Investor Overreaction in Times of Health Crisis: Moroccan Stock Market Case

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ARTICLE INFO	ABSTRACT
	In this article, we try to analyze and explain the causes of the overreaction of investors within the Moroccan stock market when a new crisis context emerges, while using a behavioral analysis approach based on the index of fear. To do this, we highlight several explanatory variables linked to COVID-19 pandemic that can lead investors to react irrationally in times of health crisis. The results show that the presence of the phenomenon of investor overreaction in the Moroccan stock market in this period is explained by fear. This feeling was caused by the uncertainties in the developed financial markets in connection with the spread of the coronavirus in the world.

INTRODUCTION

COVID-19 pandemic caused major changes in the global economy over a short period of time, which made the financial markets unstable. The behavior of stock market investors was also influenced by this unprecedented situation. Several researchers note the impact of several psychological factors, during this period of crisis, on investor behavior such as overreaction (overreaction to information) and fear.

The phenomenon of investors' overreaction to information, under the influence of COVID-19, is observed in several countries and is considered the main cause of the historical collapse of the equity markets during March 2020. This collapse was also mixed with unprecedented volatility (Baker et Al. [2020]). After this observation, several researchers also suggest that the presence of this phenomenon challenges the theory of the informational efficiency hypothesis of the financial markets and it prompts researchers to find explanations based on the new current of thought that is called behavioral finance.

For its part, the Moroccan stock market, after having resisted well during the first two months of the year 2020 to the spread of the coronavirus epidemic in China, has recorded, during the month of March 2020, one of the strongest declines in the last twenty years. This collapse, due to concerns about the spread of Covid-19 virus in the world, was followed by a bullish correction phase. This market correction assumes that the reaction of investors was not correct during the period of the collapse and that the reaction of investors was exaggerated towards the epidemiological situation in Morocco, which led them to correct, starting April 2020, their exaggerated reactions by adjusting the market in the opposite direction. The market recovery has prompted us to find explanations for the market collapse during March 2020 based on the current of behavioral finance.

On this basis, the paper's aim would be to analyze and explain the causes behind the hypothesis of the overreaction of investors to the Moroccan stock market during a context marked by the health crisis related to the spread of the coronavirus (COVID-19) and its negative repercussions on the financial markets.

Faced with these findings, we ask the following question which we will try to answer throughout this paper: **How can we explain the overreaction of investors in times of health crisis?**

To do so, we need first, to confirm the presence of the overreaction phenomenon while testing the efficiency of the Moroccan stock market in times of health crisis and, second, we seek to explain, if the market is inefficient, the reasons causing the overreaction of investors. There are two main reasons for choosing the Moroccan financial market, namely: (i) the Moroccan stock market is one of the main markets of MSCI Frontier Market[1] which recorded a sharp decline

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[1] MSCI Frontier Market is a stock market index published by MSCI (formerly Morgan Stanley). It includes pre- emerging financial markets with low market capitalization and liquidity.

during March 2020, and (ii) the scarcity of scientific studies that are devoted to the impact of the health crisis on the Moroccan stock market.

This paper is organized as follows:

- First section presents a synthesis of the existing literature review on the impact of COVID-19 on the evolution of stock markets and thus on the phenomenon of information overreaction.
- Second section describes the methodology and data used in this study. Results obtained are then interpreted in the third section.

1. Summary literature review

In this section, we focus on two parts of the literature. The first one refers to the impact of the health crisis on the evolution of financial markets and the second to the phenomenon of overreaction to information.

1.1. Impact of COVID-19 on the financial markets

Pandemic is sudden and unprecedented. It has put the global economy into a crisis of historical proportions, one of the most serious crises since the 1929 one.

It brutally crippled the economy on an unprecedented scale and induced significant uncertainty in it (Baker et al. [2020]). Several scientific papers have emerged over a short period of time to investigate the economic consequences of COVID-19 pandemic. Starting with the study by Jordà, Singh, and Taylor (2020) that analyzes the medium- and long-term impact of COVID-19 on the global economy. Results of this study assume that the health crisis is expected to generate an increase in public debt and a decrease in the national savings rate. Moser and Yared (2020) also analyzed the economic consequences associated with the implementation of health restrictions and show that these measures reduce economic output but improve health prospects. In line with this, Benmelech and Tzur-Ilan (2020) analyze the fiscal and monetary policies announced by governments during COVID-19 crisis, and find that high-income countries announced larger fiscal policies than low-income countries and that a country's credit rating is the most important determinant of its fiscal spending during the pandemic.

Regarding the impact of the health crisis on the stock market, Baker et al. (2020) show, following a textual analysis on the US market, that stock market volatility reached the highest historical level during COVID-19 crisis. For their part, Ru et al. (2021) agree that stock markets in countries that did not have SARS infections in 2003 underreacted, at the beginning of the pandemic in Wuhan, to the health risks associated with COVID-19. Ortmans and Tripier (2021), on the other hand, confirm that the shock of COVID-19 to financial markets proved even more severe than that of the financial crisis that followed the Lehman Brothers bankruptcy in September 2008.

