defined as the standard deviation of the AR during the estimation period, and $\sqrt{T}$ is the length of the event window that we are investigating. It is computed as the square root of $T = t_1 - t_0 + 1$.

3.3 Empirical Event Study Results: Moroccan All Shares Index (MASI)

In this section, we interpret the results of our empirical analysis. In Figure 3, the fluctuations of the ARs and the trend for CARs for the MASI and in Table 2, daily ARs with respective significance levels are shown. During the pre-event window (-20,

-1), abnormal returns vary in the range of [-2.01%; 1.79%]. On the trading day before the event day “0”, the market dropped by -1.03% taking a downward trend.

On the 2nd of March 2020 (Day 0), the announcement of the first case of Covid-19 in Morocco, there is no statistically significant market reaction as it is shown in Table 2. However, on the following trading day (Day +1) after the announcement, there is a statistically significant abnormal return of -1.93%, that leads the market to a descending tendency having a maximum negative AR of -8.88% (Day +10) which is the highest rate in this investigation. The Casablanca Stock Exchange had endured its reaction during the post event period with a fluctuation range of [-8.88%, 5.38%]. As it shown in Figure 3, the ARs fluctuations during the pre-event period are negligible compared to the significant fluctuations during the post event phase.

Table 2. Mean-market adjusted ARs and CARs over the event window: The MASI

DAYS (PRE-EVENT)	MEAN ADJ. AR	DAYS (EVENT AND POST-EVENT)	MEAN ADJ. AR
-20	-0.020***	0 (EVENT)	-0.007
-19	0.001	+1	-0.019***
-18	-0.001	+2	-0.007*
-17	-0.011***	+3	-0.004
-16	-0.001	+4	-0.031***
-15	0.001	+5	-0.058***
-14	-0.013***	+6	0.053***
-13	-0.001	+7	-0.005
-12	0.014***	+8	-0.067***
-11	0.010**	+9	-0.005
-10	-0.0008	+10	-0.088***
-9	-0.006	+11	-0.032***
-8	0.0002	+12	-0.034***
-7	-0.0003	+13	0.033***
-6	0.017***	+14	0.033***
-5	-0.008**	+15	0.035***
-4	0.002	+16	0.020***
-3	-0.003	+17	-0.027***
-2	-0.003	+18	-0.009**
-1	-0.010**	+19	-0.006
		+20	-0.002

Note: *, ** and *** refer to significance levels at 10%, 5% and 1%, respectively.

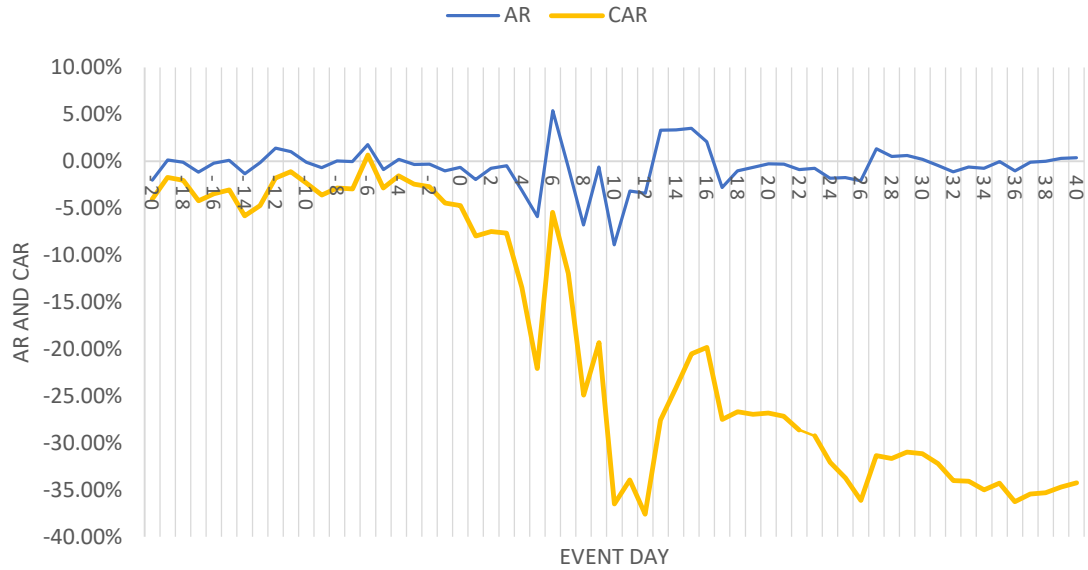


Figure 3. Daily Abnormal Returns Cumulative Abnormal Returns (-20, +40):
The Masi Index

To examine the trend in index returns of the pandemic in the CSE, we calculate the CAR for several relevant event windows as well as the statistical tests to check their significance. Table 3 displays the cumulative abnormal returns using the mean adjusted model and statistical test for the distinct event windows. We can note that the CSE endures during the pre-event period with a cumulative statistically significant CAR level of -3.43% for the pre-event window (-20, -1). Figure 3 shows prior to the announcement no significant trend in CAR is observed. Though, following the announcement, a significant downward trend in CAR is detected.

However, our results reveal that the market endures a collapse due to the spread of Covid-19 in Morocco. In the first two days after the announcement of the outbreak in Morocco, the market index decreases by -2.5% ($CAR(0,+1)$), and continues to decrease by -12.7%, -24.1%, -23.1%, -27.9%, and -31.2% respectively for the event windows $CAR(0,+5)$, $CAR(0,+10)$, $CAR(0,+20)$, $CAR(0,+30)$ and $CAR(0,+40)$.

These statistically significant negative returns are explained by the outbreak and the resulting negative effects on the stock returns of companies making up of the MASI.

Table 3. Cumulative abnormal returns of MASI Index

WINDOWS	CAR	t-test
CAR(-20,-1)	-0.034	-1.816*
CAR(-10,-1)	-0.012	-0.956
CAR(-5,-1)	-0.023	-2.445**
CAR(0,+1)	-0.025	-4.328***
CAR(0,+5)	-0.127	-12.361***
CAR(0,+10)	-0.241	-17.285***
CAR(0,+20)	-0.231	-11.975***
CAR(0,+30)	-0.279	-11.891***
CAR(0,+40)	-0.312	-11.553***

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

3.4 The CSE Sector Indices

In the sectoral analysis, we analyze the reaction of 11 sector indices to the outbreak in the Casablanca Stock Exchange. Table 4 lists these sectors and the respective number of companies in each sector index. In this section, we present the results for each sector index followed by a comparative analysis.

Table 4. The List of the Casablanca Stock Exchange Sectors

SECTOR INDEX	SYMBOL	NUMBER OF COMPANIES IN THE INDEX
Insurance Index	ASSUR:MA	5
Distributors Index	DISTR:MA	7
Banks index	BANK:MA	6
Food Producers & Processors Index	AGRO:MA	8
Real estate investment companies index	SPI:MA	3
Mining Index	MINES:MA	4
Real Estate Participation & Promotion Index	IMMOB:MA	3
Construction & Building Materials Index	B&MC:MA	8
Materials, Software & Computer Services Index	L&SI:MA	7
Oil & Gas Index	P&G:MA	3
Investment Companies & Other Finance Index	SF&AF:MA	5

3.4.1 Insurance Index (ASSUR:MA)

With a capitalization of 4.38% in 2020, and five listed companies the insurance index as the rest of the indices was severely impacted by the Covid-19 pandemic (Annual Report, 2020a). The variations of the ARs and CARs in the insurance index are shown in Figure 4 and Table 5. During the pre-announcement trading days (-20, -1), abnormal returns vary in the range of -4.3% and 4.7%. On Day -18, the market reacted negatively with a -4.3% drop, then on February 7, 2020, a positive response of 4.7% (Day -11) was detected, and just a few days before the announcement day, precisely on Day -5, the market dropped again to -3.3%. The changes in ARs as it shown in Figure 3, are relatively small on the pre-announcement period compared to the ARs variations during the 16 days following the announcement.

On the event day, Day “0”, no statistically significant reaction was detected. However, 4 days later, on March 6th, the market crashed by -5.1% and dropped sharply until it reached -8.3% on Day +10. Following these fluctuations, the market improved by 3.5% on Day +15.

Table 5. Mean-Market Adjusted ARs and CARs over The Event Window: The Insurance Index

DAYS (PRE-EVENT)	MEAN ADJ. AR	DAYS (EVENT AND POST-EVENT)	MEAN ADJ. AR
-20	0.021**	0 (EVENT)	-0.007
-19	0.001	+1	-0.012
-18	-0.043***	+2	-0.006
-17	-0.003	+3	0.003
-16	0.008	+4	-0.051***
-15	-0.004	+5	-0.050***
-14	-0.009	+6	0.006
-13	-0.001	+7	-0.001
-12	0.003	+8	-0.043***
-11	0.047***	+9	-0.047***
-10	0.001	+10	-0.083***
-9	-0.002	+11	-0.012
-8	-0.004	+12	-0.007
-7	0.002	+13	0.021**
-6	0.007	+14	0.025**
-5	-0.033***	+15	0.035***
-4	-0.005	+16	0.021**
-3	-0.009	+17	-0.021**
-2	0.012	+18	-0.013
-1	0.000	+19	-0.020*
		+20	-0.006

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

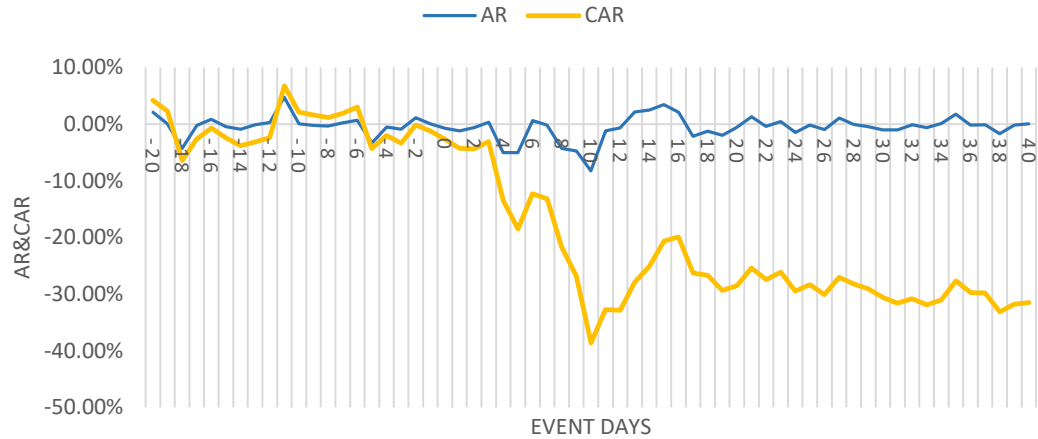


Figure 4. AR and CAR of The Insurance Index During The Estimation Window:
Insurance Index

To investigate the insurance index trend returns in the CSE, we calculated the CAR and statistical tests for several event windows. Table 4 shows the significance of the cumulative abnormal returns over the event windows. Starting with the pre-event period, no significant reaction was detected, contrary to the post-event windows we can notice a statistically significant negative CARs taking a downward trend of -12.2%, -29.1%, -26.7%, -28.3% and -30.3% respectively over the event windows (0, +5), (0, +10), (0, +20), (0, +30) and (0, +40). We can note based on Figure 4, that the variations in CARs during the pre-event phase are inconsequential compared to the high volatility in the post event period.

