# Causality and volatility in the Colcap index of the Colombian Stock Exchange as a result of Covid-19 infections and deaths

## Causalidad y volatilidad en el índice Colcap de la Bolsa de valores de Colombia por contagios y muertes por Covid-19

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## Abstract

This article analyses the causality and volatility of the Colcap index of the Colombian Stock Exchange caused by Covid-19 infections and deaths. The methodology is econometric by estimating linear and non- linear Granger causality tests. The test results show that the stock market investors overreacted to COVID- 19 infections and deaths. The non-linear causality test also determined that investors took the evolution of infections in the last three to 10 days and the number of deaths in the last 15 days into account for their investment decision. In contrast, the linear Granger test indicates that they considered the evolution of infections and deaths over the last 11 days.

## Resumen

Este artículo analiza la causalidad y volatilidad del índice Colcap de la Bolsa de Valores de Colombia por contagios y muertes por Covid-19. La metodología es econométrica mediante la estimación de los tests de causalidad de Granger lineal y no lineal. Los resultados obtenidos con los tests muestran que hubo una sobrerreacción de los inversionistas de la Bolsa de valores a los contagios y muertes por COVID-19. Así mismo, el test de causalidad no lineal determinó que los inversionistas tuvieron en cuenta para la decisión de inversión, la evolución de los contagios de los últimos tres a 10 días y del número de muertes los últimos 15 días. En cambio, el test de Granger lineal indica que tuvieron en cuenta la evolución de los contagios y muertes en los últimos 11 días.

Causality and volatility in the Colcap index of the Colombian Stock Exchange as a result of Covid-19 infections and deaths

2 /14

**Why was it carried out?**

The study was conducted to analyze the causality and volatility of the Colcap index of the Colombian Stock Exchange due to Covid-19 infections and deaths. The focus was on understanding how the pandemic influenced investor reactions and market dynamics, using econometric methodologies with linear and non-linear Granger causality tests.
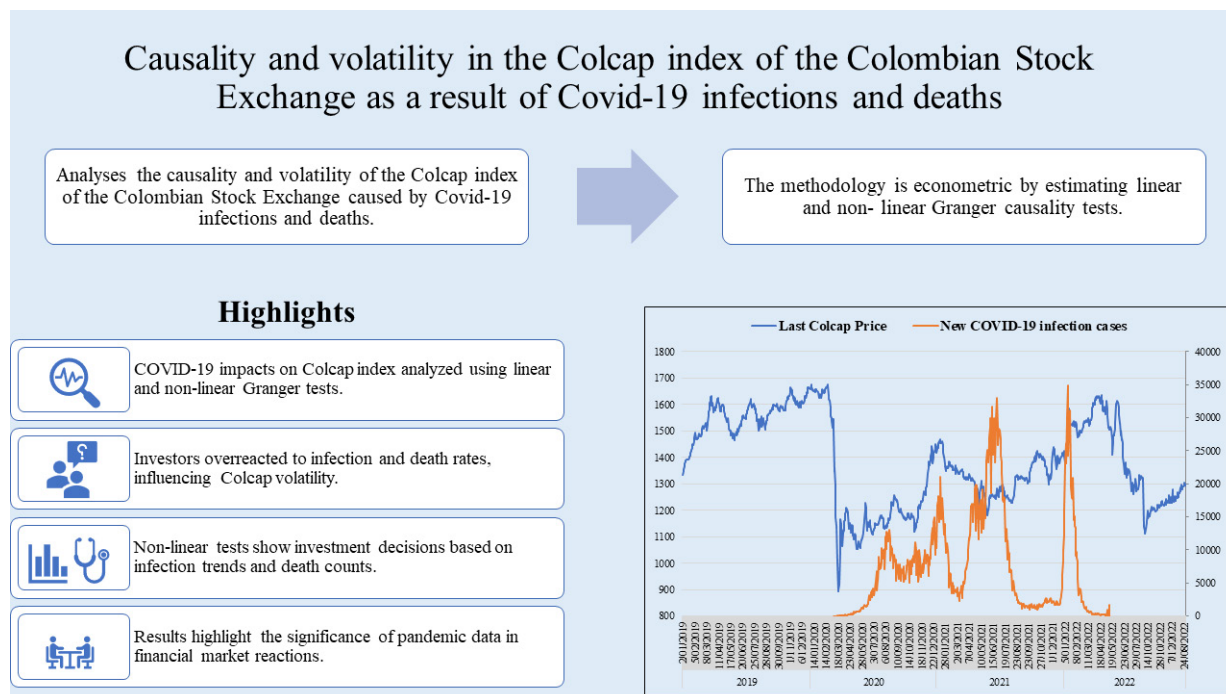
**What were the most relevant results?**