Similarly, Zhang et al. (2020) confirm, following a statistical analysis of the impact of COVID-19 pandemic on stock market risk in 12 developed countries, including China, that this health crisis created an unprecedented level of risk in global financial markets between February and March 2020. Ramelli and Wagner (2020) confirm that the US stock market reacted negatively to the health situation, which led to high volatility at the beginning of the pandemic in the US.

On the other hand, Salisu and Akanni (2020) find, through the construction of a new global fear index (GFI) based on the number of cases and deaths due to COVID-19, that the fear index is a good predictor of stock market returns in OECD and BRICS countries during the pandemic.

Overall, the unprecedented negative impact of COVID-19 health crisis on real economic activities translates into a significant negative effect on stock markets (Baker et al., 2020; Baker, Bloom, Davis, Terry et al., 2020; Barro et al. 2020; Fernandez, 2020).

At the level of the efficiency hypothesis of financial markets in times of COVID-19, Phan and Narayan (2020) empirically examine the hypothesis of overreaction of equity markets to COVID-19. The results of this study confirm the presence of the phenomenon of investor overreaction to news related to COVID-19 pandemic. This overreaction was followed over time by a bullish correction phase.

Thus, Capelle-Blancard and Desroziers (2020) evaluate, using a panel of 74 countries with daily health and economic crisis information from January to April 2020, the reaction of stock markets to public information on COVID-19, health restrictions measures and government announcements. The results suggest that stock markets initially ignored the pandemic (until February 21), before reacting strongly to the increasing number of infected people (February 23 to March 20), as volatility increased and concerns about the pandemic emerged after central bank interventions.

Finally, Vasileiou (2020) studies the efficiency of the US stock market during COVID-19 pandemic using a financial analysis approach and behavioral analysis and based on the Google Trends-based fear index. It shows that the market was not efficient during certain periods when health risk was significantly underestimated and/or ignored by investors.

1.2. The overreaction phenomenon in financial markets

The presence of abnormal returns after several weeks, following the announcement of the new information, is contradictory to the hypotheses of the theory of the efficiency of the financial markets of Eugene Fama (1965), which is based on the hypothesis of the rationality of economic agents. Indeed, for Fama (1965), a market is efficient if the prices quoted fully reflect all the information available not only in the prices but also all the public information. From these elements, it follows that the observed price of an asset on the market has a true value, called "fundamental value". According to Fama (1965), the latter is also defined as "The fundamental value of a security is equal to the mathematical risk-neutral expectation of the present value of the future

dividend flows distributed by the firm, taking into account the available information. Consequently, the abnormal returns observed after the announcement of the information generate two main phenomena, namely under- and over-reaction. Both of these phenomena imply that investors do not react rationally to the information announcement.

In contrast to what is observed on underreaction, the phenomenon of overreaction is examined in the short and long run by several works, including De Bondt and R. Thaler, (1985, 1987); Mai, (1995); P. Zarowin (1990); B.N. Lehmann (1990); A.B. Atkins and A. Dyle (1990); Clements et al, (2009); Alwathainani, (2012) and Phan and Narayan (2020). These works confirm the existence of the phenomenon of information overreaction in different stock markets. According to De Bondt and Thaler (1985), overreaction is present in the long run if stocks that performed poorly in a past period would later experience above average performance and vice versa for stocks that performed well. However, the study by N. Jegadeesh and S. Titman (1993) shows that over a short period of time, stocks with high performance show even higher future performance after one year, which supports the continuous trend of stock prices in the short run.

As for the explanation of long-term overreaction, the researchers explain this phenomenon by the cognitive errors made by investors. They give information a very high importance. Naturally, the reaction of investors to this "unexpected or striking" information leads the stock price to a level higher than its "intrinsic value" in the case of positive information and to a lower level if the information is disappointing. Subsequently, investors correct their overreactions by adjusting stock prices in the opposite direction.