Table 6. Cumulative Abnormal Returns Reaction over The Event Windows: The Insurance Index

WINDOW	CAR	t-test
CAR(-20,-1)	-0.012	-0.264
CAR(-10,-1)	-0.032	-0.993
CAR(-5,-1)	-0.035	-1.545
CAR(0,+1)	-0.018	-1.284
CAR(0,+5)	-0.122	-4.810***
CAR(0,+10)	-0.291	-8.438***
CAR(0,+20)	-0.267	-5.605***
CAR(0,+30)	-0.283	-4.897***
CAR(0,+40)	-0.303	-4.551***

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

3.4.2 Distributors Index (DISTR:MA)

The distributors sector covers seven listed companies, with a market capitalization of 2.67% (Annual Report, 2020b). Table 7 captures daily abnormal returns with respective significance levels and Figure 5 depicts the fluctuations of the ARs and the trend for CARs for the distributors sector.

On Day -12, February 13th, a statistically significant positive abnormal return rate of 3.32% was identified during the pre-event period. Up on the event day no reaction was noticed, yet on the following days the distributors index noted a variation in the abnormal returns of [-6.44%, +6.09%], after the significant negative drop of -6.44% on Day +5 the market recovered by taking on a positive trend of 6.09% on the next trading day (Day +6). As previously stated, the variations in ARs during the pre-event windows are minor in comparison to the significant differences shown in Figure 5 during the 20 days following the announcement. The collapse of the index is explained by the pandemic consequences on companies operating in the distributors sector.

Table 7. Mean-Market Adjusted ARs and CARs over The Event Window: Distributors Index

DAYS (PRE-EVENT)	MEAN ADJ. AR	DAYS (EVENT AND POST-EVENT)	MEAN ADJ. AR
-20	-0.008	0 (EVENT)	-0.002
-19	-0.007	+1	-0.002
-18	-0.001	+2	-0.027*
-17	-0.009	+3	-0.018
-16	-0.004	+4	-0.044***
-15	-0.020	+5	-0.064***
-14	0.009	+6	0.060***
-13	-0.013	+7	0.010
-12	0.033**	+8	-0.062***
-11	0.000	+9	-0.008
-10	-0.002	+10	-0.027*
-9	-0.009	+11	-0.031*
-8	-0.002	+12	-0.027*
-7	-0.006	+13	0.022
-6	0.018	+14	0.027*
-5	-0.002	+15	0.034**
-4	-0.002	+16	-0.001
-3	-0.002	+17	-0.026
-2	-0.002	+18	-0.022
-1	-0.024	+19	0.005
		+20	-0.002

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

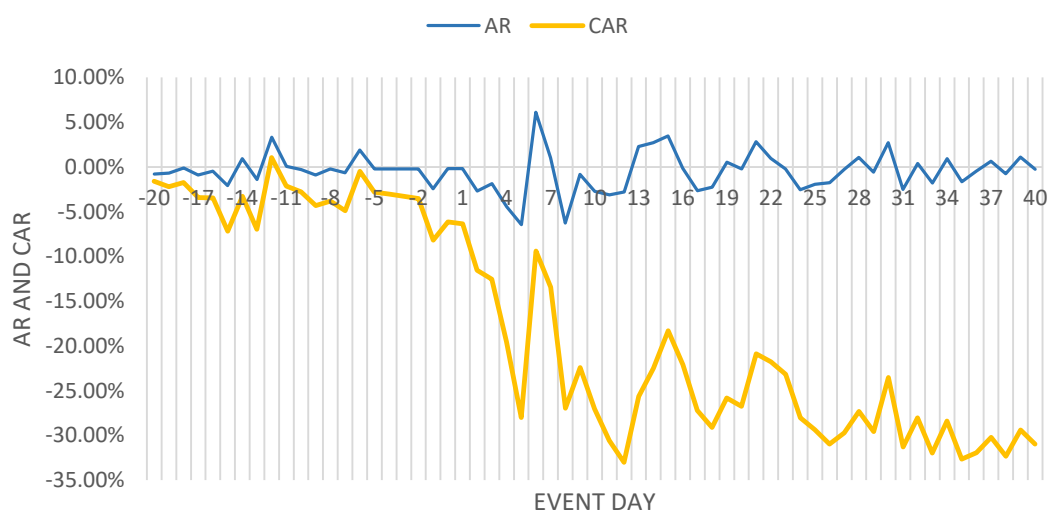


Figure 5. Daily Abnormal Returns Cumulative Abnormal Returns (-20 , +40): Distributors Index

Table 8 displays the cumulative mean abnormal returns of the distributors index across various event windows. As can be seen statistically significance cumulative abnormal returns over the post-announcement period were recorded. By cumulating the ARs, the index has a decreasing negative tendency over CAR (0, +5), CAR (0, +10), CAR (0, +20), CAR (0, +30) and CAR (0, +40) with cumulative return levels of -15.8%, -18.5%, -20.8%, -20.5% and -25% respectively. Based on Figure 5, no significant tendency in CARs is observed before the announcement. However, a significant downward trend is noticed in CARs following the first case of coronavirus declaration. These fluctuations are the results of the economic systematic downturn as a consequence of the pandemic outbreak.

Table 8. Cumulative Abnormal Returns Results of Distributors Index

WINDOW	CAR	t-test
CAR (-20,-1)	-0.057	-0.798
CAR (-10,-1)	-0.035	-0.696
CAR (-5,-1)	-0.033	-0.934
CAR (0,+1)	-0.004	-0.178
CAR (0,+5)	-0.158	-4.025***
CAR (0,+10)	-0.185	-3.484***
CAR (0,+20)	-0.208	-2.826***
CAR (0,+30)	-0.205	-2.294**
CAR (0,+40)	-0.250	-2.430**

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

3.4.3 Banks Index (BANK:MA)

Due to the pandemic shock on the Moroccan stock market, the bank index with a capitalization of 32.84% and six listed companies faced a serious damage in line with the declaration of the virus first case (Annual Report, 2020c). This section analyses the collapse results on the index performance. Tables 9 and 10 show the results of the

abnormal returns as well as the cumulative abnormal returns adopting the mean-market adjusted model over the event period.

As it shown before the announcement in Figure 6, AR variations are small and stable compared to the significant fluctuations after the announcement. During the pre-event period, the AR range from [-1.5%, 1.3%]. We can deduce that the bank index has endured well in this period. No reaction is detected on the event day, and however, the next day on March 3rd (Day +1), the market experiences a 1.3% drop in its return, which continues until it reached -9.8% on Day +10. The ARs in this post event phase range is [-9.8%, 6.7%].

Table 9. Mean-Market Adjusted ARs and CARs over The Event Window: Banks Index

DAYS (PRE-EVENT)	MEAN ADJ. AR	DAYS (EVENT AND POST-EVENT)	MEAN ADJ. AR
-20	-0.014**	0 (EVENT)	-0.005
-19	0.001	+1	-0.013**
-18	0.003	+2	-0.003
-17	-0.007	+3	-0.006
-16	0.000	+4	-0.032***
-15	0.002	+5	-0.066***
-14	-0.009*	+6	0.067***
-13	-0.005	+7	-0.008
-12	0.013**	+8	-0.074***
-11	0.007	+9	0.003
-10	0.001	+10	-0.098***
-9	-0.003	+11	-0.032***
-8	0.001	+12	-0.039***
-7	-0.002	+13	0.038***
-6	0.012**	+14	0.037***
-5	-0.007	+15	0.037***
-4	0.002	+16	0.015**
-3	-0.003	+17	-0.032***
-2	-0.003	+18	-0.009*
-1	-0.015***	+19	-0.018***
		+20	0.002

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

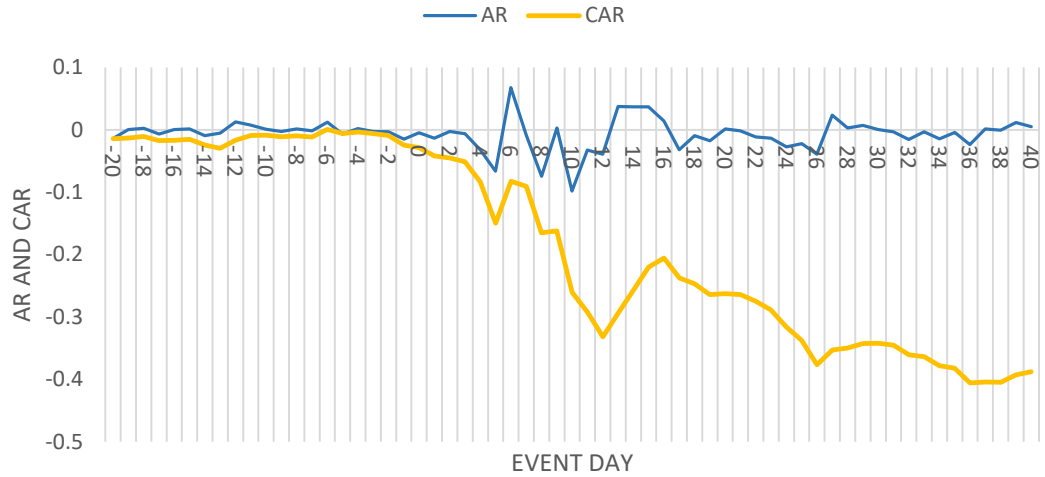


Figure 6. Daily Abnormal Returns Cumulative Abnormal Returns (-20 , +40): Banks Index

To check the banks index performance over time, we carry out a CARs analysis over several windows for the event period (-20, +40) as well as statistical tests as it shown in Table 10. Figure 6 confirms the severity of the bank sectors collapse, as we can see no significant trend is observed during the pre-announcement period, still after the announcement day the CAR variations show a decreasing trend. Starting with the pre-event period, a statistically significant cumulative negative reaction of -2.51% was detected over the window (-5, +1), and moving to the post-event windows, we can notice a statistically significant negative CARs taking a downward trend of -1.7%, -12.5%, -23.6%, -31.7% and -36.3% over the windows (0, +5), (0, +10), (0, +20), (0, +30) and (0, +40) respectively.

Table 10. Cumulative Abnormal Returns of Banks Index

WINDOWS	CAR	t-test
CAR(-20,-1)	-0.024	-0.965
CAR(-10,-1)	-0.014	-0.845
CAR(-5,-1)	-0.025	-2.005**
CAR(0,+1)	-0.017	-2.251**
CAR(0,+5)	-0.125	-9.156***
CAR(0,+10)	-0.236	-12.708***
CAR(0,+20)	-0.238	-9.284***
CAR(0,+30)	-0.317	-10.188***
CAR(0,+40)	-0.363	-10.135***

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

3.4.4 Food Producers And Processors Index (AGRO:MA)

The Food Producers and Processors Index has a market capitalization of 5.86% in the stock market covering eight listed companies and accounting for approximately 25% of the Moroccan industrial GDP (Annual Report, 2020d). However, as a result of the health crisis, this sector faced a number of limitations affecting the index's performance.

