

The Impact of Systemic Crises on Sectoral Performance: Evidence from the Casablanca Stock Exchange

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Abstract :

The COVID-19 pandemic constituted a major systemic shock that affected financial markets unevenly across sectors and over time. This study examines the relationship between COVID-19 infection dynamics and sectoral stock performance on the Casablanca Stock Exchange from February 2020 to January 2023. It focuses on three dimensions: the association between infection rates and sectoral returns, the heterogeneity of sectoral sensitivity and resilience, and temporal variation across three pandemic waves (Wave 1: March to November 2020; Wave 2: December 2020 to August 2021; Wave 3: September 2021 to January 2023).

Using Pearson correlation analysis and one-way analysis of variance (ANOVA) on 76 listed companies, the results show a statistically significant but relatively weak and heterogeneous relationship between infection rates and sectoral performance (H1), with Pearson coefficients ranging from approximately -0.184 to 0.371. Substantial sectoral differences are observed (H2): mobility-dependent industries, such as tourism, transportation, and real estate, were among the most affected, whereas telecommunications, banking, and IT services showed greater resilience, partly supported by sustained dividend payments. The wave-based analysis (H3) indicates that 18 out of 24 sectors experienced statistically significant performance changes across pandemic waves.

This study contributes to the literature by providing a granular sectoral analysis in an emerging market context. It also proposes a conceptual behavioral transmission framework based on crisis communication intensity to interpret the declining market sensitivity observed across waves. The findings highlight important policy implications for adaptive communication strategies and targeted sectoral support during systemic crises.

Keywords : COVID-19, sectoral performance, crisis communication, sectoral resilience, emerging markets, Casablanca Stock Exchange, Pearson correlation, ANOVA.

Classification JEL : C33, G01, G11, O55.

Paper type : Empirical Research

Résumé :

La pandémie de COVID-19 a constitué un choc systémique majeur ayant affecté les marchés financiers de manière hétérogène selon les secteurs et au fil du temps. Cette étude examine la relation entre la dynamique des infections à la COVID-19 et la performance des indices sectoriels à la Bourse de Casablanca sur la période allant de février 2020 à janvier 2023. Elle s'articule autour de trois dimensions : la relation entre les taux d'infection et les rendements sectoriels, l'hétérogénéité de la sensibilité et de la résilience des secteurs, ainsi que les variations temporelles à travers trois vagues pandémiques (Vague 1 : mars à novembre 2020 ; Vague 2 : décembre 2020 à août 2021 ; Vague 3 : septembre 2021 à janvier 2023).

A partir d'une analyse de corrélation de Pearson et d'une analyse de variance (ANOVA) appliquées à un échantillon de 76 entreprises cotées, les résultats mettent en évidence une relation statistiquement significative mais relativement faible et hétérogène entre le nombre de cas et la performance sectorielle (H1), avec des coefficients de corrélation compris approximativement entre -0,184 et 0,371. Des différences substantielles apparaissent entre les secteurs (H2) : les activités dépendantes de la mobilité, telles que le tourisme, le transport et l'immobilier, figurent parmi les plus affectées, tandis que les télécommunications, le secteur bancaire et les services informatiques présentent une plus grande résilience, notamment grâce au maintien des politiques de distribution de dividendes. L'analyse par vagues (H3) indique que 18 secteurs sur 24 présentent des variations de performance statistiquement significatives.

Cette étude contribue à la littérature en proposant une analyse sectorielle fine dans un contexte de marché émergent. Elle introduit également un cadre conceptuel de transmission comportementale fondé sur l'intensité de la communication de crise afin d'interpréter la diminution progressive de la sensibilité des marchés au fil des vagues. Les résultats mettent en évidence des implications importantes pour la mise en œuvre de stratégies de communication adaptatives et de politiques de soutien sectoriel ciblées en période de crise systémique.

Mots clés : COVID-19, performance sectorielle, communication de crise, résilience sectorielle, marchés émergents, Bourse de Casablanca, corrélation de Pearson, ANOVA.

JEL Classification : C33, G01, G11, O55.

Type du papier : Recherche empirique

1. Introduction

The COVID-19 pandemic constituted an unprecedented global shock that profoundly disrupted financial markets and economic systems worldwide. A rapidly expanding body of literature has examined the impact of the pandemic on stock markets, highlighting increased volatility, heightened uncertainty, and heterogeneous sectoral effects (Baker et al., 2020; Ashraf, 2020; Zhang et al., 2020; Jomo & Chowdhury, 2020; Katole, 2023). These studies demonstrate that financial markets reacted strongly to epidemiological developments, with responses varying across countries and sectors depending on structural characteristics and levels of economic integration.

In emerging markets, and particularly within the MENA region, the effects of the COVID-19 crisis have been amplified by structural vulnerabilities, limited diversification, and a strong dependence on specific sectors such as tourism, energy, and financial services. Empirical evidence from Sub-Saharan African and comparable emerging markets suggests that pandemic-related shocks were transmitted unevenly across sectors, reflecting differences in exposure to mobility restrictions, global trade disruptions, and demand shocks (Buszko et al., 2021; Ncube et al., 2023; Msiyah et al., 2022).

In the Moroccan context, recent studies have provided important insights into the impact of COVID-19 on financial markets. These works highlight the magnitude of the initial shock, the asymmetry of market reactions, and the subsequent recovery dynamics (Bouhlal & Sedra, 2022a; Bouhlal & Sedra, 2022b; Kartobi et al., 2024; Amzil et al., 2024; Benjana, 2023). They also underline the existence of significant sectoral heterogeneity, with some sectors demonstrating resilience while others experienced sustained vulnerability.

Despite this growing body of research, the existing literature remains fragmented in several important respects. First, much of the international literature on COVID-19 and financial markets has focused on aggregate market indices, thereby masking sector-specific dynamics (Ashraf, 2020; Baker et al., 2020; Zhang et al., 2020). In the Moroccan case, although recent studies have explored market reactions and structural changes, sectoral analyses remain limited or only partially developed.