In terms of empirical studies, De Bondt and Thaler [1985] form two portfolios, using the returns of NYSE stocks over the period from January 1926 to December 1982. The first "winning" portfolio is made up of 35 stocks that show the best performance during the training period. The second "loser" portfolio is also made up of 35 stocks that performed poorly during this period. Note that the three-year training period is followed by a three-year test period. The result of this study shows that the losing portfolio outperforms the winning portfolio. The figure below plots the evolution of the profitability of the two portfolios over the 3-year test period.
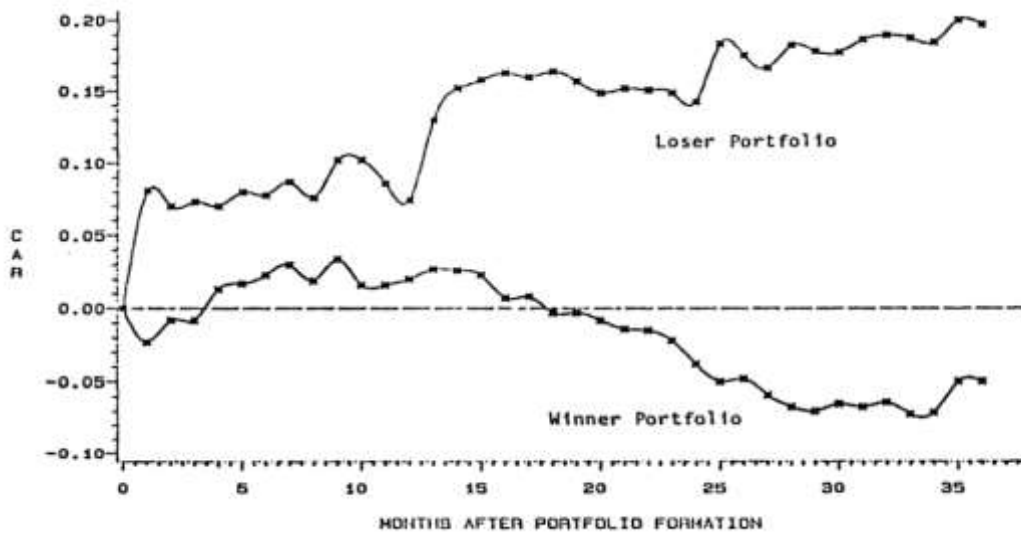

Figure 1: The evolution of the profitability of the winning and losing portfolios over the test period.

This study was further developed in 1987 and the conclusions were presented by J. Hamon and B. Jacquillat (1992): "The results of the study were presented in the form of a report on the impact of the project. Jacquillat (1992):

(i)   The presence of the January effect on the profitability of the winning and losing portfolios;

(ii)   The difference in profitability between the two types of portfolios during the test period is explained by the level of systematic risk between the losing and winning portfolios, according to Chan (1988) and Ball and Kothari (1989);

(iii)   The incorrect perception of future earnings at the time of the unexpected or striking information explains the overreaction phenomenon, according to W.F.M. De Bondt and R. Thaler (1987).

Several studies follow the same method used by De Bondt and Thaler (1985) which consists of constructing two portfolios, one a loser and the other a winner, while basing themselves on past information over the last 3 to 5 years and examining whether there will be a price reversal.

Based on this methodology, Fung (1999) observes that the losing portfolios perform 9.9% better on average over one year than the winning portfolios after the training period.

Thus, Boubaker et al. (2015) study the phenomenon of overreaction in the Egyptian stock market and they approve the presence of this phenomenon in the short run and that investors can achieve abnormal returns by selling winning stocks and buying losing stocks.

In addition, other scientific work examines the link between the overreaction phenomenon and deadly events, including epidemics.

Chen, Jang, and Kim (2007) studied the impact of the SARS epidemic on the stock price performance of hotel companies listed on the Taiwan Stock Exchange using an event study approach. This study revealed a significantly negative impact of the epidemic on the performance of the hotel sector. The results also suggest that hotel companies listed on the Taiwan Stock Exchange experienced the largest decline in stock price (approximately 29%) in the month following the SARS outbreak.

Borgards et al. (2021) examine the overreaction behavior of 20 commodity futures contracts based on intraday data from November 20, 2019 to June 3, 2020 with a focus on the impact of COVID-19 pandemic. The results show that the overreaction hypothesis was confirmed and especially during the period that was marked by COVID-19 pandemic.

The work of Phan and Narayan (2020) also indicates that stock markets appear to overreact at the beginning of the pandemic. This overreaction was followed by a bullish correction as information became more available.

Finally, Harjoto et al. (2020) study the overreaction hypothesis in 53 emerging and 23 developed countries and argue that the impact of COVID-19 on stock markets during the period of increasing infection (before April) is different from its impact during the stabilization period (after April). The market overreacted to COVID-19 at the beginning of the pandemic and then corrected when it took more of the pandemic.

2. Data and Analysis:

In order to answer our problem, we need, first, to confirm the presence of the overreaction phenomenon while testing the efficiency of the Moroccan stock market in times of health crisis and, second, we seek to explain, if the market is inefficient and if the overreaction phenomenon is observed, the reasons causing the overreaction of investors. This can be summarized in two steps:

1st step: Evaluation of the efficiency of the Moroccan stock market during COVID-19 crisis and confirmation of the presence of the overreaction phenomenon

2nd step: Explanation of the overreaction of investors by variables related to the health crisis.