In Table 11, ARs range between -1.5% and 1.5% in the post-event period. The market dropped by -1.5% a few days before the Day 0, specifically on day -9, and then merged to 1.5% a few days before the Covid-19 first case announcement (Day -6). Table 11 shows that the ARs in the post-event period vary between [-7.9%, 5.5%]. A statistically significant negative reaction of -1.4% is detected on Day "0", the market drops further the next day by -2.1% and continues to fall until it reaches -7.9% on March 16 (Day +10). Those fluctuations are represented in Figure 7, before the announcement the ARs are minor, in contrast to the significant variations within the announcement.

Table 11. Mean-Market Adjusted ARs and CARs over The Event Window: Food Producers & Processors Index

DAYS (PRE-EVENT)	MEAN ADJ. AR	DAYS (EVENT AND POST-EVENT)	MEAN ADJ. AR
-20	-0.010	0 (EVENT)	-0.014*
-19	0.002	+1	-0.021***
-18	0.001	+2	-0.009
-17	-0.003	+3	-0.008
-16	-0.005	+4	-0.035***
-15	-0.010	+5	-0.045***
-14	0.006	+6	0.055***
-13	-0.008	+7	0.000
-12	0.006	+8	-0.076***
-11	0.007	+9	-0.009
-10	0.012	+10	-0.079***
-9	-0.015**	+11	-0.023***
-8	0.002	+12	-0.026***
-7	-0.002	+13	0.024***
-6	0.015*	+14	0.025***
-5	-0.005	+15	0.029***
-4	0.001	+16	0.029***
-3	-0.006	+17	-0.024***
-2	0.000	+18	0.000
-1	-0.003	+19	0.014*
		+20	-0.006

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

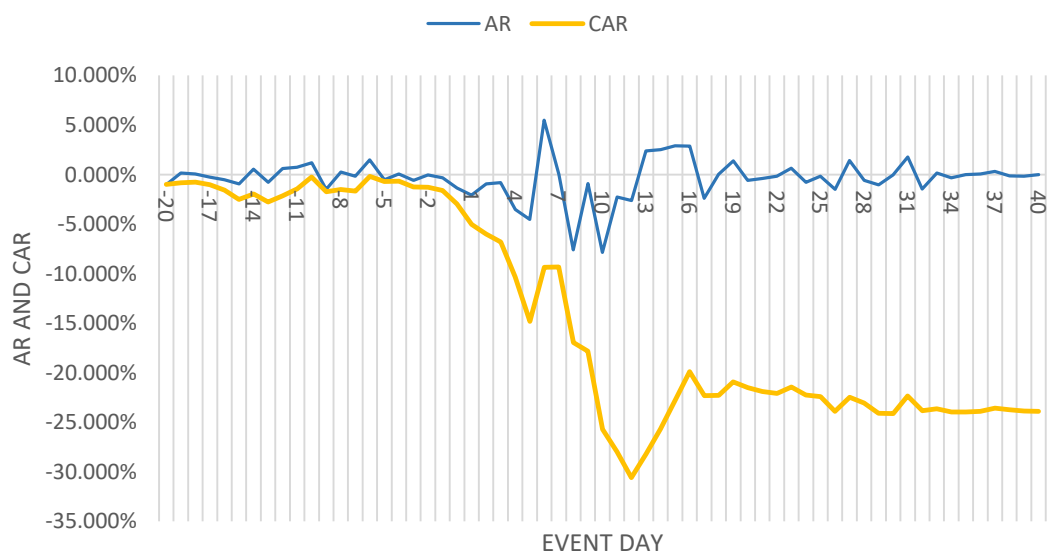


Figure 7. Daily Abnormal Returns Cumulative Abnormal Returns (-20, +40): Food Producers & Processors Index

To examine the trend in the food producers & processors index, we calculate the cumulative abnormal returns and perform statistical tests over several windows. Starting with the pre-event period, no cumulative market response is detected (see Table 12). However, in the post-event windows, we can see a statistically significant downward trend CARs of -3.4%, -13.2%, -24.1%, -19.9%, -22.5% and -22.2% over the windows (0, +1), (0, +5), (0, +10), (0, +20), (0, +30) and (0, +40) respectively. Those variations can be seen in Figure 7 as in the pre-event windows no significant trend is detected, still during the 20 days following the announcement the ARs are taking a descending shift.

Table 12. Cumulative Abnormal Returns of Food Producers & Processors Index

WINDOWS	CAR	t-test
CAR(-20,-1)	-0.015	-0.474
CAR(-10,-1)	-0.001	-0.070
CAR(-5,-1)	-0.014	-0.834
CAR(0,+1)	-0.034	-3.229***
CAR(0,+5)	-0.132	-7.163***
CAR(0,+10)	-0.241	-9.636***
CAR(0,+20)	-0.199	-5.758***
CAR(0,+30)	-0.225	-5.363***
CAR(0,+40)	-0.222	-4.615***

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

3.4.5 Real Estate Investment Companies Index (SPI:MA)

The real estate investment sector consists of three traded companies, and represents 5.08% of market capitalization along with other indexes (Annual Report, 2020e). The respective results and the trend in Table 13 and Figure 8 show the adverse effects of Covid-19 on the Real Estate Investment Companies Index. According to our findings, the announcement of the first case of the Covid-19 pandemic has a significant impact

in the market. Table 13 shows that no response is detected during pre-event phase including the event day.

However, the market endures severe fluctuations in abnormal returns. In Figure 8, the variations during the post-event period are larger compared to the changes before the announcement. Perceiving a range of [-9.5%, 7.02%], on March 10, 2020 after a drop of -5.7% on the day before (Day +5), the index recovers by achieving an abnormal rate return of 7.02% (Day +6). This pick up is followed by a significant decrease in the ARs, scoring a rate level of -9.5% on March 16,2020 (Day +10). This movement can be justified by the capital flight which leads to the collapse of asset prices in financial markets due to the fear and loss of confidence, resulting in market uncertainty.

Table 13. Mean-Market Adjusted ARs and CARs over The Event Window: Real Estate Investment Companies Index

DAYS (PRE-EVENT)	MEAN ADJ. AR	DAYS (EVENT AND POST-EVENT)	MEAN ADJ. AR
-20	-0.013	0 (EVENT)	0.000
-19	0.000	+1	-0.009
-18	0.000	+2	0.000
-17	-0.003	+3	0.008
-16	0.015	+4	-0.009
-15	0.000	+5	-0.057***
-14	0.000	+6	0.070***
-13	0.018	+7	-0.027**
-12	-0.005	+8	-0.021*
-11	-0.019	+9	-0.014
-10	-0.010	+10	-0.095***
-9	-0.001	+11	-0.034***
-8	0.000	+12	-0.034***
-7	0.005	+13	0.023*
-6	0.000	+14	0.037***
-5	0.004	+15	0.038***
-4	0.000	+16	0.015
-3	0.000	+17	-0.015
-2	0.004	+18	-0.007
-1	0.000	+19	-0.038***
		+20	0.038***

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

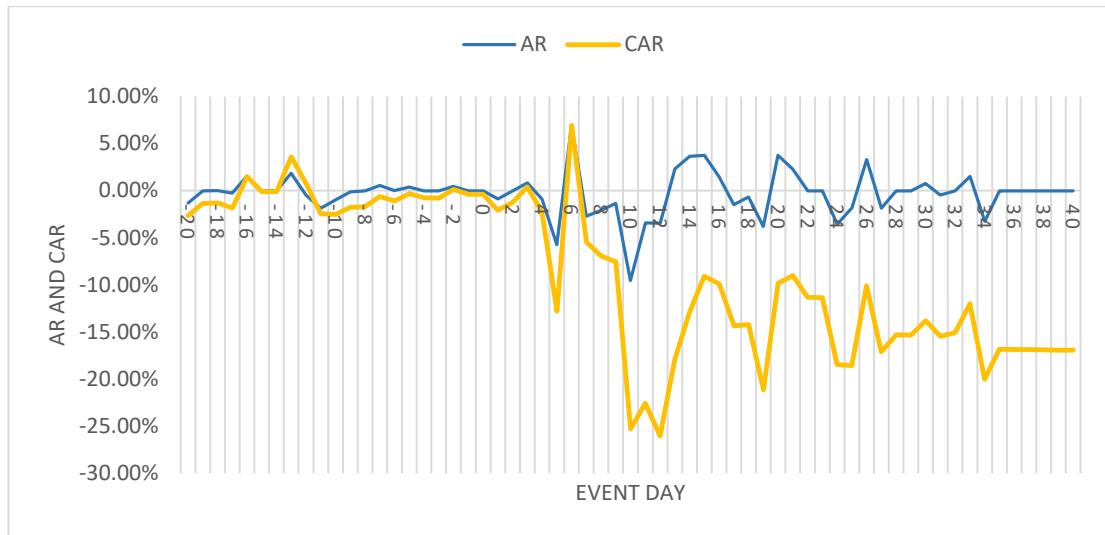


Figure 8. Daily Abnormal Returns Cumulative Abnormal Returns (-20, +40): Real Estate Investment Companies Index

Table 14 shows the findings of the CARs for the Real Estate Investment Companies Index. There were no significant CARs detected during the pre-event windows. This sector was the most adversely affected by the Covid-19 outbreak, with a noticeable decreasing tendency over the CAR (0,+5), CAR (0,+10), CAR (0,+20), CAR (0,+30) and CAR (0,+40), with CARs levels of -6.7%, -15.4%, -13.2%, -14.2% and -16.5%, respectively. The CARs trend fluctuates by taking a significant downward tendency during the post-event period. However, no significant movement were observed before the announcement.

Table 14. Cumulative Abnormal Returns Results of Real Estate Investment Companies Index

WINDOW	CAR	t-value
CAR (-20,-1)	-0.003	-0.060
CAR (-10,-1)	0.002	0.063
CAR (-5,-1)	0.007	0.279
CAR (0,+1)	-0.008	-0.501
CAR (0,+5)	-0.067	-2.196**
CAR (0,+10)	-0.154	-3.723***
CAR (0,+20)	-0.132	-2.315**
CAR (0,+30)	-0.142	-2.046**
CAR (0,+40)	-0.165	-2.075**

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

3.4.6 Mining Index (MINES:MA)

Based on the annual report of the Casablanca Stock Exchange (2020f), the mining sector has a market capitalization of 2.95% in the market, and consists of four listed companies. Mining is Morocco's most important export revenue generators, properly accounted for 20.9% of total exports in 2018. Currently the sector contributes 10% of Morocco's GDP, with 90% of this coming from phosphates, since the mining industry has long been dominated by phosphates. The kingdom remains the leading global exporter, it owns an estimated 75% of the world's total phosphate reserves (Oxford Business Group, 2020).

Figure 9 depicts the Mining Index AR fluctuations and the trend for CARs while Table 15 depicts daily ARs with their respective significance levels. However, on February 24, 2020 (Day -5), the industry reacted negatively with a rate of -3% during pre-event window (-20, -1). Moving on to event day "0" no market reaction was observed. After the announcement, the abnormal return range vary [-8.5%, 6.2%]. The market crashed

on the post-event period as well, but recovered in the days that followed, climbing to an abnormal rate of return of 6.2% on March 10, 2020 (Day +6). The fluctuations are illustrated in Figure 8, as we can see the AR variations during the estimation phase are small expect during the 20 days after the announcement.