The most relevant findings were that stock market investors significantly overreacted to COVID-19 infections and deaths. The non-linear causality test revealed that investors factored in the evolution of infections from the last three to ten days and the number of deaths from the last fifteen days in their investment decisions. Conversely, the linear Granger test indicated that the evolution of infections and deaths over the last eleven days was considered by investors.

**What do these results provide?**

These results contribute to the understanding of how health crises like the COVID-19 pandemic can affect financial markets, specifically through investor behavior and market volatility. They highlight the significant impact of pandemic-related news on investor decision-making and the broader market dynamics. Additionally, the findings emphasize the importance of considering both linear and non-linear relationships when analyzing the effects of external shocks on financial markets, which could have implications for financial analysts, investors, and policymakers in managing and mitigating market volatility during crises.

**Graphical Abstract**



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## Introduction

Covid-19 has had a profound impact on the global economy, causing an unprecedented amount of uncertainty and greatly affecting stock markets and investors. In many countries, stock markets plummeted as a result of the pandemic, while others have experienced high volatility in their stock market indices (1- 3). In response to the pandemic, governments around the world rushed to implement emergency actions such as forced closures, travel restrictions, COVID-19 testing and quarantines (4). The main objective of these actions was to ensure social distancing between people in order to contain the spread of the disease. However, these actions created uncertainty in financial markets (2, 4, 5).

In the economic literature it is essential for the functioning of financial markets to understand volatility, stock price movements and risk in stock market indices that influence investment decisions, financial strategies and economic policies. Furthermore, volatility can serve as an economic indicator reflecting the broader health of the economy and investor confidence. According to Wen et al. (6), the Covid-19 pandemic triggered a new area of research linking the impacts and consequences of the pandemic on the volatility of financial markets, economic activity and social interactions. According to Giraldo-Picón (7) as a result of the pandemic, shock and trepidation, the price of stock market indices around the world fell; the Dow Jones Industrial Average and the FTSE 100 index fell by -23% and -25%, respectively.

In Colombia, the first reported outbreak of Covid-19 occurred on 6 March 2020, and by 2022, about six million people had been infected. As a result, the national government issued Decree 457 of 25 March 2020, which led to the shutdown of the country's economic activity. Similarly, according to data from the Colombian Stock Exchange (Bvc), the Colcap index, which measures the movements of the most listed companies on the Bvc, showed a loss of 47% of its value on 18 March 2020, compared to its closing value on 19 February 2020 (8). Furthermore, in 2019, the Colcap index growth was 0.091% and in the period 2020- 2022 it was -0.021%. In the same way, according to Giraldo-Picón (7), in the course of the pandemic, about 20% of the companies listed on the Bvc did not issue shares.

For this reason, the objective of this article is to analyse the causality and volatility of the Colcap index of the Colombian Stock Exchange due to Covid-19 infections and deaths. The methodology is econometric by estimating linear and non-linear causality tests in the Granger sense. This article shows the impact of Covid-19 infections and deaths on the Colombian stock market.

While the focus of this study is the relationship between Covid-19 infections and deaths and the volatility of the Colcap index on the Colombian Stock Exchange, it is important to recognise that there are other factors associated with stock index volatility such as; labour dynamics, emergency economic policies, market fluctuations, internal company management, and the general perception of risk in the markets, among others (9-11). Despite such a variety of factors, this article focuses on Covid-19 infections and deaths because of their direct and immediate impact on risk perception and stock market uncertainty, which are critical to understanding the volatility of Colcap during this period (6,7). In addition, the methodologies proposed by authors such as Harjoto et al. (10), Romero-Meza (12), Ashraf (13), Al-Awadhi et al. (14), Reimer et al. (15), who use COVID-19 infections and deaths as an important variable in stock market price volatility using univariate and causal methods.

On the basis of the above, this article is structured by introducing the theoretical framework, followed by the methodology and the results obtained from the study. Finally, the conclusions.