In this study, the data used are the daily returns of the MASI index, the main index of the Casablanca Stock Exchange, the cumulative total of cases and deaths of COVID-19 in Morocco, Coronavirus Fear Index (CFI) based on Google Trends, Stringency index Morocco[2] and the US stock market volatility indicator (VIX). All of these data are from Bloomberg except for the fear index which was based on Google Trends data.

The period of study is spread over the year 2020, that is 250 observations for each variable. This means that all the variables are adjusted to the number of stock market sessions in the year 2020. From these data, we will analyze the overreaction of investors in the Moroccan stock market when a new context of uncertainty appears. This context is mainly related to COVID-19 pandemic that created more fear and uncertainty, causing an unprecedented level of volatility in the financial market (Albulescu [2020]).

Given the above, in order to explain investors' overreaction and to assess the efficiency of the Moroccan stock market in times of uncertainty, we examine the performance of the MASI index during the following subperiods:

- 1st sub-period: 02.01.2020-02.03.2020: from the first trading session after the first notice of the Chinese authorities[3] until the announcement of the first case of coronavirus in Morocco;

- 2nd sub-period: 03.03.2020-19.03.2020: from the announcement of the first case in Morocco to the day before the containment in Morocco;

- 3rd sub-period: 20.03.2020-31.12.2020: the post-pandemic declaration.

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[2] Stringency index Morocco is an index constructed by researchers at Oxford University that illustrates the health restrictions against COVID-19 taken by Morocco. This index measures the "stringency of containment" for virtually every country based on governmental guidelines such as school closures, domestic travel restrictions, border controls, etc. The values of this index range from 0 (= no action) to 100 (= total lockdown).

[3] On 12/31/2019, WHO was informed by Chinese authorities of an outbreak of clustered pneumonia cases, all of which were linked to a live animal market in the city of Wuhan, Hubei Province, China.
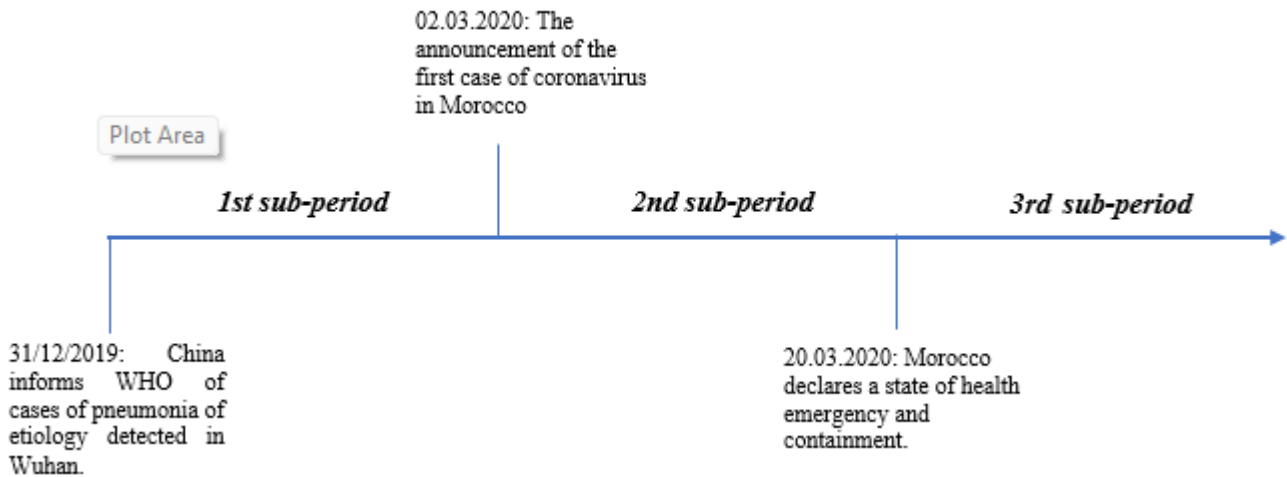
Figure 2: Timeline of COVID-19 pandemic used in our study.
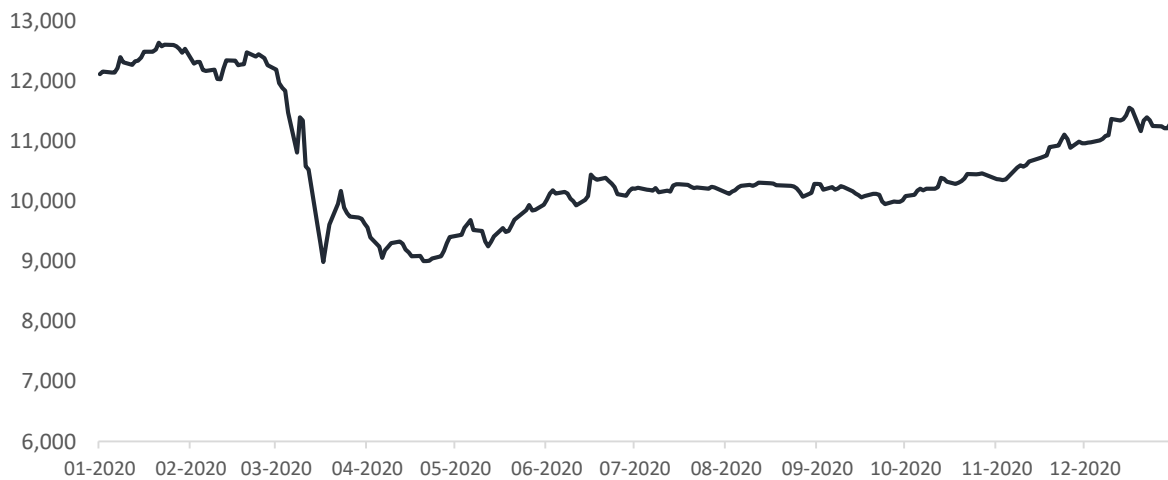
Moroccan All Shares Index, MASI