Table 15. Mean-Market Adjusted ARs and CARs over The Event Window: Mining Index

DAYS (PRE-EVENT)	MEAN ADJ. AR	DAYS (EVENT AND POST-EVENT)	MEAN ADJ. AR
-20	0.001	0 (EVENT)	-0.013
-19	-0.005	+1	-0.021
-18	-0.002	+2	-0.015
-17	-0.001	+3	-0.001
-16	-0.010	+4	-0.029**
-15	0.003	+5	-0.076***
-14	0.008	+6	0.062***
-13	-0.006	+7	0.005
-12	-0.003	+8	-0.081***
-11	-0.003	+9	-0.029**
-10	-0.001	+10	-0.085***
-9	-0.007	+11	-0.038***
-8	0.001	+12	-0.028*
-7	0.001	+13	0.035**
-6	0.005	+14	0.028*
-5	-0.030**	+15	0.020
-4	0.015	+16	-0.010
-3	0.009	+17	-0.040***
-2	-0.021	+18	-0.014
-1	-0.021	+19	-0.034**
		+20	-0.034**

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

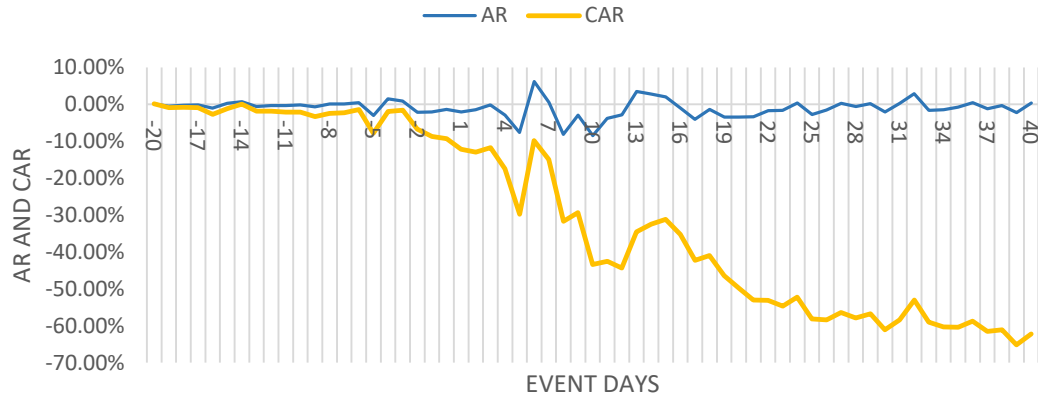


Figure 9. Daily Abnormal Returns Cumulative Abnormal Returns (-20, +40): MINING INDEX

Table 16 shows the results of aggregating the ARs over the event period as well as statistical tests for several event windows. During the pre-announcement phase, no significant cumulative abnormal returns is detected. However, we can see a statistically significant downward trend of -3.4%, -15.5%, -28.2%, -39.7%, -52.3% and -55.9% over CAR (0,+5), CAR (0,+10), CAR (0,+20), CAR (0,+30) and CAR (0,+40) in the post-event windows respectively. As we previously stated Figure 9 shows the CAR trend, we can note that during the pre-announcement windows no significant tendency is seen, just after the announcement a significant downward shift is detected.

Table 16. Cumulative Abnormal Returns of The Mining Index

WINDOWS	CAR	t-test
CAR(-20,-1)	-0.066	-1.026
CAR(-10,-1)	-0.048	-1.054
CAR(-5,-1)	-0.047	-1.476
CAR(0,+1)	-0.034	-1.665*
CAR(0,+5)	-0.155	-4.379***
CAR(0,+10)	-0.282	-5.891***
CAR(0,+20)	-0.397	-5.999***
CAR(0,+30)	-0.523	-6.506***
CAR(0,+40)	-0.559	-6.037***

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

3.4.7 Real Estate Participation & Promotion Index (IMMOB:MA)

Real Estate Participation & Promotion industry covers three listed companies with a market capitalization of 5.08% in the stock market. Figure 10 depicts a severe collapse in the Real Estate Participation & Promotion index during the event window. Overall, the market reaction to this announcement has been mainly negative. The mean-market adjusted ARs are decreasing, as it is shown in Table 17. In terms of AR variations, as shown in Figure 10, during the pre-event period, fluctuations are small-scale as to the significant fluctuations after the announcement.

Starting from the pre-announcement period, precisely two trading days prior to the event (Day -1), a significant negative AR of -4.8% was detected. The Real Estate Participation & Promotion Index recorded no reaction on the 2nd of March (Day “0”). A few days later, on March, 9 2020 (Day +5), the index experienced another drop of -8.2% followed by an increase of 9.63% manifested the next trading day (Day +6). This recovery do not last long, as it reverts to a downward slide of -9.78% on Day+10.

Table 17. Mean-Market Adjusted ARs and CARs over The Event Window: Real Estate Participation & Promotion Index

DAYS (PRE-EVENT)	MEAN ADJ. AR	DAYS (EVENT AND POST-EVENT)	MEAN ADJ. AR
-20	0.008	0 (EVENT)	0.001
-19	0.010	+1	-0.035
-18	0.001	+2	-0.005
-17	0.000	+3	0.003
-16	-0.001	+4	-0.000
-15	-0.008	+5	-0.082***
-14	-0.011	+6	0.096***
-13	0.010	+7	-0.000
-12	-0.002	+8	-0.062**
-11	-0.024	+9	-0.011
-10	0.017	+10	-0.097***
-9	-0.003	+11	-0.038
-8	0.006	+12	-0.037
-7	-0.003	+13	0.039
-6	-0.007	+14	0.040
-5	-0.009	+15	0.040
-4	0.005	+16	0.019
-3	-0.026	+17	-0.033
-2	0.005	+18	-0.028
-1	-0.048*	+19	-0.007
		+20	0.007

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

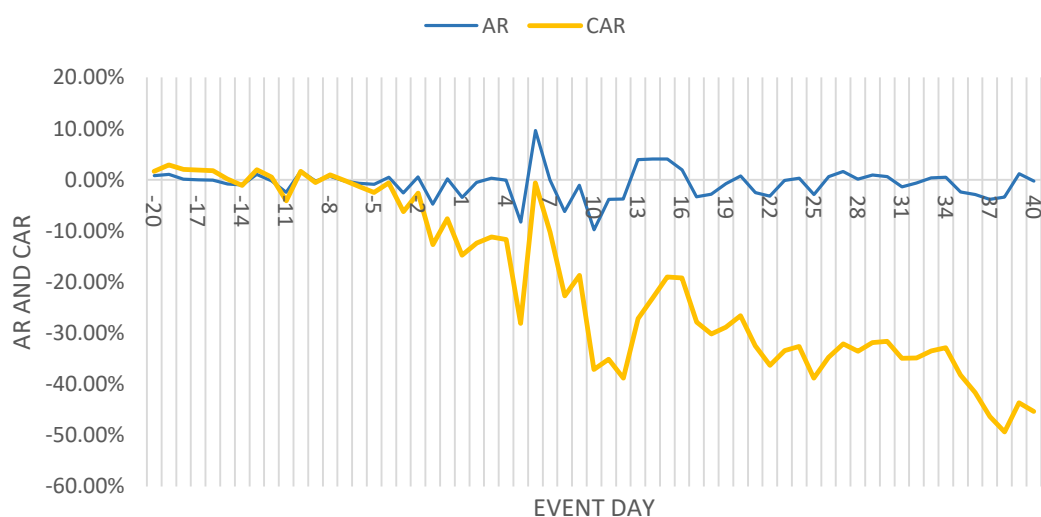


Figure 10. Daily Abnormal Returns Cumulative Abnormal Returns (-20, +40): Real Estate Participation & Promotion Index

The Real Estate Participation & Promotion Index shrank significantly following the event. As shown in Table 18, cumulative abnormal returns fell by -11.9%, -19.4%, -19.4%, -24.2% and -37.1%, respectively over CAR (0,+5), CAR (0,+10), CAR (0,+20), CAR (0,+30) and CAR (0,+40). These variations are exposed in Figure 10, as we can note the descending tendency in CAR after the announcement compared to the absence of trend significance prior to the announcement. This reaction can be explained by large impact of the Covid-19 pandemic on the Moroccan stock market.

Table 18. Cumulative Abnormal Returns of Real Estate Participation & Promotion Index

WINDOWS	CAR	t-test
CAR(-20,-1)	-0.079	-0.713
CAR(-10,-1)	-0.062	-0.790
CAR(-5,-1)	-0.072	-1.310
CAR(0,+1)	-0.033	-0.956
CAR(0,+5)	-0.119	-1.968*
CAR(0,+10)	-0.194	-2.366**
CAR(0,+20)	-0.194	-1.712*
CAR(0,+30)	-0.242	-1.757*
CAR(0,+40)	-0.371	-2.340**

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

3.4.8 Construction & Building Materials Index (B&MC:MA)

According to the annual report of the CSE (2020g), Construction & Building Materials sector has a market capitalization of 11.08% in the stock market, and has eight listed companies. The figure and tables below show the Construction & Building Materials Index's response to the pandemic spread by calculating the ARs and cumulating the ARs over the event period (-20, +40). Figure 11 illustrates the small AR fluctuations

prior to the event day. However, along with the announcement, the fluctuations get more and more pronounced.

Starting with the first phase (-20, -1), a significant positive rate of 1.8% was observed on February 10, 2020 (Day -15). The index dropped by -3.7% on the next day (Day -16), continuing its downward trend. On March 2nd, Day “0”, no reaction was recorded. Following that, on Day “+1”, the market persisted to fall before recovering on Day “+6” adapting a fluctuating trend of [-9.78%, 4.26%].

Table 19. Mean-Market Adjusted ARs and CARs over The Event Window: Construction & Building Materials Index

DAYS (PRE-EVENT)	MEAN ADJ. AR	DAYS (EVENT AND POST-EVENT)	MEAN ADJ. AR
-20	-0.000	0 (EVENT)	-0.004
-19	-0.001	+1	-0.037***
-18	-0.001	+2	-0.015
-17	-0.005	+3	-0.001
-16	-0.006	+4	-0.041***
-15	0.018*	+5	-0.061***
-14	-0.037***	+6	0.042***
-13	0.005	+7	0.002
-12	0.016*	+8	-0.077***
-11	0.013	+9	-0.013
-10	0.002	+10	-0.097***
-9	-0.022**	+11	-0.039***
-8	-0.001	+12	-0.039***
-7	0.008	+13	0.037***
-6	0.012	+14	0.037***
-5	-0.012	+15	0.038***
-4	0.007	+16	0.015
-3	0.000	+17	-0.035***
-2	-0.000	+18	-0.006
-1	-0.008	+19	-0.018*
		+20	-0.010

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

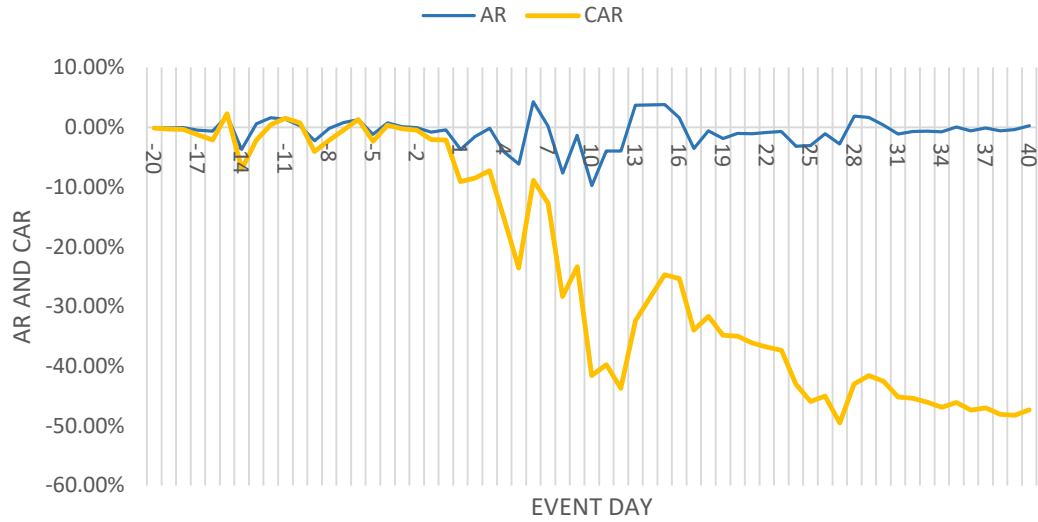


Figure 11. Daily Abnormal Returns Cumulative Abnormal Returns (-20, +40): Construction & Building Materials Index

To investigate the performance of the Construction & Building Materials Index return, we added the abnormal returns over the event period (-20, +40) in addition to statistical tests to determine their significance. Significant CARs are detected during the post-event period, as shown in Table 20. Before the announcement, no significant CAR trend is detected, as represented in Figure 11. However, after the announcement, the CAR is taking a decreasing proclivity.