Second, while the pandemic unfolded through successive waves, limited attention has been paid to the temporal differentiation of its effects. Existing studies often focus on the initial shock or overall period averages, without systematically analyzing how sectoral performance evolved across distinct pandemic waves. In the Moroccan context, although some contributions document changes in volatility, correlations, and market structure (Amzil et al., 2024; Msiyah et al., 2022), they do not provide a comprehensive wave-based sectoral analysis covering the full period of the crisis.

Third, although the role of information and uncertainty has been widely acknowledged in the COVID-19 finance literature (Baker et al., 2020; Goodell, 2020), the specific role of crisis communication as a behavioral transmission channel between epidemiological dynamics and financial market performance remains insufficiently explored, particularly in emerging market contexts. In this regard, the present study does not aim to empirically test a formal communication model, but rather to propose a conceptual framework that helps interpret the observed decline in market sensitivity across pandemic waves.

Against this background, the central research question of this study is the following: *To what extent did COVID-19 infection dynamics influence sectoral stock performance on the Casablanca Stock Exchange, and how did this relationship vary across sectors and pandemic waves?*

To address this question, the paper pursues three main objectives. First, it examines the relationship between COVID-19 infection rates and sectoral stock performance. Second, it

analyzes the heterogeneity of sectoral sensitivity and resilience. Third, it investigates the temporal evolution of these effects across successive pandemic waves.

Using Pearson correlation analysis and a one-way analysis of variance (ANOVA) on a sample of 76 listed companies over the period from February 2020 to January 2023, this study provides a detailed sectoral perspective on the Moroccan stock market during the COVID-19 crisis.

In addition, this paper introduces a conceptual behavioral framework linking epidemiological dynamics to financial market responses through the intensity of crisis communication. This framework is intended as an interpretative tool to better understand the observed patterns, rather than as an empirically validated mechanism.

By combining sectoral analysis, temporal wave-based differentiation, and a behavioral interpretation of market dynamics, this study contributes to the literature on financial markets in emerging economies. It also provides useful insights for policymakers and investors regarding sectoral resilience and crisis management strategies.

The remainder of the paper is structured as follows. Section 2 reviews the relevant literature and presents the theoretical framework. Section 3 develops the research hypotheses. Section 4 presents the data, methodology, and empirical results. Section 5 discusses the main findings. Section 6 outlines the limitations of the study. Section 7 concludes.

2. Literature Review

This literature review is organized around three analytical dimensions aligned with the objectives of the study: (i) the relationship between pandemic dynamics and financial markets, (ii) sectoral heterogeneity and resilience mechanisms, and (iii) the temporal dimension of crisis transmission. Unlike a purely descriptive approach, this section critically discusses the convergence, divergence, and methodological limitations of existing studies.

2.1. Pandemic Dynamics and Financial Market Reactions

The impact of COVID-19 on financial markets has been extensively documented in the international literature. Several seminal contributions demonstrate that stock markets reacted strongly and immediately to pandemic-related information, particularly in the early stages of the crisis (Baker et al., 2020; Ashraf, 2020; Zhang et al., 2020; Al-Awadhi et al., 2020; Liu et al., 2020). These studies highlight a significant negative relationship between infection indicators and stock returns, although the magnitude and persistence of this effect vary across countries.

However, empirical findings are not fully consistent. While some studies confirm a direct and significant impact of infection rates on stock performance, others suggest that this relationship is mediated by information flows, policy responses, and investor sentiment (Goodell, 2020; Katole, 2023). This divergence reflects important methodological differences, including the use of daily versus aggregated data, event-study approaches versus time-series models, and cross-country versus single-market analyses.

In emerging markets, evidence suggests that financial markets exhibit stronger sensitivity to negative information than to positive signals, leading to asymmetric responses. In Morocco, for instance, stock market reactions were more pronounced during periods of deteriorating health conditions than during recovery phases (Kartobi et al., 2024). These findings point to the importance of behavioral and informational channels in shaping market responses.

Despite these contributions, most studies remain focused on aggregate indices, thereby overlooking sector-specific dynamics. This limitation justifies the need for a disaggregated analysis at the sectoral level.

2.2. Sectoral Sensitivity and Resilience to Pandemic Shocks

A second strand of the literature emphasizes the heterogeneous impact of the pandemic across economic sectors. Global evidence indicates that mobility-dependent and labor-intensive sectors such as tourism, transportation, and manufacturing were disproportionately affected, whereas technology-intensive and essential sectors demonstrated greater resilience (Buszko et al., 2021; Ncube et al., 2023).

Table 1: Immediate impact of the crisis on economic production by sector

Sector of activity	Immediate impact of the crisis on economic production
Wholesale and retail trade; repair of motor vehicles and motorcycles	High
Manufacturing activities	High
Real estate activities; administrative and commercial activities	High
Accommodation and catering activities	High
Transport, storage and communication	Medium – High
Arts, entertainment and recreation and other services	Medium – High
Extractive activities	Medium
Insurance and financial activities	Medium
Construction	Medium
Agriculture, forestry and fishing	Medium – Low
Public services	Low
Public administration and defense; compulsory social security	Low
Health and social action	Low
Education	Low

Source : International Labor Organization, (2020)

Table 1 (ILO, 2020) provides a useful overview of the immediate impact of the crisis across sectors. However, this classification relies on aggregated global data and does not account for country-specific institutional and economic differences. In addition, the static nature of this assessment does not capture dynamic adjustments over time.

Table 2. Impact of the COVID-19 Crisis on the business sector

Activity sectors	Loss in MMAD	Index	Vulnerability
Agriculture and fishing	-11316	0,317	Medium - Low
Mining industry	-6586	0,784	Medium - High
Food and tobacco	-4946	0,323	Medium - Low
Textile and manufacturing industry	-4012	0,965	High
Chemical industry	-3162	0,695	Medium
Steel and electrical industry	-7880	0,934	High
Other industries	-6115	0,824	Medium - High
Electricity and sanitation	-1137	0,245	Low
Construction	-9127	0,64	Medium
Trade	-13469	0,62	Medium
Hosting	-5483	1	High
Transportation	-5308	0,611	Medium
Post and telecommunications	-596	0,067	Low
Financial activities and insurance	-3759	0,295	Medium - Low
Real estate	-19240	0,717	Medium
Public administration	-659	0	Low
Education, health and social work	-2442	0,085	Low
Other non-financial activities	-2188	0,617	Medium

Source: Haddad et al., (2020)

Similarly, Table 2 presents a vulnerability index for Moroccan sectors. While this index provides valuable insights into sectoral exposure, it is based on aggregated loss estimates and

does not explicitly model behavioral or financial market responses. Moreover, it reflects an early-stage snapshot of the crisis and may not fully capture subsequent adaptation processes. Empirical studies highlight that resilience is not only determined by structural characteristics but also by financial strategies and investor expectations. In the Moroccan context, the “parachute effect” of dividends played a stabilizing role by sustaining investor confidence during periods of uncertainty (Amzil et al., 2024; Benjana, 2023). However, the measurement of resilience remains heterogeneous across studies, reflecting differences in methodological approaches and indicators.