## Theoretical Framework

The economic literature identifies factors that generate uncertainty and significantly influence volatility in equity markets. These can be institutional, political, economic (16, 17). However, Bora and Basistha (18) found evidence that trading activity, investor sentiment and risk aversion in the economy have been added as factors that impacted on uncertainty and volatility during the pandemic.

The measurement of volatility is of significant importance in economic and financial models, because it allows the identification of asymmetric behaviour in financial returns in order to make a profit in stock markets (19). Volatility is defined as the best indicator of risk forecasting of returns in financial markets (20) and refers to the magnitude of uncertainty associated with changes in the price of an asset. According to efficient market theory, these price changes reflect new information and any new information is a phenomenon independent of time, as it cannot be inferred in advance (21). Conversely, Stiglitz and Rothschild (22) with the theory of information asymmetries argue that moral hazard and adverse selection problems affect pricing and exchange in capital markets.

The capital market is highly volatile due to the presence of uncertainty and asymmetric information. The former pertains to states of nature or unpredictable and uncontrollable events, while the latter indicates that some agents possess information not available to others in the same market (23). This distinction helps to understand that agents face not only competition but also a series of uncontrollable natural phenomena or disasters, as well as moral hazard and adverse selection factors from agents and institutions, which generate risks in their investments (24).

One of the most important financial tools for measuring stock markets is stock market indices; these are indices calculated from the stock prices of a select group of companies that are present in the stock market and represent a specific industry or market (25). In other words, it allows for the analysis of the collective performance trend of companies, from a global perspective of an industry or the national economy. According to Pérez-Faúndez (25), these indices are useful for managers in managing and investing, as they provide information that allows them to measure the probability of profitability and market risks, or to create a portfolio that replicates the behavior of these indices.

With regard to the impact of Covid-19 and the volatility of stock market indices internationally; Al-Awadhi et al. (14) found that the stocks of all companies in China reacted negatively to both infected cases and deaths per day due to COVID-19. Similarly, Alfaro et al. (26) demonstrated that COVID-19 had a significant negative impact on US stock returns, using the GARCH family of models. Likewise, in Europe, Sanguinetti-Sánchez (27) finds that the Milan Stock Exchange index fell by -37.31%; the London Stock Exchange by -30%; the Frankfurt Stock Exchange by - 35%; and the Paris Stock Exchange by -35%. In Africa, Emenogu et al. (28) reported that COVID- 19 negatively affected stock market returns in Nigeria. Finally, in Latin America, Rakshit and Neog (29) find that COVID-19 had negative effects on the stock markets of Mexico, Brazil, Chile, Colombia and Peru.

In the literature on the impact of Covid-19 infections on stock index volatility, Albulescu (30) concludes that the health crisis increases volatility in the S&P 500 index, using data

from both the US and around the world. Similarly, Albulescu (31) analyses the effect of official new infection announcements and mortality rates on the financial market volatility index VIX. While new cases reported inside and outside China had a mixed effect on financial volatility, the mortality rate influenced the VIX positively. Furthermore, this study finds that the greater the number of countries affected, the greater the financial volatility.

On the other hand, the Onali report (32) identified that significant increases in US stock market volatility are related to reports of COVID-19 cases and deaths in multiple countries. On the other hand, Haroon and Rizvi (33) investigate whether news coverage of COVID-19 causes changes in volatility. Their results show that for different economic sectors, panic-laden news contributed more to an increase in volatility in the sectors considered to be most affected by the coronavirus outbreak. Employing characteristic selection methods via machine learning.

Baek et al. (5), selected the economic indicators that best explain changes in volatility. Their results show that volatility is sensitive to news concerning COVID-19. Furthermore, they find that both good and bad news are significant, however, bad news has a greater impact on volatility. Likewise, Romero-Meza et al (12) studied the causality of news about COVID-19 and the volatility of the Ipsa stock index in Chile, where they found that news about COVID-19 causes volatility in the linear and non-linear Granger sense.

## Methodology

To analyse the relationship of COVID-19 infections and deaths in Colombia with the volatility of the Colcap index, two causality tests have been applied: 1) the linear Granger causality test (34); which consists of testing whether the current and past behaviour of COVID-19 infections and deaths predict the volatility of the Colcap index. For this purpose, the test estimates a VAR or autoregressive model, i.e., a regression that takes into account lagged values, using the F-test. The model specification is shown below:

$$
\begin{aligned}
VolatilidadColcap_t &= \delta + \theta_1 VolatilidadColcap_{t-1} + \cdots + \theta_p VolatilidadColcap_{(t-p)} \\
&\quad + \delta_1 Covid19_{t-1} + \cdots + \delta_q Covid19_{t-q} + e_t
\end{aligned} \tag{1}
$$

Where:

t = is the time period from 6 March 2020 to 12 May 2022.