In accordance with our findings, this sector encountered the impact of the Covid-19 spread during the post event phase. The index experienced a drop of -4.1% in the first two trading days following the announcement (CAR(0, +1). The CARs collapsed by -16.1%, -30.5%, -32.7%, -41.6% and -46.3% respectively for the event windows CAR(0,+5), CAR(0,+10), CAR(0,+20), CAR(0,+30) and CAR(0,+40).

Table 20. Cumulative Abnormal Returns of Construction & Building Materials Index

WINDOWS	CAR	t-test
CAR(-20,-1)	-0.012	-0.284
CAR(-10,-1)	-0.014	-0.465
CAR(-5,-1)	-0.012	-0.592
CAR(0,+1)	-0.041	-3.054***
CAR(0,+5)	-0.161	-6.842***
CAR(0,+10)	-0.305	-9.532***
CAR(0,+20)	-0.327	-7.390***
CAR(0,+30)	-0.416	-7.744***
CAR(0,+40)	-0.463	-7.492***

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

3.4.9 Materials, Software & Computer Services Index (L&SI:MA)

Materials, Software & Computer Services Index has only 1.19% market capitalization, and has seven listed companies (Annual Report, 2020h). Across this section, we analyze the empirical investigation findings. Figure 12 depicts daily variations of ARs and CAR trend. Over the pre-announcement phase, the changes in AR were negligible compared to the large fluctuations after the announcement. During the post-event window (0, +20), the abnormal returns fluctuate in the range of [-9.3%, 4.5%]. However, no significant results were detected on the pre-event period, as shown in Table 21. A sharp drop in ARs was observed immediately following the event day, with the Materials, Software & Computer Services Index collapsing to an abnormal return rate level of -9.1% on March 12, 2020 (Day +8). Over the next few days, the industry bounced from negative to a positive trend, by rising to a significant positive abnormal return of 4.5%. The Materials, Software & Computer Services Index has well resisted to the outbreak.

Table 21. Mean-Market Adjusted ARs and CARs over The Event Window: Materials, Software & Computer Services Index

DAYS (PRE-EVENT)	MEAN ADJ. AR	DAYS (EVENT AND POST-EVENT)	MEAN ADJ. AR
-20	0.003	0 (EVENT)	-0.004
-19	-0.005	+1	-0.015
-18	-0.003	+2	-0.003
-17	-0.008	+3	-0.001
-16	0.002	+4	-0.026**
-15	0.002	+5	-0.086***
-14	-0.003	+6	0.045***
-13	-0.011	+7	0.005
-12	0.002	+8	-0.091***
-11	0.005	+9	-0.025**
-10	-0.001	+10	-0.093***
-9	-0.007	+11	-0.038***
-8	0.003	+12	-0.038***
-7	0.003	+13	0.034***
-6	0.002	+14	0.037***
-5	-0.012	+15	0.036***
-4	0.006	+16	0.035***
-3	-0.009	+17	0.003
-2	0.001	+18	0.012
-1	-0.009	+19	-0.009
		+20	0.021**

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

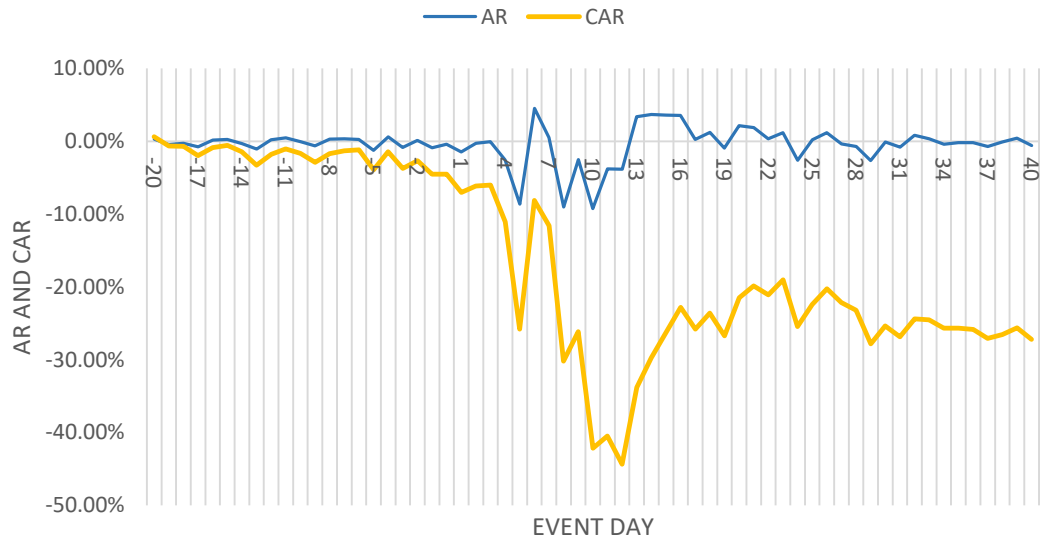


Figure 12. Daily Abnormal Returns Cumulative Abnormal Returns (-20, +40): Materials, Software & Computer Services Index

The following table exhibits the cumulative abnormal returns of the Materials, Software & Computer Services Index over several event windows. In the aim to identify the index returns of the Covid-19 in the Moroccan Stock Market, by cumulating the ARs across multiple windows. Figure 12, shows the tendency of the CARs before and after the announcement, on the pre-event period no significant trend is detected, just after the announcement a significant downward trend is noticed.

Accordingly, with Table 22 results, no significant responses are detected during the pre-event phase. Moving to the post event period, we obtained statistically significant negative results on the following windows (0, +5), (0, +10), (0, +20), (0, +30) and (0, +40), respectively, -13.4%, -29.2%, -19.9%, -21.6% and -20.9%. These negative reactions are the consequences of the pandemic outbreak.

Table 22. Cumulative Abnormal Returns of Materials, Software & Computer Services Index

WINDOWS	CAR	t-test
CAR(-20,-1)	-0.036	-0.762
CAR(-10,-1)	-0.021	-0.631
CAR(-5,-1)	-0.022	-0.937
CAR(0,+1)	-0.018	-1.247
CAR(0,+5)	-0.134	-5.129***
CAR(0,+10)	-0.292	-8.216***
CAR(0,+20)	-0.199	-4.063***
CAR(0,+30)	-0.216	-3.615***
CAR(0,+40)	-0.229	-3.342***

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

3.4.10 Oil & Gas Index (P&G:MA)

The oil and gas sectors was playing a major role in the Moroccan economy before the crisis period, noting a market capitalization of 4.27% with three listed companies (Annual Report, 2020i). The results, reported in Table 23, suggest that the Oil and Gas Index earned statistically and economically significant ARs in the event window (-20, +40). The outcomes indicate that the announcement had a negative impact on the Oil & Gas Index volatility. During the pre-event period, a statistically significant negative reaction of -5.9% was recorded on the 6th of February. On March 12, 2020 (Day +8) a significant negative rate level of -6.4% is observed. However, the Oil and Gas market recovered a few days after, rising to 3.8% on March 23, 2020 (Day +15). These findings can be seen in Figure 13. The AR fluctuations are smaller in the pre-announcement period compared to the large swings detected after the announcement.

Table 23. Mean-Market Adjusted ARs and CARs over The Event Window: Oil & Gas Index

DAYS (PRE-EVENT)	MEAN ADJ. AR	DAYS (EVENT AND POST-EVENT)	MEAN ADJ. AR
-20	-0.013	0 (EVENT)	-0.001
-19	-0.018	+1	-0.012
-18	-0.001	+2	-0.001
-17	-0.059***	+3	-0.003
-16	-0.005	+4	-0.064***
-15	-0.001	+5	-0.032
-14	0.024	+6	0.034
-13	-0.005	+7	-0.027
-12	0.005	+8	-0.064***
-11	0.005	+9	-0.013
-10	0.002	+10	-0.031
-9	-0.002	+11	-0.012
-8	-0.002	+12	-0.012
-7	0.001	+13	0.009
-6	-0.001	+14	0.019
-5	-0.013	+15	0.038*
-4	0.002	+16	0.023
-3	-0.004	+17	-0.033
-2	-0.002	+18	0.006
-1	-0.015	+19	-0.033
		+20	-0.013

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

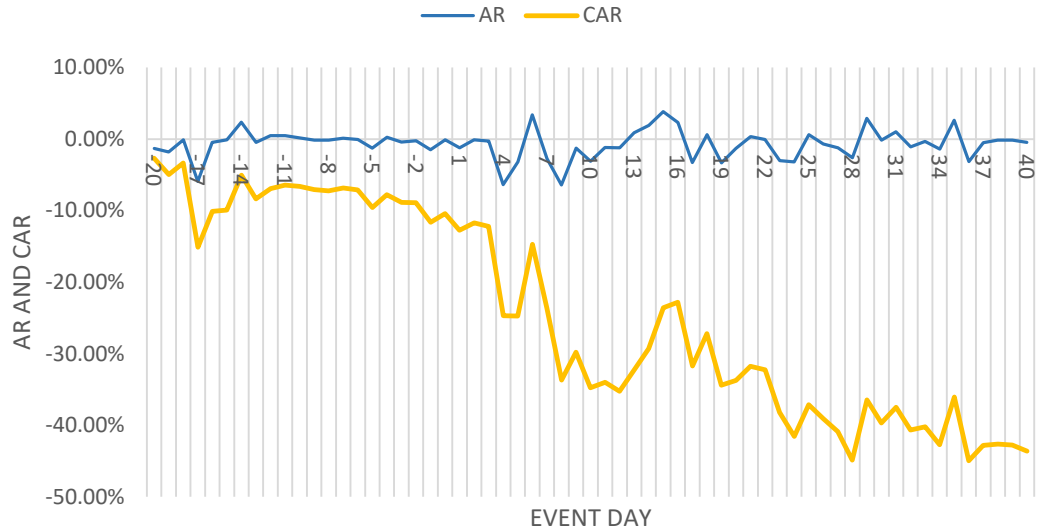


Figure 13. Daily Abnormal Returns Cumulative Abnormal Returns (-20 , +40): Oil & Gas Index

Conforming to Figure 13, a significant downward trend is observed following the announcement. As for the pre-event windows, no significant CAR trend is detected. OIL & GAS INDEX earned statistically and economically significant CARs of -11.3%, -21.4%, -22.2%, -29.3% and -32.9%, respectively, over the windows (0, +5), (0, +10), (0, +20), (0, +30) and (0, +40). These statistically significant negative returns are explained by the deceleration in the economic activity.