2.3. Influence of Pandemic Waves and Temporal Dynamics on Market Performance

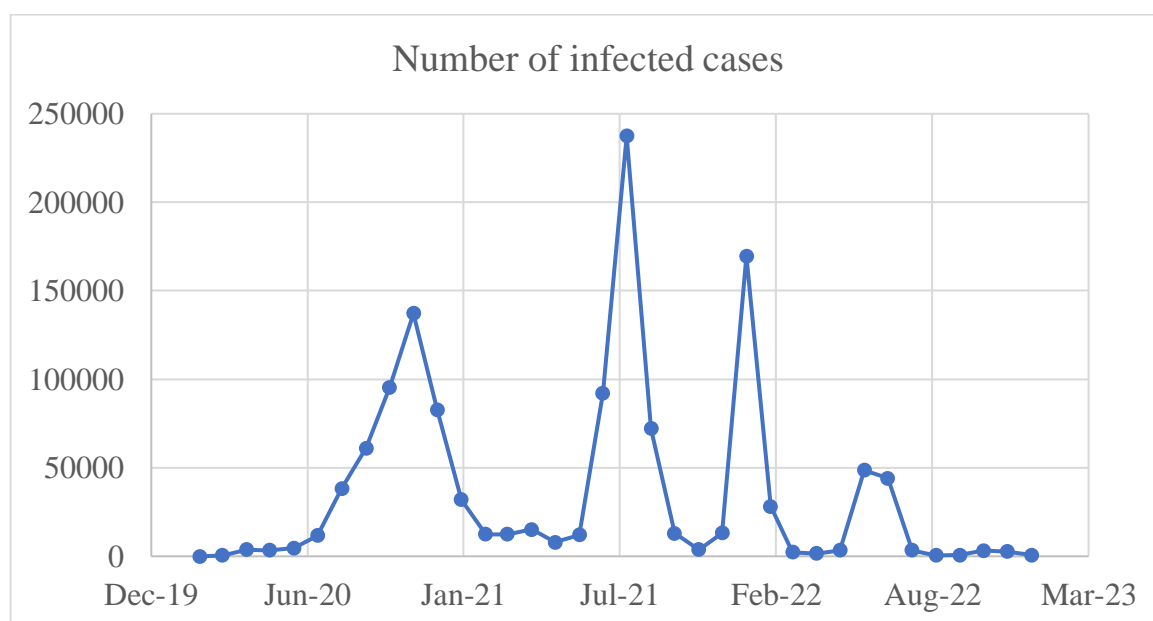
A third line of research focuses on the temporal dimension of the crisis. The COVID-19 pandemic unfolded in successive waves, each characterized by different levels of uncertainty, policy intervention, and economic adaptation.

While early studies concentrated on the initial shock, more recent contributions emphasize the importance of dynamic adjustment processes. Evidence suggests that financial markets exhibited strong overreactions during the first wave, followed by gradual adaptation in subsequent phases (Amzil et al., 2024; Msiyah et al., 2022).

However, the literature rarely provides a structured wave-based sectoral analysis. Most studies rely on aggregated time periods or focus on short-term event windows. This limitation prevents a comprehensive understanding of how sectoral performance evolved across different phases of the pandemic.

To illustrate these dynamics in the Moroccan context, the evolution of pandemic waves is presented below.

Figure 1. Evolution of infected cases from January 2020 to January 2023 in Morocco



Source: Moroccan Ministry of Health and Social Protection (2020–2023, accessed March 2024)

The first wave (March–November 2020) was characterized by high uncertainty and strict containment measures, resulting in a significant decline in stock market performance. This period can be associated with a “black swan” event, where the MASI index experienced a sharp downturn (Kartobi et al., 2024). During the second wave (December 2020–August 2021), despite higher infection rates, markets showed signs of adaptation due to vaccination campaigns, policy responses, and stable dividend distributions (Amzil et al., 2024; Benjana, 2023).

The third wave (September 2021–January 2023) corresponded to a recovery phase, although financial markets did not fully return to pre-pandemic conditions. Increased correlations between sectoral returns persisted, indicating higher systemic risk and reduced diversification opportunities (Amzil et al., 2024; Msiyah et al., 2022).

These observations reinforce the relevance of a wave-based analytical framework to understand the transition from crisis to recovery and the emergence of sectoral differentiation.

2.4. Theoretical Framework and Crisis Communication Model

This study is grounded in a multidisciplinary theoretical framework that integrates financial economics, behavioral finance, and crisis communication theory.

From a financial perspective, the Efficient Market Hypothesis (Fama, 1970) suggests that stock prices rapidly incorporate available public information, including epidemiological data and government announcements. However, the COVID-19 crisis revealed important limitations of this hypothesis, as financial markets exhibited strong overreactions and persistent deviations from fundamental values.

Behavioral finance provides complementary insights by emphasizing the role of cognitive and emotional biases such as fear, limited attention, and habituation. These mechanisms help explain why investors reacted more strongly during the initial phase of the pandemic and gradually adapted over time, reducing their sensitivity to subsequent waves.

In addition, this study incorporates insights from crisis communication theory. The Situational Crisis Communication Theory (Coombs, 2007) and the Crisis and Emergency Risk Communication framework (Reynolds & Seeger, 2005) highlight the importance of information framing, repetition, and credibility in shaping public perception and behavior. These theories provide a relevant foundation for analyzing how health-related communication can influence economic decision-making.