Figure 3: MASI evolution from January 2, 2020 to December 31, 2020

1st sub-period: January 02, 2020 to March 02, 2020

At the end of this first phase, the MASI index recorded a slight increase of 0.6% and a standard deviation of 0.71%. The Moroccan stock market has resisted well during the first two months of the year 2020 to the spread of the coronavirus epidemic in the world. The impact of this health crisis on the evolution of the Moroccan equity market remains, at this stage, unnoticed.

2nd sub-period: March 03, 2020 to March 19, 2020

The Moroccan stock market recorded, during this phase, a counter-performance of -23.77% and a standard deviation of 3.88%. This is one of the sharpest declines in the last twenty years. This historical collapse of the Moroccan stock market is explained by the concerns related to the extent of the spread of the coronavirus in the world and their impact on the national economic activity, which caused stress on the market.

Given these findings, our study tries explain the sharp decline recorded during this phase based on a behavioral analysis.

3rd sub-period: 20 March 2020 to 31 December 2020

After the phase that was marked by panic and market collapse, the overall index of the Casablanca Stock Exchange entered a phase of upward correction, posting a performance of 21.48% and a standard deviation of 0.88%. This correction could be explained basically by (i) the expectations of a gradual recovery in 2021 of some key listed sectors, (ii) the hope of an effective vaccine against the coronavirus that has restored investor confidence (iii) the publication of quarterly indicators that show that listed companies are resilient in the face of the current economic crisis, and (iv) the easing of monetary policy by the Moroccan central bank (Bank Al-Maghrib).

The recovery of the market during this phase has prompted us to find explanations for the market collapse during the second phase based on behavioral finance. This recovery comes in a context where the pandemic is still threatening people's lives, and the number of cases and deaths are increasing exponentially not only in Morocco, but also worldwide. The

bullish correction of the market means that the reaction of investors is not correct during the second phase and that this reaction is exaggerated in the face of the epidemiological situation in Morocco which led investors to correct during the third phase their exaggerated reactions by adjusting the market in the opposite direction. This finding is consistent with the stock market overreaction hypothesis that has been proposed by Phan and Narayan (2020) and Harjoto and al. (2020).

2.1. The efficiency of the Moroccan stock market in times of health crisis:

In this section, we use several statistical and econometric tests that are presented in financial theory (Fama [1965; 1970], Solnik [1973] and Malkiel [2003] etc.) to examine the hypothesis of the efficiency of financial markets. This empirical study is carried out on the daily data of the MASI[4] index, the main index of the Casablanca Stock Exchange, to test the hypothesis of the efficiency of financial markets (EHM) during the period of COVID-19 pandemic.

The study period is spread over the year 2020, which is 250 trading days on the Casablanca Stock Exchange (BVC). The descriptive statistics of our sample are presented in the table below.

Table 1: Descriptive Statistics for Daily Returns of the MASI Index

MASI index Daily Returns

Observations	250
Mean	-0,02%
Median	0,00%
Maximum	5,45%
Minimum	-8,82%
Std. Dev.	1,27%
Skewness	-1,85
Kurtosis	17,34
Jarque-Bera	2284,78
Probability	0,00
Sum	-0,05
Sum Sq. Dev.	0,04

a) Normality tests:

To test whether the market is efficient during the health crisis period, we performed normality tests on the daily return series of the MASI index. These tests are based on the skewness and kurtosis coefficients and the Jarque-Bera statistic. It is therefore necessary to test the null hypothesis H0:

The distribution is normal, if:
- The coefficient S of Skewness is equal to 0 ;
- The coefficient K of Kurtosis is equal to 3.

[4] The MASI index groups together all the stocks listed on the Casablanca Stock Exchange. It allows to measure the global evolution of the market.