Table 24. Cumulative Abnormal Returns of The Oil & Gas Index:

WINDOWS	CAR	t-test
CAR(-20,-1)	-0.101	-1.051
CAR(-10,-1)	-0.032	-0.471
CAR(-5,-1)	-0.031	-0.647
CAR(0,+1)	-0.013	-0.448
CAR(0,+5)	-0.113	-2.147**
CAR(0,+10)	-0.214	-3.000***
CAR(0,+20)	-0.222	-2.251**
CAR(0,+30)	-0.293	-2.442**
CAR(0,+40)	-0.329	-2.384**

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

3.4.11 Investment Companies & Other Finance Index (SF&AF:MA)

The investment companies & other finance industry retains a market capitalization of 0.97% with five listed companies (Annual Report, 2020j). Using the mean-market adjusted model, Table 25, shows the daily ARs variations over the event window (-20, +40). As we can remark from Figure 14, during the pre-event phase, the AR variations enrolled a sense of stability, as no significant changes are detected. However, following the announcement, large AR fluctuations are observed. The index experienced a drop of -4% on March 9, 2020 (Day +5) just after the announcement but recovered immediately the next day (Day +6) with a rate increase of 3.5%. This recovery did not last long, as a significant negative drop of -6.2% was recorded in Day +10.

Table 25. Mean-Market Adjusted ARs and CARs over The Event Window: Investment Companies & Other Finance Index

DAYS (PRE-EVENT)	MEAN ADJ. AR	DAYS (EVENT AND POST-EVENT)	MEAN ADJ. AR
-20	0.004	0 (EVENT)	0.006
-19	0.002	+1	-0.016
-18	0.000	+2	0.000
-17	0.000	+3	0.000
-16	0.000	+4	-0.017
-15	0.000	+5	-0.040***
-14	0.000	+6	0.035***
-13	-0.011	+7	-0.006
-12	-0.001	+8	0.005
-11	0.000	+9	-0.012
-10	0.011	+10	-0.062***
-9	0.000	+11	0.000
-8	0.000	+12	-0.014
-7	0.000	+13	0.003
-6	-0.016	+14	0.001
-5	0.001	+15	0.000
-4	0.009	+16	-0.003
-3	0.000	+17	0.000
-2	0.000	+18	0.000
-1	0.000	+19	-0.016
		+20	-0.023*

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

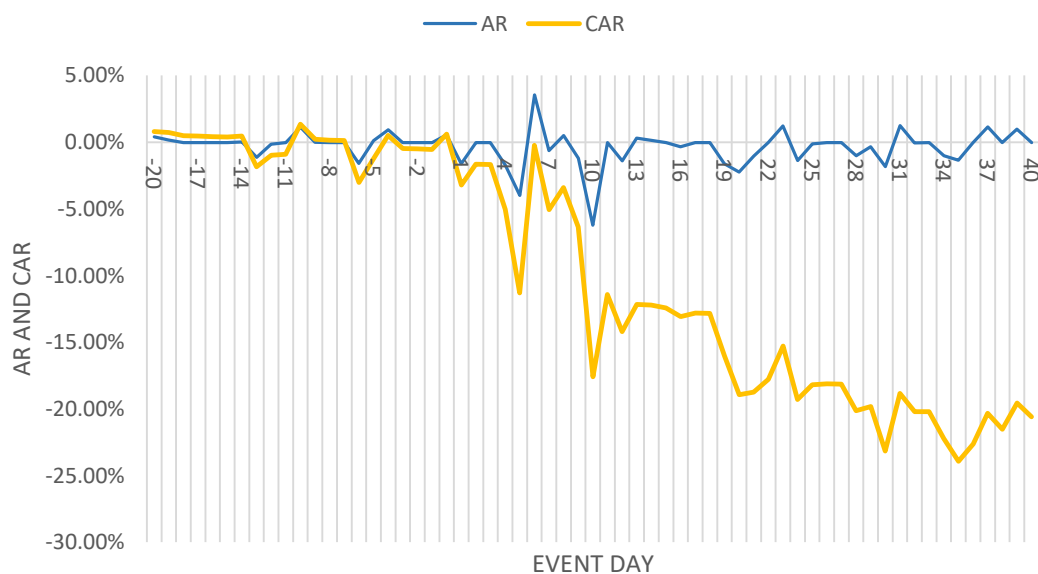


Figure 14. Daily Abnormal Returns Cumulative Abnormal Returns (-20, +40): Investment Companies & Other Finance Index

According to Figure 14, no significant CAR trend is observed over the pre-event window. However, following the announcement, a significant downward trend in CAR is detected. To assess the inclination of the Investment Companies & Other Finance Index, we aggregate the abnormal returns over the period (-20, +40) for numerous event windows to evaluate their significance. There was no discernible response during the pre-event phase. Nonetheless, our findings in Table 26 affirm that the index experienced a crash as a result of the pandemic's spread. We acquired significant negative response of -6.8%, -10.8%, -16.1%, -20.8%, and -20% during the first following five days following the announcement, by accumulating the abnormal returns over 5 days, 10 days, 20 days, 30 days, and 40 days following the event date.

Table 26. Cumulative Abnormal Returns of Investment Companies & Other Finance Index

WINDOWS	CAR	t-test
CAR(-20,-1)	-0.005	-0.097
CAR(-10,-1)	0.003	0.100
CAR(-5,-1)	0.009	0.352
CAR(0,+1)	-0.010	-0.650
CAR(0,+5)	-0.068	-2.386**
CAR(0,+10)	-0.108	-2.805***
CAR(0,+20)	-0.161	-3.023***
CAR(0,+30)	-0.208	-3.203***
CAR(0,+40)	-0.200	-2.683***

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

3.4.12 Comparative Analysis

In a situation of crisis related to the appearance of the first contaminated cases of Covid-19 in Morocco, the performance of various sectors has faced a fairly high instability. This crash created a massive sell-off of shares in the CSE's main indices,

which caused the Moroccan index collapse. Over our event period, we identified significant reaction of 11 sectors as well as the Moroccan All Share Index (MASI) in the CSE. Through this section, a comparative analysis is triggered to evaluate the impact of the panic associated with this situation.

Table 27. CAR of Industries Within The Event Windows (-20, -1), (-10, -1) and (-5, -1).

	CAR (-20,-1)	t-value	CAR (-10,-1)	t-value	CAR (-5,-1)	t-value
ASSUR:MA	-0.012	0.791	-0.032	0.322	-0.035	0.124
SPI:MA	-0.003	0.951	0.002	0.949	0.007	0.779
BANK:MA	-0.024	0.336	-0.014	0.399	-0.025**	0.047
AGRO:MA	-0.015	0.636	-0.001	0.943	-0.014	0.405
DISTR:MA	-0.057	0.426	-0.035	0.487	-0.033	0.351
MINES:MA	-0.066	0.306	-0.048	0.293	-0.047	0.142
IMMOB:MA	-0.079	0.476	-0.062	0.430	-0.072	0.192
B&MC:MA	-0.012	0.776	-0.014	0.642	-0.012	0.554
L&SI:MA	-0.036	0.447	-0.021	0.528	-0.022	0.350
P&G:MA	-0.101	0.294	-0.032	0.637	-0.031	0.518
SF&AF:MA	-0.005	0.922	0.003	0.919	0.009	0.724

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

Insurance Index: **ASSUR:MA**, Distributors Index: **DISTR:MA**, Banks index: **BANK:MA**, Food Producers & Processors Index: **AGRO:MA**, Real estate investment companies index: **SPI:MA**, Mining Index: **MINES:MA**, Real Estate Participation & Promotion Index: **IMMOB:MA**, Construction & Building Materials Index: **B&MC:MA**, Materials, Software & Computer Services Index: **L&SI:MA**, Oil & Gas Index: **P&G:MA**, Investment Companies & Other Finance Index: **SF&AF:MA**.

Table 27 compares the crisis impacts on the different indexes of the CSE. During the pre-announcement phase, no market reaction is detected except for the Banks Index. Over the window (-5, -1), a statistically negative response of -5% and a cumulative abnormal return of -2.51% are detected. This reaction can be explained by the global spread of the pandemic, which put a strain on the banking sector's liquidity.

Table 28. CAR of industries within the event windows (0, +1), (0, +5) and (0, +10).

	CAR(0,+1)	t-value	CAR(0,+5)	t-value	CAR(0,+10)	t-value
ASSUR:MA	-0.018	0.201	-0.122***	4.48E-06	-0.291***	9.38E-14
SPI:MA	-0.008	0.616	-0.067**	0.030	-0.154*	0.000
BANK:MA	-0.017**	0.026	-0.125***	1.98E-15	-0.236***	7.69E-24
AGRO:MA	-0.034***	0.001	-0.132***	7.32E-11	-0.241***	1.45E-16
DISTR:MA	-0.004	0.858	-0.158***	0.000	-0.185***	0.000
MINES:MA	-0.034*	0.098	-0.155***	2.58E-05	-0.282***	3.69E-08
IMMOB:MA	-0.033	0.340	-0.119*	0.051	-0.194**	0.019
B&MC:MA	-0.041***	0.002	-0.161***	3.69E-10	-0.305***	2.57E-16
L&SI:MA	-0.018	0.214	-0.134***	1.15E-06	-0.292***	3.06E-13
P&G:MA	-0.013	0.654	-0.113**	0.033	-0.214***	0.003
SF&AF:MA	-0.010	0.516	-0.068**	0.018	-0.200***	0.008

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

Insurance Index: **ASSUR:MA**, Distributors Index: **DISTR:MA**, Banks index: **BANK:MA**, Food Producers & Processors Index: **AGRO:MA**, Real estate investment companies index: **SPI:MA**, Mining Index: **MINES:MA**, Real Estate Participation & Promotion Index: **IMMOB:MA**, Construction & Building Materials Index: **B&MC:MA**, Materials, Software & Computer Services Index: **L&SI:MA**, Oil & Gas Index: **P&G:MA**, Investment Companies & Other Finance Index: **SF&AF:MA**.

Table 28 shows the performance of CARs for several sectors over 10 trading days (10 days post the outbreak of the news). Starting with window (0, +1), during the announcement day and the following trading day, only four sectors responded significantly to the outbreak. The construction and building materials index was the most affected industry through this window, the market noted a significant negative CAR of 4.17%. Followed by the Food Producers & Processors Index and the Mining Index which marked a drop of -3.44% and -3.40%, respectively. Lastly, the Banks Index namely the less damaged sector recording a CAR decrease of -1.78%.