Building on these theoretical foundations, this study proposes a conceptual behavioral transmission mechanism linking epidemiological dynamics to financial market performance through the intensity of crisis communication.

The proposed model is formalized as follows:

$$C_p^t = \gamma \cdot \frac{\partial N_p^t}{\partial t}, \gamma \in [0,1]$$

where C_p^t represents the intensity of crisis communication at time t , $\frac{\partial N_p^t}{\partial t}$ is the rate of change in the number of infections, and γ is the attention coefficient that captures the responsiveness or sensitivity of economic agents to pandemic-related information.

This specification assumes a proportional relationship between infection dynamics and communication intensity. The linear functional form is adopted for analytical simplicity and interpretability.

Within this framework, the attention coefficient γ is expected to decline across successive pandemic waves:

$$\gamma_{\text{wave 1}} > \gamma_{\text{wave 2}} > \gamma_{\text{wave 3}}$$

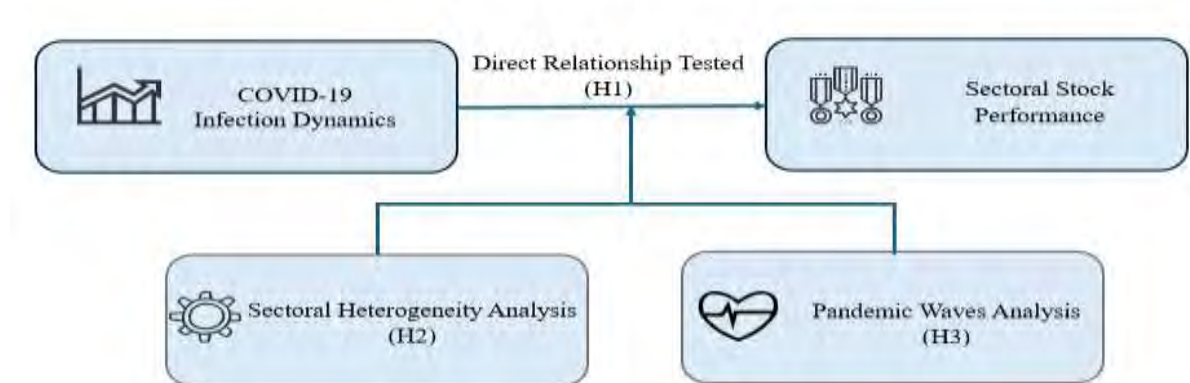
This assumption is consistent with behavioral finance theory, particularly the concept of habituation, whereby repeated exposure to crisis-related information reduces the marginal sensitivity of economic agents over time.

It is important to emphasize that this model is not empirically estimated in the present study. Rather, it is proposed as a conceptual and interpretative framework aimed at explaining the observed decline in the impact of infection dynamics on sectoral performance across pandemic waves.

Future research could operationalize the attention coefficient using proxies such as media coverage intensity or Google Trends indicators.

2.5. Empirical Framework

Figure 2. Empirical Framework of the Study



Source: Authors

This figure illustrates the empirical framework adopted in this study. It highlights the direct relationship between COVID-19 infection dynamics, measured by the number of confirmed cases, and sectoral stock performance on the Casablanca Stock Exchange.

The analysis is structured along two main dimensions: sectoral heterogeneity and temporal variation across pandemic waves (Wave 1, Wave 2, and Wave 3). These dimensions are examined using Pearson correlation analysis and one-way analysis of variance (ANOVA), allowing for the identification of statistically significant relationships and differences across sectors and time periods.

It is important to note that this framework represents the empirical component of the study. Conceptual elements related to crisis communication and investor attention are not included in this figure, as they are not directly tested but rather serve as an interpretative framework in the discussion.

3. Research Hypotheses

Building on the analytical literature review and the identified research gaps, this study formulates the following hypotheses, aligned with its three main research objectives.

Empirical evidence suggests that financial markets react to pandemic-related information, with stock returns responding to variations in infection rates and health indicators (Ashraf, 2020; Baker et al., 2020; Zhang et al., 2020). However, these reactions are often complex, heterogeneous, and sometimes asymmetric, particularly in emerging markets.

H1: *COVID-19 infection rates are significantly associated with sectoral stock performance on the Casablanca Stock Exchange.*

The literature also highlights substantial differences in how sectors respond to the COVID-19 shock. These differences are explained by structural characteristics such as dependence on physical mobility, intensity of human interaction, exposure to global value chains, and level of digitalization (Buszko et al., 2021; Ncube et al., 2023). As a result, sectoral performance is expected to vary significantly in response to pandemic-related disruptions.

H2: *The relationship between COVID-19 infection rates and stock performance differs significantly across economic sectors.*

Finally, the temporal evolution of the pandemic suggests that financial market responses are not constant over time. Early phases of the crisis were characterized by strong reactions to uncertainty, whereas subsequent periods reflect gradual adaptation and learning processes (Amzil et al., 2024; Msiyah et al., 2022). This indicates that the relationship between infection dynamics and stock performance may vary across successive pandemic waves.

H3: *The relationship between COVID-19 infection rates and sectoral stock performance varies significantly across pandemic waves.*

These hypotheses are tested using Pearson correlation analysis to examine the direct relationship between infection rates and sectoral performance (H1), and one-way analysis of variance (ANOVA) to assess sectoral heterogeneity (H2) and temporal variation across pandemic waves (H3).

4. Data and Methodology

4.1. Data and Sample Description

This study examines the relationship between COVID-19 infection dynamics and sectoral stock performance on the Casablanca Stock Exchange over the period from February 2020 to January 2023. The dataset consists of monthly observations, yielding a balanced sample of 36 periods. The empirical analysis is conducted at the sectoral level, using sectoral stock indices provided by the Casablanca Stock Exchange. These indices are constructed from a sample of 76 listed firms distributed across 24 sectors. While firm-level data are used to describe the structural composition of the market, all econometric analyses are performed at the sectoral level.

The main explanatory variable is the number of confirmed COVID-19 cases, obtained from official reports of the Moroccan Ministry of Health and Social Protection. Although this variable may be affected by variations in testing capacity, it remains the most consistent proxy for pandemic intensity over the study period.

Sectoral performance is proxied by the level of sectoral stock indices, allowing for a consistent comparison across sectors and over time.