$VolatilidadColcap_t$ = is the dependent variable of the volatility of the Colcap index in period t.

$VolatilidadColcap_{t-1}$ = is the independent variable of the lagged Colcap index volatility in period t-1.

$VolatilidadColcap_{(t-p)}$ = is the volatility variable of the lagged Colcap index in the t-p- lagged period.

$Covid19_{t-1}$ = is the lagged COVID-19 infections or deaths variable in period t-1.

$Covid19_{t-q}$ = is the lagged Covid-19 infection or death variable in the t-p- lagged period.

With Eq. (1), the Granger causality test was created, where:

$$
\begin{aligned}
H0 &: \delta1 = 0, \delta2 = 0, \ldots, \delta q = 0 \\
H1 &: \text{at least one } \delta i \neq 0
\end{aligned} \tag{2}
$$

The rejection of $H0$ implies that COVID-19 causes in the linear Granger sense the $VolatilidadColcap$. According to the above, the number of COVID-19 infections and deaths in earlier periods will improve the forecast in a $VolatilidadColcap$ linear fashion.

The second test is the causality test in the non-linear Granger sense of Diks and Panchenko ([35]), which does not have the restricted assumption that the distribution of the series as a whole or individually are independent and identically distributed ([36]). The statistic for this test is:

$$T_n(\varepsilon_n) = \frac{n-1}{n(n-2)} \sum_i (f(\,Covid19, VolatilidadColcap, VolatilidadColcap_{t+1})$$
$$* f(VolatilidadColcap) - f(VolatilidadColcap, Covid19)$$
$$* f(VolatilidadColcap, VolatilidadColcap_{t+1})$$

(3)

It starts with a lag length of order 1 and a bandwidth with a standard normal distribution as a limit ([37]).

$$\varepsilon_n = Cn^{-\beta}\left( C > 0, \beta \in \left(\frac{1}{4}, \frac{1}{3}\right)\right)$$

(4)

The test statistic in Eq. 5 satisfies:

$$\sqrt{n} * \frac{(T_n(\varepsilon_n) - q)}{s_n} \overset{D}{\Rightarrow} N(0,1)$$

(5)

Where $\overset{D}{\Rightarrow}$ denotes convergence in the distribution and Sn is an estimator of the asymptotic variance of $(Tn(Sn) - q)$. Consequently, the causality test statistic in the non-linear Granger sense in Eq. (3) for non-linear causality is asymptotically distributed as standard normal at positive infinity under the alternative hypothesis. Therefore, the statistic above 1.28 rejects the null hypothesis up to the 10% significance level and supports the evidence in favour of non-linear Granger causality.

## Data

The data used in this study were: the closing and opening price of the Colcap index in the period from 6 March 2020 to 12 May 2022 with a total of 533 data points. This information was obtained from the Bvc website.

To calculate the Volatility of the Colcap index we use the returns of the series through its logarithmic transformation, as shown in Eq. (6):

$$r_t = (\ln(p_t) - \ln(p_{(t-1)})) * 100,$$

(6)

where rt is the return of the series at time t, pt is the value of the index at time t and p(t-1) is the value of the index at a previous period.

Likewise, data on the number of infections, new infections, and deaths by COVID-19 will be taken into account for the period 6 March 2020 to 12 May 2022 with a total of 533 data. This information was obtained from the website of the Colombian Ministry of Health.

# Results

When analysing the evolution of the Colcap index as shown in figure 1, in 2019 it is observed that the performance of the index is stable with an upward trend with low volatility. However, at the onset of the pandemic with the first reported cases of infection, the index immediately fell sharply, as investors overreacted to the economic uncertainty and social distancing measures being implemented by the government. This same behaviour on a global level is observed by Rakshit and Neog ([29]); where they found that the stock market overreacted to news of contagion early in the pandemic until governments provided assurances and created strategies to mitigate and safeguard the economy. The lowest value of the Colcap index was on 18 March 2020, with a value of 894.03 Colombian pesos, a drop of -40% compared to 19 February of the same year with only 102 COVID-19 infections nationwide and zero deaths. As of 25 March 2020, by means of Decree 457, the government determined the compulsory quarantine and the index recovered slowly, without reaching its pre-pandemic value in 2022.