Over the windows (0, +5) and (0, +10), all sectors responded negatively to the event. Starting with the 5 trading days after day “0”, the CARs collapsed more and more. As it is shown in Table 28 for CAR(0, +5), the Construction & Building Materials Index

experienced a severe break down of CAR registering a rate of -16.19%. The Real Estate Investment Companies Index compared to other indexes has well endured the outbreak along with this phase noting a CAR decrease of only -6.71%. Moving to the rest of the indices, Investment Companies & Other Finance Index, Oil & Gas Index, Real Estate Participation and Promotion Index, Insurance Index, Banks Index, Food Producers & Processors Index, Materials, Software & Computer Services Index, Mining Index, Distributors Index and Construction & Building Materials Index, earned significantly negative CARs of -6.81%, -11.35%, -12.26%, -12.56%, -13.26%, -13.48%, -15.51%, -15.84% and -16.19%, respectively.

Regarding the CAR(0, +10) window, the CSE persisted on a downward trend. The Construction & Building Materials Index recorded a cumulative abnormal rate of return level of -30.55% which is considered as the highest collapsed index over this window. Followed by the Insurance Index, Materials, Software & Computer Services Index and Mining Index with significant negative CARs of -29.25%, -29.12% and -28.26%, respectively. As for the rest of the indices, Food Producers & Processors Index, Banks Index, Oil & Gas Index, Investment Companies & Other Finance Index, Real Estate Participation and Promotion Index and Distributors Index recorded CARs of -24.10%, -23.61%, -21.48%, -20.05%, -19.45% and -18.57%, respectively. Real Estate Investment Companies Index experienced less downfall compared to other indices by recording a CAR rate level of -15.40%. We can conclude that the Moroccan stock market indices responded negatively and rapidly as the wave of coronavirus spread over the kingdom.

Table 29. CAR of industries within the event windows (0, +20), (0, +30) and (0, +40).

	CAR (0,+20)	t-value	CAR (0,+30)	t-value	CAR (0,+40)	t-value
ASSUR:MA	-0.267***	1.38E-07	-0.283***	3.11E-06	-0.303***	1.30E-05
SPI:MA	-0.132**	0.022	-0.142**	0.042	-0.165**	0.040
BANK:MA	-0.238***	9.90E-16	-0.317***	7.16E-18	-0.363***	9.58E-18
AGRO:MA	-0.199***	6.85E-08	-0.225***	4.11E-07	-0.222***	1.00E-05
DISTR:MA	-0.208***	0.005	-0.205**	0.023	-0.250**	0.016
MINES:MA	-0.397***	2.22E-08	-0.523***	1.94E-09	-0.559***	1.86E-08
IMMOB:MA	-0.194*	0.089	-0.242*	0.081	-0.371**	0.020
B&MC:MA	-0.327***	2.28E-11	-0.416***	3.66E-12	-0.463***	1.35E-11
L&SI:MA	-0.199***	8.74E-05	-0.216***	0.000	-0.229***	0.001
P&G:MA	-0.222**	0.026	-0.293**	0.016	-0.329**	0.018
SF&AF:MA	-0.161***	0.003	-0.208***	0.001	-0.200***	0.008

Note: *, ** and *** refer to significance levels 10%, 5% and 1%, respectively.

Insurance Index: **ASSUR:MA**, Distributors Index: **DISTR:MA**, Banks index: **BANK:MA**, Food Producers & Processors Index: **AGRO:MA**, Real estate investment companies index: **SPI:MA**, Mining Index: **MINES:MA**, Real Estate Participation & Promotion Index: **IMMOB:MA**, Construction & Building Materials Index: **B&MC:MA**, Materials, Software & Computer Services Index: **L&SI:MA**, Oil & Gas Index: **P&G:MA**, Investment Companies & Other Finance Index: **SF&AF:MA**.

According to the results shown in Table 29, over the event windows (0, +20), (0, +30) and (0, +40), the CSE industries significantly collapsed. The major outbreak of coronavirus in Morocco caused high volatility and fear across the CSE. The indexes experienced higher variations in CARs exceeding -20%. For instance, the Mining Index scored significant CARs of -39.76% level over the window (0, +20), and decreasing more until the CARs reached levels of -52.39% and -55.91% respectively over the windows (0, +30) and (0, +40). The mining industry recorded the highest collapse over this window relative to other industries. Besides, the Real estate investment companies index has well endured the crisis compared to the other indexes, noting a CARs decreasing tendency of -13.23%, -14.21% and -16.57% over the windows (0, +20), (0, +30) and (0, +40) respectively. This slip can be explained by the

major interventions conducted by national bodies during the previous windows to curb the pandemic spread over the territory.

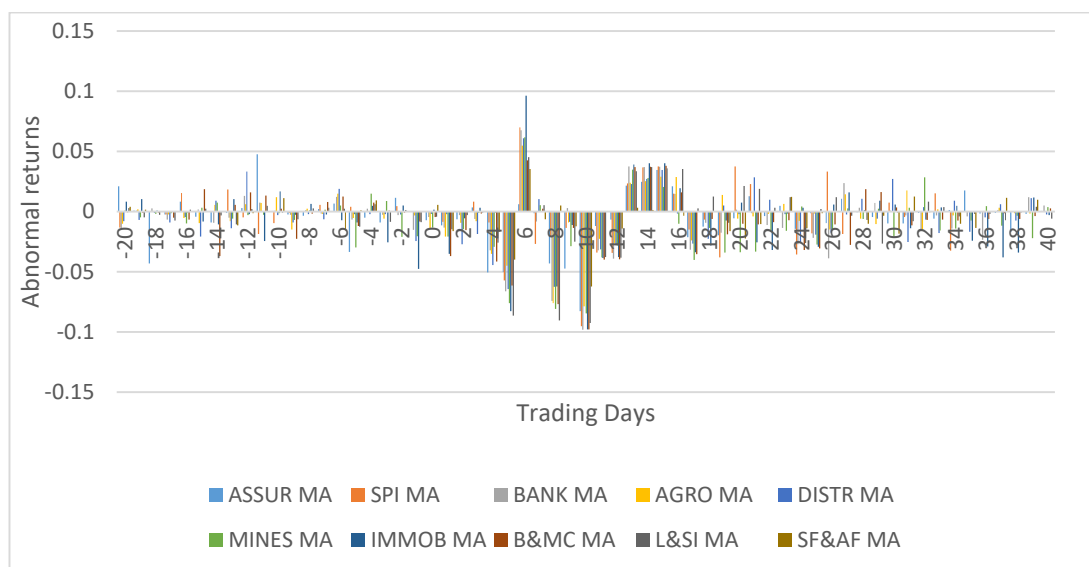


Figure 15. AR fluctuations during the event period

Figure 15 exhibits the whole picture of the ARs of various indices of the Casablanca Stock Exchange over the event period. The abnormal returns witness violent fluctuations over the announcement and the post-event period. As it is shown in Figure 15, the greatest indices collapses can be seen over Day 10.

Overall, we discovered that Covid-19 has increased stock market risk. However, our findings are diverse and heavily influenced by the sectors. All sectors were temporarily impacted, but the mining sector suffered the most accordingly with CAR analysis. This quick response mainly one of the behaviors of investors during this global pandemic which can be related to uncertainty (Ashraf, 2020), the industry's future expectations will influence the investment decision.

Chapter 4

CONCLUSION

According to the IMF's Managing Director, this Covid-19 crisis has had the worst economic consequences since the Great Depression of 1929. The World Health Organization recommended maintaining social distance to eradicate this virus spread. However due to the quick proliferation of Covid-19 cases, a global lockdown has been established. As a result, this health crisis shifted into a global economic crisis with major restrictions on international products and people's mobility as well as the crash of the stock markets and the huge drop in oil prices.

Through our study, we investigated the short-run market reaction of the Casablanca Stock Exchange performance in the course of the virus outbreak. Based on the event study methodology and considering data from the 6th of August 2019 to the 27th of April 2020, our findings suggest that the declaration of the first case of covid-19 by the Moroccan government on the 2nd of March 2020 has stimulated a severe collapse in the CSE indices.

Considering an estimation period of 6 months (120 days) and by using the mean adjusted model, our findings suggest that the Casablanca Stock Exchange performance indices had a significant negative market reaction to the Covid-19 outbreak. We remarked that within our sample period, there is almost no chance that the Covid-19

pandemic would have a positive impact on stock market performance in any of the studied industries.

Moroccan financial markets have reacted strongly to the spread of the Covid-19 pandemic across the country and have delivered eloquent negative reactions. To estimate the market reaction in the Morocco All-Share Index (MASI) relative to the post-pandemic economic consequences, we must examine daily abnormal returns as well as cumulative abnormal returns during the estimation phase. The results revealed that the MASI experienced a sharp drop of 8.88% during the event period.

Accordingly, with our empirical findings, the CSE indices withstood the Covid-19 outbreak during the pre-announcement phase. Based on Figure 14, ARs fluctuations were negligible and stable. The Real estate investment companies, the Materials, Software & Computer Services, and the Investment Companies & Other Finance Indexes were the only ones that did not respond to the outbreak. However, the CSE responded quickly and negatively to the declaration of the first Covid-19 case in Morocco. Over the announcement day, no significant ARs were detected expect for the Food Producers & Processors Sector, which responded negatively recording a drop in the abnormal return of -1.4% (see Table 10).

By accumulating AR over multiple windows, we find that the indexes continue to decline through the post event window. Our results are consistent with those of Sayed & El (2021) that shows the impact of the pandemic crisis on Moroccan stock markets and describes how the declaration of the first case of Covid-19 impacted negatively the stock market performance. Our results show that the value of the stock market index experienced larger shocks and volatility in profitability following the

announcement period. The estimated CARs collapsed, taking a decreasing trend over the post-event window. The CSE indices significantly responded to the outbreak, recording negative CARs. Six indices dropped severely through the event windows, noting: The Insurance, the Banks, the Real Estate Participation & Promotion, the Construction & Building Materials, the Oil & Gas Indexes and lastly the Mining Index which experienced the hardest hit compared to the rest of the indices. The mining index was the most damaged one through our estimation window, likewise CARs took a downward trend reaching a rate level of -55.9% (see Table 28). This collapse which could be attributed to investor concerns about restrictions and social distancing, causing mining projects to slow or put on hold until further notice.

Fear associated with financial market uncertainties related to the spread of the Coronavirus throughout the world, has a direct effect on market volatility. As a result, this fear-filled environment caused by an increase in uncertainty on financial markets, pushes investors to react quickly and irrationally.

Our findings shed light on the implications of such major events for economies like Morocco's. These results can help investors and policymakers understand stock markets behavior and reaction during such catastrophic events, along with developing appropriate risk management and business continuity strategies as the pandemic continues to disrupt the supply chain and shatter the world economy and global trade.

REFERENCES

- Ajili, W. (2020). Pourquoi la crise Covid-19 est-elle aussi inédite. *L'Economiste*, 1.
<https://www.leconomistemaghrebin.com/2020/05/01/pourquoi-crise-covid-19-est-elle-aussi-inedite/>
- Ashraf, B. N. (2020). Economic impact of government interventions during the Covid-19 pandemic: International evidence from financial markets. *Journal of Behavioral and Experimental Finance*, 27, 100371.
- Ashraf, B. N. (2020). Stock markets' reaction to COVID-19: Cases or fatalities? *Research in International Business and Finance*, 54, 101249.
- Albaity, M., Saadaoui Mallek, R., & Mustafa, H. (2022). Bank Stock Return Reactions to the COVID-19 Pandemic: The Role of Investor Sentiment in MENA Countries. *Risks*, 10(2), 43.
- Baker, S. R., Bloom, N., Davis, S. J., Kost, K., Sammon, M., & Viratyosin, T. (2020). The unprecedented stock market reaction to COVID-19. *The Review of Asset Pricing Studies*, 10(4), 742-758.
- Benmelech, E., & Tzur-Ilan, N. (2020). The determinants of fiscal and monetary policies during the COVID-19 crisis. *National Bureau of Economic Research*, (No. w27461).