4.2. Preliminary Statistical Diagnostics

Prior to the empirical analysis, several diagnostic tests were conducted to assess the statistical properties of the data.

Stationarity was examined using the Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979). The results indicate that the COVID-19 case series is stationary, while stationarity across sectoral index series is mixed, reflecting the presence of persistent trends in financial data.

Normality was assessed using the Jarque-Bera test (Jarque & Bera, 1987). The results show that the distribution of COVID-19 cases deviates from normality, whereas most sectoral index series do not exhibit severe departures from normality.

Statistical significance is evaluated at conventional levels of 10% (*), 5% (**), and 1% (***). These findings suggest that the underlying relationships may not fully satisfy the assumptions of strict parametric models. Consequently, the empirical strategy is designed as exploratory, aiming to identify general patterns and associations rather than to establish causal relationships.

4.3. Correlation Analysis

To test the first hypothesis (H1), the study employs Pearson correlation analysis to examine the association between COVID-19 infection dynamics and sectoral stock performance.

Pearson correlation is widely used as a standard measure of linear dependence in empirical finance (Wooldridge, 2010). However, given the potential presence of non-linearity and distributional asymmetries, Spearman rank correlation is also computed as a robustness check (Conover, 1999). This non-parametric measure allows capturing monotonic relationships without imposing strict assumptions on the distribution of the variables.

The combined use of Pearson and Spearman correlations provides a more robust assessment of the relationship between pandemic dynamics and financial market performance.

It is important to emphasize that this analysis is exploratory in nature and does not aim to establish causal relationships.

4.4. Analysis of Sectoral and Temporal Heterogeneity

To test hypotheses H2 and H3, the study examines differences in sectoral performance across sectors and pandemic waves using analysis of variance (ANOVA).

ANOVA is a standard method for testing differences in means across multiple groups (Gujarati & Porter, 2009). In this study, the analysis is conducted separately for each sector to assess whether mean performance differs significantly across pandemic waves.

The pandemic period is divided into three waves based on official epidemiological data:

Wave 1: March – November 2020

Wave 2: December 2020 – August 2021

Wave 3: September 2021 – January 2023

This classification reflects the observed evolution of infection dynamics in Morocco and is consistent with institutional reporting. While alternative approaches based on structural break tests could provide a more formal segmentation, the adopted classification ensures interpretability and comparability with existing studies.

4.5. Methodological Limitations

The empirical strategy adopted in this study is subject to several limitations.

First, correlation analysis does not allow for causal inference and may be affected by omitted variable bias, as macroeconomic and global financial factors are not explicitly controlled for.

Second, the use of confirmed COVID-19 cases as an explanatory variable may be influenced by variations in testing capacity over time.

Third, the use of sectoral index levels instead of returns may capture both short-term fluctuations and long-term trends, which may affect the interpretation of results.

Finally, the absence of advanced econometric modeling and extensive robustness checks limits the generalizability of the findings. Future research could address these limitations by incorporating additional control variables, using alternative epidemiological indicators, and applying more sophisticated econometric techniques such as dynamic models or non-linear dependence measures.

5. Empirical Results

5.1. Descriptive Statistics

The study sample consists of 76 companies listed on the Casablanca Stock Exchange, distributed across multiple sectors as presented in Table 3.

Note: The “Health” sector includes a single firm introduced in 2022 and is therefore excluded from the econometric analysis due to insufficient observations.

This distribution highlights the structural composition of the Moroccan stock market, characterized by a concentration in a limited number of key sectors such as banking, construction, and industrial activities.

For consistency purposes, this sectoral classification is used throughout the empirical analysis.

Table 3. Distribution of Companies Listed on the Moroccan Stock Exchange by Sector (N, %) for the year 2022

Sector	N	%
Agri-food / Production	6	7.89%
Insurance	5	6.58%
Banking	6	7.89%
Building and Building Materials	8	10.53%
Drinks	2	2.63%
Chemistry	2	2.63%
Distributors	7	9.21%
Electricity	1	1.32%
Pharmaceutical industry	2	2.63%
Engineering and Industrial Capital Goods	2	2.63%
Leisure and Hotels	1	1.32%
IT Hardware, Software and Services	8	10.53%
Mining	4	5.26%
Real Estate Participation and Promotion	3	3.95%
Oil and Gas	3	3.95%
Health	1	1.32%
Transportation Services	1	1.32%
Financing companies and other financial activities	5	6.58%
Real Estate Investment Companies	3	3.95%
Portfolio Companies – Holdings	2	2.63%
Forestry and Paper	1	1.32%
Telecommunications	1	1.32%
Transportation	2	2.63%
Total	76	100%

Source: Casablanca Stock Exchange

5.2. Preliminary Diagnostic Tests

Before conducting the main empirical analysis, a set of diagnostic tests was performed.

Table 4. Augmented Dickey-Fuller (ADF) Test Results

Variable	ADF Statistic	p-value	Conclusion
COVID-19 cases	-4.21	0.0018	Stationary
Sectoral indices (average)	-2.11	0.24	Mixed

Source: Authors

Table 5. Jarque-Bera Normality Test

Variable	JB Statistic	p-value	Conclusion
COVID-19 cases	18.72	0.0001	Non-normal
Sectoral indices (average)	2.85	0.24	Approximately normal

Source: Authors

These results justify the use of both Pearson and Spearman correlations and confirm the exploratory nature of the analysis.

5.3. Relationship between COVID-19 infection rates and sectoral stock performance

To test H1, which examines the impact of COVID-19 infection rates on sectoral stock performance, a Pearson correlation analysis was conducted.

Table 6 presents the correlation coefficients between the number of infected cases and sectoral index performance.

The results indicate weak and heterogeneous relationships, with only a limited number of statistically significant correlations.

H1 is partially supported.