In our study, the Skewness coefficient is less than 0, which means that the returns are shifted towards negative values. The Kurtosis coefficient is well above 3. These two tests indicate the non-normality of the series. The Jarque-Bera statistic confirms this result and shows that the MASI returns are not normally distributed.

The tests performed lead to the rejection of the H0 hypothesis of a normal distribution. Therefore, the application of non-parametric tests has become essential.

b) Non-parametric tests:

Faced with the non-normality of the distribution, the use of non-parametric tests allows us to reject the normality hypothesis of the distribution of daily returns of the MASI index. This test is widely used to examine normality in the context of tests of financial market efficiency (Fama and Blime [1966]; Islam et Al [2007]; Vasileiou [2020] etc.). The Runs test is a non-parametric test used to determine whether successive realizations of a variable are independent. This test is constructed to observe the change in sign of the variables. A "run" is then a sequence of changes of the same sign concerning the variations of output. In our case, the number of positive runs must be close to or equal to the number of negative runs, which is related to the hypothesis of efficiency of the financial markets.

The null hypothesis (H0) of the test is that the successive price changes are independent and random.

Table 2: The Runs test of the daily returns of the MASI during the study period.

Runs Test

	Daily Returns
Test Value[a]	0,0%
Cases < Test Value	125
Cases >= Test Value	125
Total Cases	250
Number of Runs	94
Z	-4,056
Asymp. Sig (2-tailed)	,000

a. Median

The more the Z-statistic exceeds its critical value, the less the time series follows a random walk process. The results of our nonparametric test indicate that the Z-statistic for the daily return series of the MASI stock index far exceeds the critical value of 1.96, which means that the null hypothesis of the random walk is rejected and that these results are in

contradiction with the hypothesis of efficient financial markets.

The main conclusion we draw from these tests is that the Moroccan stock market was not efficient during a long period of COVID-19 pandemic.

c) Stationarity tests:

To confirm the inefficiency of the Moroccan stock market during COVID-19 crisis, we apply one of the main random walk tests, unit root test (Kwiatkowski et al.1992), to determine whether it is possible to predict future returns from past returns. The assumption of efficient financial markets requires that prices are non-stationary. For this reason, our null hypothesis is the non-stationarity of the series.

The results of the unit root test applied, concerning the daily returns of the MASI index, showed that there is no unit root in the series because the Augmented Dickey-Fuller (ADF) and Phillips-Perron test statistics are negative at the Mackinnon tabulated values. On their side, the p-values are also lower than 0.05. We therefore reject the null hypothesis (the non-stationarity of the series) and conclude that the returns have no unit root and are stationary, and we also assume that the market is not efficient.

The results of these tests approve that the Moroccan stock market is inefficient during the period of the health crisis, which leads us to look for the best explanatory variables of the market inefficiency and investors' overreaction observed in the second phase of the study.

2.2. Explanatory variables of the market overreaction during the second phase:

Certainly, the explanatory variables of the overreaction are variables related to the health crisis. From this study, we will try to show the influence of all the variables which could generate an excessive reaction of the investors of the Stock Exchange of Casablanca.

In contrast to the research work conducted in developed countries which shows that the number of deaths and cases of COVID-19 have a negative influence on the performance of the stock market (Al-Awadhi et al. [2020]; Ali et al. [2020] etc.), our research work has shown that the evolution of the Moroccan stock market, during the period of our study, has not been influenced by the number of cases and deaths in Morocco. The correlation between the MASI index and the cumulative total of COVID-19 cases in Morocco is 0.13 during the whole study period. This low correlation could not be used as an explanatory variable for the evolution of the Moroccan stock market in this time of crisis. On the other hand, a significant negative correlation of -0.88 is detected during the first two phases of our study, the period from 31/12/2019 to 19/03/2020, which shows that this measure could be useful to explain the evolution of the MASI index during the early stages of the pandemic, but not during the whole year 2020.
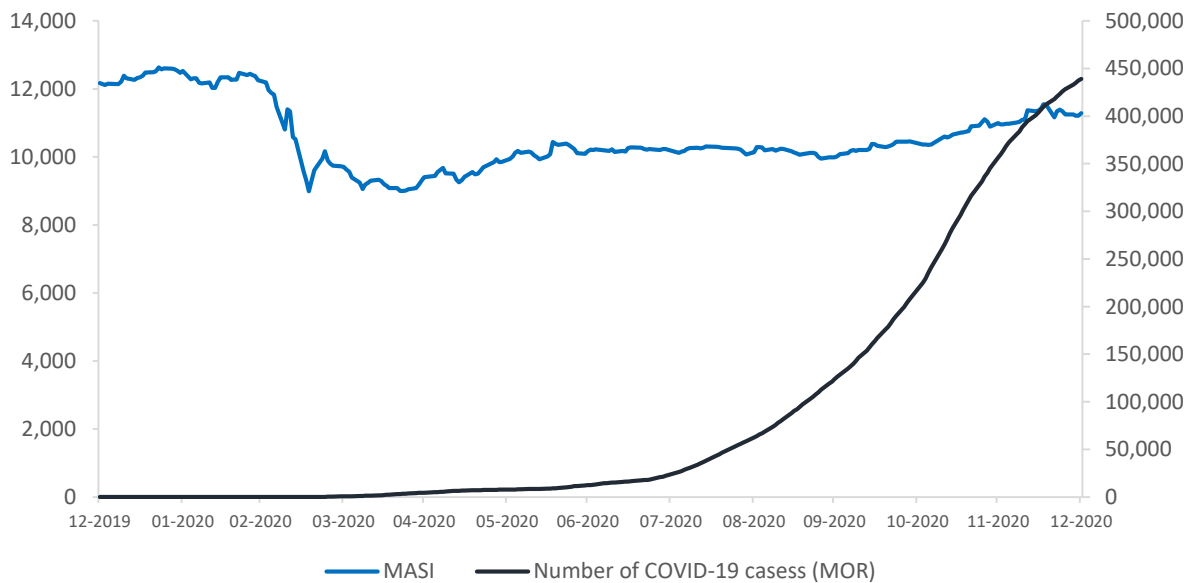