According to Valdés-Medina et al. ([38]), stock market indices in many countries in the second quarter of 2020 saw a slight recovery, due to the listing of companies in the banking, pharmaceutical, food and technology sectors, among others, that were able to operate remotely, while sectors that required on-site work, because of regulations and decrees, saw a decline and the closure of activities such as tourism and commerce.

Figure1. Evolution of the Colcap index and new COVID-19 infections, 2019-2022.
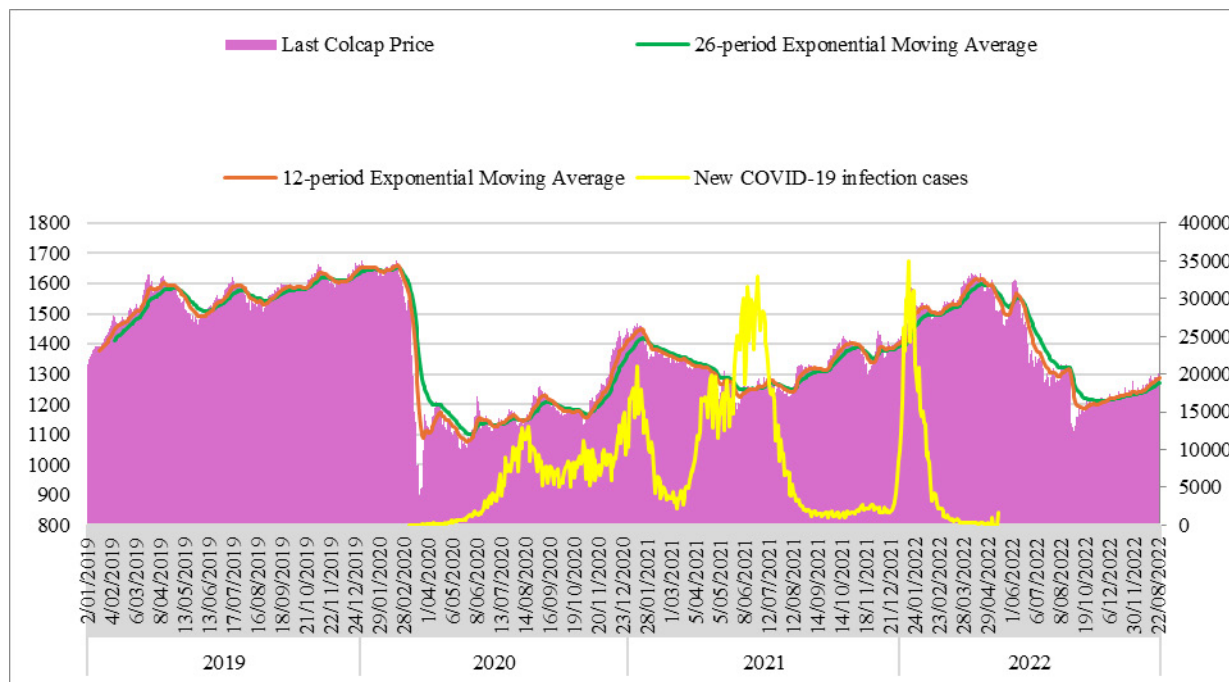


## Causality test

For the causality analysis of COVID-19 infections and deaths on the volatility of the Colcap index, the series must be stochastic, i.e. stable with constant average and variance

over time. To do this, an augmented Dickey-Fuller unit root test must be performed, which allows the determination of whether or not a time series is stationary. The time series that were evaluated are: opening and closing of the Colcap index, volatility of the Colcap index, number of COVID-19 infections, number of deaths, and growth of COVID-19 infections and deaths.

Applying the Dickey-Fuller test, the series that were found to be stochastic were volatility, the number of COVID-19 infections on a logarithmic scale, the growth rate of COVID-19 infections, the number of COVID-19 deaths on a logarithmic scale, and the growth rate of COVID-19 deaths. Table 1.