Table 6. Pearson correlation coefficient (r)

Sector	Pearson r	p-value	Spearman ρ	p-value
Agri-food / Production	0.371	0.025**	0.402	0.018**
Insurance	0.029	0.86	0.041	0.8
Banking	0.208	0.22	0.241	0.16
Building and Building Materials	0.236	0.16	0.261	0.13
Drinks	0.047	0.78	0.052	0.76
Distributors	-0.033	0.85	-0.045	0.79
Electricity	0.01	0.95	0.012	0.94
Chemistry	-0.05	0.77	-0.062	0.72
Pharmaceutical industry	0.046	0.79	0.058	0.74
Engineering & Capital Goods	0.037	0.83	0.049	0.78
Leisure and Hotels	-0.019	0.91	-0.031	0.86
IT Services	0.187	0.27	0.215	0.21
Mining	-0.058	0.74	-0.071	0.69
Real Estate Participation	0.279	0.10*	0.301	0.08*
Real Estate Investment Company	-0.159	0.35	-0.172	0.32
Oil and Gas	0.065	0.71	0.082	0.64
Transportation Services	0.184	0.28	0.203	0.24
Financing companies and other financial activities	-0.02	0.91	-0.035	0.84
Portfolio Holdings	0.306	0.07*	0.338	0.05**
Forestry and Paper	-0.184	0.28	-0.295	0.09*
Telecommunications	0.33	0.049**	0.365	0.03**
Transportation	0.156	0.36	0.181	0.3

Note: $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$,

Source: Authors

5.4. Sectoral heterogeneity in response to the pandemic

To formally assess sectoral heterogeneity, a one-way analysis of variance (ANOVA) test was conducted to examine whether mean sectoral performance differs significantly across sectors. The results indicate statistically significant differences in mean performance across sectors ($F = 5.87$, $p < 0.01$), suggesting that sectoral performance is not homogeneous.

In addition, the correlation analysis reveals variation in both the magnitude and statistical significance of coefficients across sectors, further supporting the presence of heterogeneity.

However, these results should be interpreted with caution, as the analysis remains exploratory and does not fully capture all sources of sectoral differences.

Overall, H2 is supported, although the magnitude of heterogeneity remains moderate.

Table 7. one-way analysis of variance (ANOVA) test for sectoral heterogeneity

Source of variation	Sum of Squares	df	Mean Square	F-statistic	p-value	Significance
Between sectors	245.32	21	11.68	5.87	0	***
Within sectors	512.45	714	0.72			
Total	757.77	735				

Note: $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$,

Source: Authors

5.5. Impact of pandemic waves on sectoral performance

To examine whether sectoral performance varied across different phases of the COVID-19 pandemic, one-way analysis of variance (ANOVA) tests were conducted for each sector. These tests compare mean sectoral performance across the three pandemic waves.

Sectoral classifications are harmonized across all tables to ensure consistency and comparability of the analysis.

The results indicate that a majority of sectors exhibit statistically significant differences in mean performance across pandemic waves, suggesting that the temporal evolution of the health crisis influenced sectoral dynamics.

However, the magnitude and direction of these differences vary across sectors. Some sectors display strong temporal variation (e.g., agri-food, mining, oil and gas), while others remain relatively stable (e.g., telecommunications, real estate participation, forestry and paper).

It is important to note that statistical significance does not necessarily imply a consistent or monotonic trend across waves, but rather indicates that average performance differs across periods.

Furthermore, differences between the correlation results (H1) and the ANOVA outcomes (H3) reflect distinct analytical dimensions. While correlation analysis captures the overall association between infection dynamics and sectoral performance, ANOVA evaluates temporal variation across pandemic phases. These approaches are therefore complementary rather than contradictory.

Overall, these findings support H3, indicating that the impact of COVID-19 on sectoral performance evolved over time.

To complement the statistical analysis, Appendix 1 presents the evolution of sectoral indices over the study period. This graphical representation provides a visual illustration of the heterogeneous sectoral dynamics observed during the pandemic.

The figure highlights distinct trajectories across sectors, confirming the presence of both sectoral heterogeneity and temporal variation. In particular, mobility-sensitive sectors exhibit pronounced fluctuations during the first wave, while more resilient sectors such as telecommunications and financial activities display relatively stable trends over time.

These visual patterns are consistent with the statistical results obtained from correlation and ANOVA analyses.

Table 8. One-way analysis of variance (ANOVA) results across pandemic waves

Sector	F-statistic	Significance
Agri-food / Production	34.627	***
Insurance	15.971	***
Banking	8.825	***
Building and building Materials	15.224	***
Drinks	0.794	
Chemistry	37.626	***
Distributors	25.064	***
Electricity	7.966	***
Pharmaceutical industry	6.701	***
Engineering & Capital Goods	5.056	***
Leisure and Hotels	16.567	***
IT Services	16.038	***
Mining	26.607	***
Real Estate Participation	0.69	
Oil and Gas	32.086	***
Transportation Services	3.161	*
Financing companies and other financial activities	7.336	***
Real Estate Investment Companies	0.017	
Portfolio Holdings	1.172	
Forestry and Paper	0.404	
Telecommunications	0.177	
Transportation	16.494	***

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$; $df = 2$.

Source: Authors

6. Discussion

This section discusses the empirical findings in relation to the study's three main hypotheses, while engaging more critically with the existing literature and highlighting both convergent and divergent evidence.

6.1. Infection dynamics and market response

The results partially support H1, revealing a statistically significant but relatively weak and heterogeneous relationship between COVID-19 infection rates and sectoral stock performance. While this finding is consistent with studies documenting a negative and significant impact of pandemic indicators on financial markets (Ashraf, 2020; Baker et al., 2020; Zhang et al., 2020), it contrasts with other contributions that report stronger and more persistent effects, particularly in the early stages of the crisis.

This divergence may be explained by differences in market structure and information processing. In contrast to developed markets, where high-frequency trading and rapid information diffusion amplify reactions, the Moroccan stock market appears to exhibit a more moderate sensitivity to epidemiological indicators. This finding aligns with studies suggesting that in emerging markets, financial responses are often mediated by institutional factors, investor composition, and information frictions (Goodell, 2020).

Moreover, the weak magnitude of correlations supports the argument that infection dynamics alone are insufficient to explain market movements. This finding is consistent with research emphasizing the role of additional channels such as policy responses, investor sentiment, and global financial conditions (Zhang et al., 2020), thereby highlighting the limits of purely epidemiological explanations.

6.2. Sectoral heterogeneity and resilience

The results support H2, confirming the presence of sectoral heterogeneity in response to the pandemic. While this finding is consistent with both international and national evidence (Buszko et al., 2021; Ncube et al., 2023; Amzil et al., 2024), the magnitude of these differences remains moderate.