Figure 4: The evolution of the MASI and the cumulative number of COVID-19 cases in Morocco in 2020.

To determine the best variables explaining the evolution of the Moroccan stock market, we will study the influence of several other variables related to COVID-19 on the performance of the MASI index, namely: Fear Index (CFI) based on Google Trends, Stringency Index Morocco (SMI) and the volatility indicator of the US stock market (VIX). Note that the VIX index is widely followed by several global investors, including Moroccan investors, and is deemed by

Mele et Al. (2015) as an indicator of uncertainty in financial markets.

On the fear sentiment side, we created a Coronavirus Fear Index (CFI) based on Google searches of the term "coronavirus" in Morocco. This index varies between 0 and 100, the higher the number of Google searches for the term "coronavirus", the higher the value of the index, the higher the fear and vice versa. The purpose of creating this index is

to quantitatively measure the fear generated by the pandemic in our analysis of investor overreaction to the Moroccan stock market.

The results suggest that the Fear Index (CFI), the Volatility Indicator of the US stock market (VIX) and Stringency Index Morocco (SIM) have a significant influence on the evolution of the main index of the Casablanca Stock Exchange during this period of health crisis.

As presented in Figure 4 and Table 3, the evolution of the MASI index is negatively correlated with the Fear Index (CFI), the S&P500 volatility indicator and Stringency index Morocco. This approves the existence of an influence of these three variables on the evolution of the Moroccan stock market during our study period.

Table 3: The correlation matrix between the MASI and the main explanatory variables.

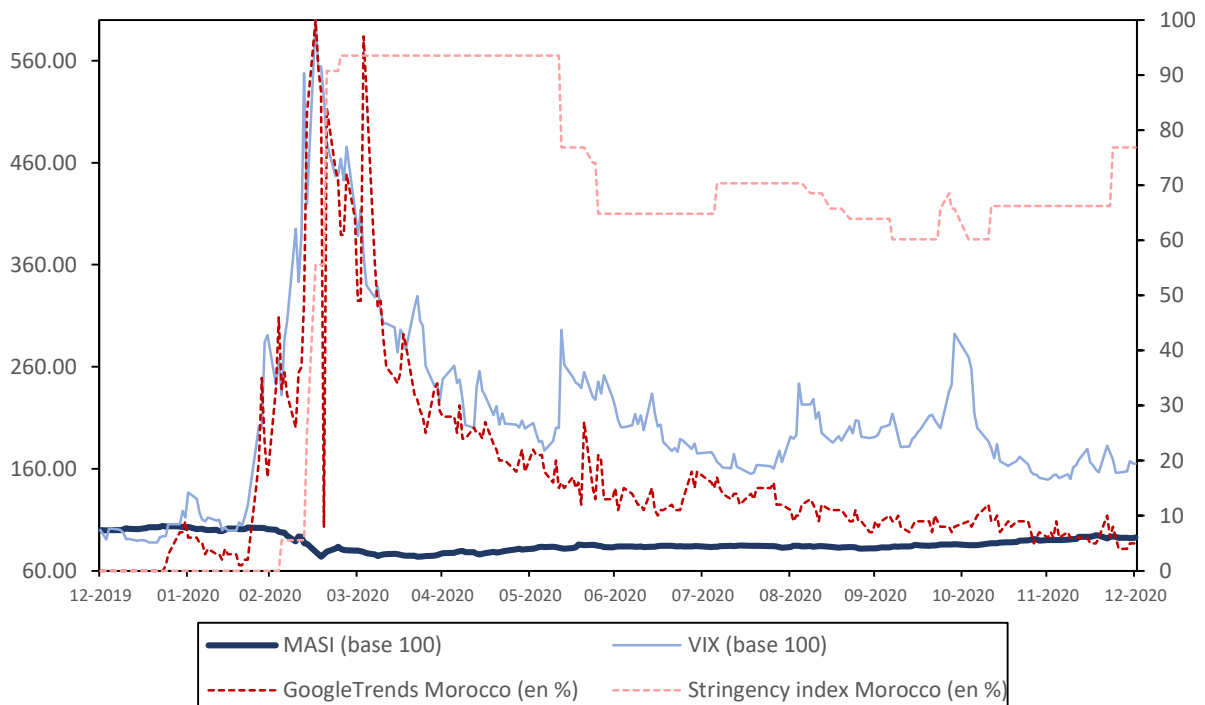|	*MASI*	*VIX*	*GoogleTrends Morocco*	*Stringency index Morocco*
MASI	1			
VIX	-0,58	1		
GoogleTrends Morocco	-0,49	0,86	1	
Stringency index Morocco	-0,89	0,38	0,34	1