- Boufama, O. (2013). The methodology of study of events a method and tools to appropriate in finance. *Journal of Human Sciences*, 29. <http://archives.univ-biskra.dz/handle/123456789/822>
- Brown, S. J., & Warner, J. B. (1980). Measuring security price performance. *Journal of Financial Economics*, 8(3), 205-258.
- Brown, S. J., & Warner, J. B. (1985). Using daily stock returns: The case of event studies. *Journal of financial economics*, 14(1), 3-31.
- Capelle-Blancard, G., & Desroziers, A. (2020). The stock market is not the economy? Insights from the COVID-19 crisis. *Insights from the COVID-19 Crisis (June 16, 2020)*. *CEPR Covid Economics*. <https://dx.doi.org/10.2139/ssrn.3638208>
- Casablanca Stock Exchange. (2019). 2019 Annual report. https://www.casablancabourse.com/BourseWeb/UserFiles/File/rapports_annuels/2019/vf/Rapport_Annuel_VUK_2019-mars_2021.pdf?csrt=11869821747849835268
- Casablanca Stock Exchange. (2021). 2021 Annual Report. https://www.casablancabourse.com/BourseWeb/UserFiles/File/rapports_annuels/2020/ANNUALREPORT_2020_V2.pdf
- Chen, M. H., Jang, S. S., & Kim, W. G. (2007). The impact of the SARS outbreak on Taiwanese hotel stock performance: an event-study approach. *International Journal of Hospitality Management*, 26(1), 200-212.

Coronavirus Pandemic: A Timeline of COVID-19 in Morocco. (2020). *Morocco World News*. <https://www.moroccoworldnews.com/2020/03/296727/coronavirus-a-timeline-of-covid-19-in-morocco>

Covid-19: the virus is plunging global stock markets. (2020, September 3). *Franceinfo*. https://www.francetvinfo.fr/sante/maladie/coronavirus/covid-19-le-virus-fait-plonger-les-bourses-mondiales_3859265.html

Crisis24, (2020). *Morocco: Health ministry confirms first COVID-19 case March 2* /update 2. Retrieved March 2,2020, from https://crisis24.garda.com/alerts/2020/03/morocco-health-ministry-confirms-first-covid-19-case-march-2-update-2?origin=fr_riskalert

Fama, E. F., Fisher, L., Jensen, M. C., & Roll, R. (1969). The adjustment of stock prices to new information. *International Economic Review*, 10(1), 1-21.

Friedman, J. (2011). *What Caused the Financial Crisis*. University of Pennsylvania Press.

Furceri D, Mazraani S, Versailles B (2013). Morocco: Selected Issues; IMF Country Report 13/110; May 2013. Technical Report 13, *International Monetary Fund*, Washington. <https://doi.org/10.5089/9781484340769.002>

Gerschel, E., Martinez, A., & Mejean, I. (2020). Propagation of shocks in global value chains: the coronavirus case. *Notes IPP*, (53).

Göker, İ. E. K., Eren, B. S., & Karaca, S. S. (2020). The impact of the COVID-19 (Coronavirus) on the Borsa Istanbul sector index returns: An event study. *Gaziantep University Journal of Social Sciences*, 19(COVID-19 Special Issue), 14-41.

Hassan 2 Foundation for Moroccans Living Abroad. (2011). What's the Stock Exchange? https://www.fh2mre.ma/fh2mre_wp/wp-content/uploads/2011/07/quest_ce_que_la-bourse.pdf

Hemrit, W., & Benlagha, N. (2021). Does renewable energy index respond to the pandemic uncertainty? *Renewable Energy*, 177, 336-347.

He, P., Sun, Y., Zhang, Y., & Li, T. (2020). COVID-19's impact on stock prices across different sectors—An event study based on the Chinese stock market. *Emerging Markets Finance and Trade*, 56(10), 2198-2212.

He, Q., Liu, J., Wang, S., & Yu, J. (2020). The impact of COVID-19 on stock markets. *Economic and Political Studies*, 8(3), 275-288.

Ibenrissoul, N., & Aouragh, N. (2022). THE EVOLUTION OF FINANCIAL MARKETS IN TIMES OF CRISIS COVID-19: A STATE OF PLAY. *IJTM International Journal of Trade and Management*, 1(1), 91-99.

International Monetary Fund. (n,d). *Special Data Dissemination Standard*. <https://dsbb.imf.org/sdds/dqaf-base/country/MAR/category/SPI00>

Jordà, Ò., Singh, S. R., & Taylor, A. M. (2022). Longer-run economic consequences of pandemics. *Review of Economics and Statistics*, 104(1), 166-175.

Kasraoui, S. (2020, March 2). *Morocco Records First Case of Coronavirus*. MOROCCO WORLD NEWS.
<https://www.moroccoworldnews.com/2020/03/295120/morocco-records-1st-case-of-coronavirus>

Kasraoui, S. (2020, March 19). *Coronavirus Pandemic: A Timeline of Covid-19 in Morocco*. MOROCCO WORLD NEWS.
<https://www.moroccoworldnews.com/2020/03/296727/coronavirus-a-timeline-of-covid-19-in-morocco>

Liu, H., Manzoor, A., Wang, C., Zhang, L., & Manzoor, Z. (2020). The COVID-19 outbreak and affected countries stock markets response. *International Journal of Environmental Research and Public Health*, 17(8), 2800.

LeMatin. (2001, December 26). MASI and MADEX, two new benchmarks. *Economy*.
<https://lematin.ma/journal/2001/Le-MASI-et-le-MADEX-deux-nouveaux-indices-de-reference/11207.html>

MacKinlay, A. C. (1997). Event Studies in Economics and Finance. *Journal of Economic Literature*, 35(1), 13–39. <http://www.jstor.org/stable/2729691>

Menye, O. A. (2018). Impact of the event study on the variation of the risk of the action: an application to the case of stock splits on the French stock market.

Congolese Management Review, 26(2), 103-144.
<https://doi.org/10.3917/rcg.026.0103>

Moroccan Capital Market Authority AMMC. (2011). *Casablanca Stock Exchange*.
<https://www.ammc.ma/en/node/197>

Moroccan Capital Market Authority, (Date de consultation : 14 Octobre 2020) : « 2^{ème} rapport trimestriel sur le profil des investisseurs en Bourse 2020 ». [en ligne]. URL: [www.ammc.ma/sites/default/files/Rapport_Profil_investisseurs_T2_2020 .pdf](http://www.ammc.ma/sites/default/files/Rapport_Profil_investisseurs_T2_2020.pdf)).

Nedelec, G & Rolland, S. (2020, March 9). Coronavirus Causes Global Stock Market Crash. *lesEchos. Edition*. <https://www.lesechos.fr/finance-marches/marches-financiers/coronavirus-les-bourses-europeennes-au-bord-du-krach-1183136>

Onali, E. (2020). Covid-19 and stock market volatility. *Available at SSRN 3571453*.
<https://dx.doi.org/10.2139/ssrn.3571453>

Ortmans, A., & Tripier, F. (2021). Quand la BCE a-t-elle stoppé la contagion de la Covid-19 aux marchés financiers ? *La Lettre du CEPII*, (416).

Oxford Business Group, (2020). *Morocco seeks to extract and process a wider variety of mineral resources*. <https://oxfordbusinessgroup.com/analysis/below-ground-mineral-producers-are-digging-more-phosphates>

- Ozkanlisoy, O. (2021). The covid-19 outbreaks effects and new inclinations in terms of logistics and supply chain activities: A conceptual framework. *Journal of Management Marketing and Logistics*, 8(2), 76-88.
- Papadamou, S., Fassas, A., Kenourgios, D., & Dimitriou, D. (2020). Direct and indirect effects of COVID-19 pandemic on implied stock market volatility: Evidence from Panel Data Analysis. <https://EconPapers.repec.org/RePEc:pra:mpapa:100020>
- Papava, V., & Charaia, V. (2020). The coronomic crisis and some challenges for the Georgian economy. *GFSIS, Expert Opinion*, (136).
- Ramelli, S., & Wagner, A. F. (2020). Feverish stock price reactions to COVID-19. *The Review of Corporate Finance Studies*, 9(3), 622-655.
- Ru, H., Yang, E., Zou, K., (2020b). What Do We Learn from SARS-CoV-1 to SARS-Cov-2: Evidence from Global Stock Markets. Working Paper Nanyang Technological University, January 2020.
- Ru, H., Yang, E., & Zou, K. (2020). What do we learn from SARS-CoV-1 to SARS-CoV-2: Evidence from global stock markets. *Available at SSRN*, 3569330.
- Salisu, A. A., Akanni, L., & Raheem, I. (2020). The COVID-19 global fear index and the predictability of commodity price returns. *Journal of Behavioral and Experimental Finance*, 27, 100383.

- Sansa, N. A. (2020). The Impact of the COVID-19 on the Financial Markets: Evidence from China and USA. *Electronic Research Journal of Social Sciences and Humanities*, 2.
- Sapir, J. (2020). Would the lock-down induced economic contraction be a prelude to a major depression? *Ekonomika i Matematicheskie Metody*, 56(3), 5-25.
- Sikich, G. W. (2005). A new planning paradigm: Economic Consequences of a Pandemic. Retrieved on NEED DATE from [http://www. continuitycentral. com/ConsequencesofPandemic. pdf](http://www.continuitycentral.com/ConsequencesofPandemic.pdf).
- Singh, B., Dhall, R., Narang, S., & Rawat, S. (2020). The outbreak of COVID-19 and stock market responses: An event study and panel data analysis for G-20 countries. *Global Business Review*, 0972150920957274.
- Stock Exchange Casablanca Regional Investment Center, CRI. (n.d.). *Stock Exchange*. <https://casainvest.ma/fr/secteurs/bourse>
- Vasileiou, E. (2021). Behavioral finance and market efficiency in the time of the COVID-19 pandemic: does fear drive the market? *International Review of Applied Economics*, 35(2), 224-241.
- Vasileiou, E., Samitas, A., Karagiannaki, M., & Dandu, J. (2021). Health risk and the efficient market hypothesis in the time of COVID-19. *International Review of Applied Economics*, 35(2), 210-223.

Wild, J., & Lebdaoui, H. (2014). Stock market performance and economic growth in Morocco. *Global Advanced Research Journal of Management and Business Studies*, 3(5), 207-216.

Yilmazkuday, H. (2021). COVID-19 effects on the S&P 500 index. *Applied Economics Letters*, 1-7. <https://ssrn.com/abstract=3555433>

Zeren, F., & Hizarci, A. (2020). The impact of COVID-19 coronavirus on stock markets: evidence from selected countries. *Muhasebe ve Finans İncelemeleri Dergisi*, 3(1), 78-84.