However, the results also reveal nuances that diverge from parts of the literature. While several studies report sharply differentiated sectoral impacts, particularly between “winners” (technology, telecommunications) and “losers” (tourism, transport), the Moroccan case suggests a more attenuated differentiation. This may reflect the relatively lower level of sectoral specialization and financial market depth.

In addition, while the vulnerability index proposed by Haddad et al. (2020) provides a useful benchmark, the empirical results indicate that resilience is not solely determined by structural exposure. Financial strategies, such as dividend policies (the “parachute effect”), and institutional support mechanisms also play a significant role. This finding complements and extends existing studies by emphasizing the interaction between structural and financial resilience factors.

6.3. Temporal dynamics and pandemic waves

The results support H3, demonstrating that the impact of the pandemic varied significantly across waves. Beyond confirming temporal heterogeneity, these findings provide indirect empirical support for the conceptual crisis communication model proposed in this study.

According to the model $C_p^t = \gamma \cdot \frac{\partial N_p^t}{\partial t}$ (with $\gamma \in [0,1]$) market reactions depend not only on infection dynamics but also on the attention coefficient γ .

The observed decline in the statistical relationship between infection rates and sectoral performance across waves can be interpreted as a decrease in γ , consistent with the hypothesis

of behavioral adaptation and habituation. This interpretation aligns with behavioral finance theories and is supported by empirical evidence showing that markets reacted more strongly during the initial shock than in subsequent phases.

However, it is important to note that this interpretation remains indirect, as the attention coefficient is not empirically estimated in this study. Therefore, while the results are consistent with the model's predictions, they do not constitute a formal validation. This distinction is essential to avoid overinterpretation and reinforces the conceptual nature of the proposed framework.

6.4. Policy implications in the Moroccan context

The findings have important implications for economic policy and financial regulation in Morocco. However, these implications vary across different phases of the crisis and should be interpreted in relation to the policy instruments actually implemented.

During the initial phase of the pandemic, characterized by high uncertainty and strong market reactions, rapid and coordinated policy responses—such as the establishment of the Economic Monitoring Committee (Comité de Veille Économique) and the COVID-19 Special Fund—played a crucial role in stabilizing expectations and mitigating systemic risk.

In later phases, as market sensitivity declined, the effectiveness of general communication strategies appears to have diminished. This suggests that policymakers, including Bank Al-Maghrib and the Moroccan Capital Market Authority (AMMC), should complement communication efforts with more targeted sectoral interventions, particularly for structurally vulnerable industries.

More broadly, the results highlight the importance of adaptive policy frameworks that evolve with the crisis lifecycle. Early-stage interventions should focus on macro-financial stabilization and communication credibility, while later-stage policies should prioritize sectoral support, structural transformation, and resilience-building measures.

6.5. External validity and generalizability

Finally, the generalizability of these findings should be considered with caution. While the results provide valuable insights for Morocco, their applicability to other emerging markets depends on several structural factors, including market depth, sectoral composition, and institutional quality.

Nevertheless, similarities between Morocco and other MENA economies—such as sectoral concentration, exposure to external shocks, and the importance of policy intervention—suggest that the observed patterns may have broader relevance. In particular, the combination of moderate market sensitivity, sectoral heterogeneity, and declining responsiveness over time may characterize a wider group of emerging financial markets.

Future research could extend this analysis through cross-country comparisons to assess the robustness of these findings and identify common structural mechanisms across emerging economies.

7. Limitations

This study presents several limitations that vary in scope and severity and should be interpreted accordingly when assessing the robustness of the findings.

The most critical limitation concerns the empirical strategy, which relies on Pearson correlations and ANOVA tests. While these methods allow the identification of statistical associations, they do not establish causal relationships. In addition, the absence of firm-level control variables (such as size, leverage, liquidity, and profitability) introduces a potential

omitted variable bias. This limitation is significant, as it may affect the internal validity of the results and implies that the findings should be interpreted as indicative rather than causal.

A second important limitation relates to the measurement of the epidemiological variable. The use of the absolute number of confirmed COVID-19 cases may be biased by variations in testing capacity, reporting practices, and policy changes over time. This issue may attenuate or distort the estimated relationships between infection dynamics and market performance. However, given the consistency of this indicator across the study period, this limitation primarily affects the precision of the estimates rather than their overall direction.

Third, the uneven distribution of firms across sectors constitutes a moderate limitation. Some sectors are represented by a very small number of companies, which reduces the statistical robustness of sector-specific results and may increase the sensitivity of findings to outliers. Consequently, conclusions related to these sectors should be interpreted with caution, particularly when statistical significance is weak or absent.

Fourth, the exclusive focus on listed firms on the Casablanca Stock Exchange limits the external validity of the study. Listed companies tend to be larger, more structured, and more financially resilient than the broader population of firms, particularly SMEs. As a result, the findings may underestimate the overall economic impact of the pandemic at the national level.

Finally, the delimitation of pandemic waves, although consistent with the epidemiological context in Morocco, remains partly subjective. This limitation has a relatively lower impact on the results, as the main findings are robust to broad temporal patterns. However, alternative segmentation methods (e.g., structural break tests) could provide a more objective definition of crisis phases.

Overall, while these limitations do not invalidate the core findings, they suggest that the results should be interpreted as exploratory and context-specific. They also highlight several avenues for future research, including causal modeling approaches, the integration of additional control variables, and cross-country comparative analyses.

8. Conclusion

The COVID-19 pandemic constituted a major systemic shock that revealed both the vulnerabilities and adaptive capacities of financial markets in emerging economies. This study examined the relationship between COVID-19 infection dynamics and sectoral stock performance on the Casablanca Stock Exchange over the period February 2020 to January 2023. The empirical findings provide three main insights. First, infection rates are significantly associated with sectoral stock performance, although the strength of this relationship remains weak and heterogeneous. Second, the impact of the pandemic differs across sectors, reflecting structural characteristics such as dependence on physical mobility, intensity of human interaction, and level of digitalization. Third, the effect of infection dynamics varies across pandemic waves, indicating a process of behavioral adaptation and declining sensitivity to health-related information over time.