Figure 5: The evolution of the MASI and the main explanatory variables.

In detail, we try to deepen our study, using the Granger causality test[5], in order to draw statistical conclusions on the influence of these variables on the evolution of the MASI index during the crisis of COVID-19.

Table 4: Granger causality test.

Granger Causality Tests	F-Statistic	Prob.
Fear index not Granger Cause MASI	8,00371	0,0004
VIX does not Granger Cause MASI	4,14579	0,017
SIM does not Granger Cause MASI	1,36068	0,2584

The test allows us to establish a rigorous causality link between the Fear index based on GoogleTrends, the volatility on the American market and the evolution of the MASI index. Nevertheless, the causality link between Stringency index Morocco and the Casablanca index, MASI, is not significant, which allowed us to eliminate this variable.

These statistical results indicate that the Fear index based on GoogleTrends and the volatility on the US market are the main variables causing an overreaction of the Moroccan stock market during the study period.

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[5] (Granger 1969)

3. Results

To summarize what we mentioned above, the Fear index based on GoogleTrends and the volatility in the US market are retained as explanatory variables for the overreaction of investors in the Moroccan stock market during March 2020 (the second phase of the study period).

This work approves that the cumulative number of COVID-19 cases in Morocco was an explanatory variable for the evolution of the Masi index just at the beginning of the pandemic in Morocco. However, during the third phase, the relationship between the evolution of the number of cases and the market became negative. The equity market entered a bullish correction phase as the number of cases and deaths continued to rise, not only in Morocco, but worldwide. This recovery could be explained basically by the stimulus packages associated with the monetary policy easing measures of the Moroccan central bank. Following our quantitative results and also the low number of COVID-19 cases recorded in Morocco during the second phase, we will not retain the cumulative number of COVID-19 cases as an explanatory variable for investor overreaction.

Furthermore, we used the Coronavirus Fear Index (CFI) based on Google searches of the term "coronavirus" in Morocco, which allowed us to incorporate health-related risk, to analyze the overreaction of the Moroccan equity market during the second phase. This index is a useful tool to quantitatively measure the fear generated by the pandemic and also to analyze the influence of fear on the evolution of the MASI. The results of our study show that fear is one of the main causes of the sharp decline in the Moroccan stock market. The fear caused by the coronavirus pandemic concomitantly created uncertainties in the global financial markets, including the Moroccan financial market, which led to negative returns during the second phase. These results could be useful for equity market practitioners because using the fear index, investors could understand price formation in financial markets based on market sentiment.

Also, our research showed the existence of a causal relationship between the VIX index and the MASI returns. Therefore, the volatility of the U.S. market had a significant influence on the evolution of the Moroccan stock market during the period that was marked by fear and panic. As a result, this high volatility of the US stock market caused a sell-off among investors in the Casablanca Stock Exchange.

CONCLUSION

This paper has provided quantitative evidence showing that the hypothesis of investors' overreaction in the Moroccan stock market in times of health crisis is explained by the sense of fear that was generated by the uncertainties in the developed financial markets related to the spread of coronavirus in the world. These results are consistent with those obtained by Baig et al. (2020) who suggest that the sense of fear generated by the spread of coronavirus is associated with market volatility. Based on our results, we agree that a higher level of uncertainty in the developed financial markets leads investors in the Casablanca market to obtain more information about the event, which in turn leads to an increase in the volume of research on the coronavirus. Consequently, this context marked by fear, caused by the increase in uncertainty in the financial markets, leads investors to react quickly and irrationally. In turn, emotional biases, such as fear, may be one of the explanatory variables of investors' overreaction in times of crisis and Google searches may be a useful tool to quantitatively show the influence of fear on stock market evolution and to bridge the gap between behaviorists and proponents of the efficient financial market hypothesis.

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