This study contributes to the literature by providing a granular sectoral analysis in an emerging market context and introducing a dynamic wave-based perspective that captures the evolving nature of systemic shocks. It also proposes a conceptual framework linking epidemiological dynamics to financial markets through crisis communication intensity. By incorporating the attention coefficient (γ), this approach integrates insights from financial economics, behavioral finance, and crisis communication. However, this contribution remains conceptual, as the model is not empirically estimated and its validation is indirect.

From a policy perspective, the findings emphasize the need for adaptive and context-specific responses. During the initial phase, coordinated interventions such as the Economic Monitoring Committee and the COVID-19 Special Fund helped stabilize expectations. In later phases, declining market sensitivity to health information suggests that communication strategies

should be complemented by targeted sectoral support. Overall, sectoral heterogeneity highlights the importance of differentiated policy responses, particularly for mobility-dependent sectors. Despite these contributions, the study presents several limitations, notably the absence of causal inference, potential omitted variable bias, and the use of confirmed COVID-19 cases as a proxy for the pandemic. In addition, the focus on listed firms limits the generalizability of the findings. These constraints imply that the results should be interpreted as exploratory and context-specific.

Several avenues for future research emerge from this work. Extending the analysis to other emerging markets, particularly in the MENA region, would allow testing the external validity of the findings. The use of more advanced econometric approaches, such as dynamic conditional correlation (DCC-GARCH) models or structural VAR frameworks, could improve the analysis of time-varying and causal relationships. Furthermore, the proposed crisis communication model could be empirically operationalized by constructing proxies for the attention coefficient using textual data, such as media coverage or sentiment indicators derived from Natural Language Processing techniques. Future studies should also incorporate firm-level control variables to strengthen robustness and explore comparative analyses across different systemic shocks, such as the 2008 financial crisis or the Arab Spring.

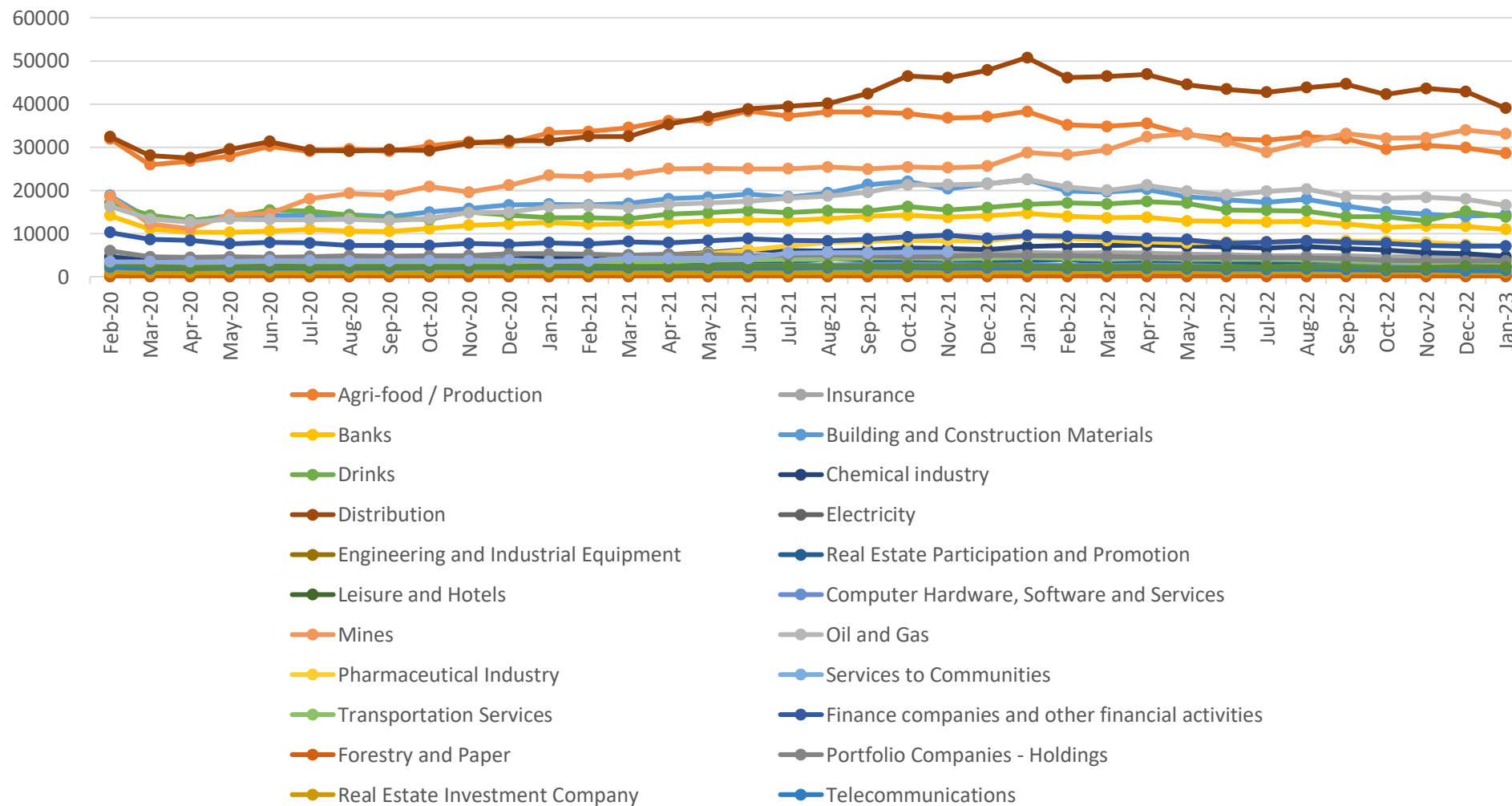
Overall, the Moroccan experience during the COVID-19 pandemic illustrates that financial market responses to systemic crises are shaped not only by epidemiological conditions, but also by behavioral dynamics, structural characteristics, and the effectiveness of policy interventions. Understanding these interactions is essential for improving crisis preparedness in emerging economies.

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Appendix 1: Evolution of the sector index performance between February 2020 and January 2023



Source: Authors' elaboration based on data from the Casablanca Stock Exchange