Table 1. Dickey-Fuller unit root test

| Series | Z(t) | P-Value | Results |
|---|---|---|---|
| Last Colcap Price | -1.803 | 0.3792 | Not stochastic |
| Ln (Last Colcap Price) | -1.639 | 0.4628 | Not stochastic |
| Colcap Opening Price | -0.859 | 0.8013 | Not stochastic |
| Ln (Colcap Opening Price) | -1.321 | 0.6194 | Not stochastic |
| Colcap Index Volatility | -11.062 | 0.0000 | Is stochastic |
| Number of cases of COVID-19 infections | 0.379 | 0.9807 | Not stochastic |
| Ln (Number of case of COVID-19 infection) | -7.101 | 0.0000 | Is stochastic |
| Growth rate (Number of cases of COVID-19 infections) | -15.308 | 0.0000 | Is stochastic |
| Number of deaths from COVID-19 | -0.994 | 0.7555 | Not stochastic |
| Ln (Number of deaths from COVID-19) | -9.614 | 0.0000 | Is stochastic |
| Growth rate (Number of deaths due to COVID-19) | -9.776 | 0.0000 | Is stochastic |

Source: author

With the results of the unit root test, linear and non-linear causality tests in the Granger sense were performed to determine whether the number and growth of COVID-19 infections and deaths have a sufficient degree of insight for forecasting the volatility of the Colcap index.

Regarding the relationship between the growth of the number of COVID-19 infections and the volatility of the Colcap index, the non-linear causality test finds that the lags of three to 10 periods are significant, i.e., that these lags of the growth of infections significantly and non-linearly predict the volatility of the Colcap index. These results can be interpreted to mean that investors who participated on the Colombian stock market took into account the evolution of the growth in infection between the third and tenth day of trading in their investment decisions. The test also indicates that the infections generated a feedback effect on the Colcap index, which led to investor overreaction.

In contrast, the Granger linear causality test finds that the 11 lags of infection growth significantly and linearly forecast the volatility of the Colcap index. These results can be understood to mean that investors who participated in the companies in the Colcap index took into account the trend in the growth of infection over the last 11 days in their investment decisions.

Regarding the relationship between the number of COVID-19 infections on a logarithmic scale and the volatility of the Colcap index, the non-linear causality test finds that the first eight lags are significant, i.e. these lags of the number of infections significantly and non-linearly predict the volatility of the Colcap index. These results can be interpreted to mean that investors who participated in the companies in the Colcap index took into account the evolution of the number of infections over the last eight days in their investment decisions. The test also indicates that the infections generated a feedback effect on the Colcap index, which caused investors to overreact.

Conversely, the Granger linear causality test finds that the 10 lags of the number of infections significantly and linearly predict the volatility of the Colcap index. Only the lag in period two was not significant. In other words, investors took into account the evolution of the number of infections over the past 10 days in their investment decision.

Regarding the relationship between the growth of the number of COVID-19 deaths and the volatility of the Colcap index, the non-linear causality test finds that the lags of two over the 15 periods are significant, i.e. that these lags of the growth of COVID-19 deaths significantly and non-linearly predict the volatility of the index. These results can be understood to mean that investors who participated in the companies in the Colcap index took into account the evolution of the growth of deaths between the second and the fifteenth day in their investment decision. The test also indicates that the infections generated a feedback effect on the Colcap index, which caused investors to overreact.

In contrast, the Granger linear causality test finds that lags three, four and nine to 15 of death from COVID-19 growth significantly and linearly predict the volatility of the Colcap index. It should be noted that unlike infections, investors take into account the evolution of the growth of the number of deaths in the last 15 days in their investment decision, i.e. five more days.

Regarding the relationship between the number of COVID-19 deaths on a logarithmic scale and the volatility of the Colcap index, the non-linear causality test finds that the first 11 lags are significant, i.e. that these lags significantly and non-linearly predict the volatility of the Colcap index. These results can be interpreted to mean that investors who participated in the companies in the Colcap index, took into account the evolution of the number of deaths in the last 11 days in their investment decision. The test also indicates that the infections generated a feedback effect on the Colcap index, which caused investors to overreact.

Alternatively, the Granger linear causality test finds that lags one, four, five, six and twelve of the number of deaths significantly and linearly predict the volatility of the Colcap index, table 2. This indicates that in their decision to invest in the Bvc, investors take into account the evolution of the number of deaths in the last 11 and 12 days, according to the non-linear and linear tests.

Causality and volatility in the Colcap index of the Colombian Stock Exchange as a result of Covid-19 infections and deaths

10/14

Table 2. Results of the linear and non-linear causality test in the Granger sense, Colcap index volatility and COVID- 19 infections and deaths.

| | Granger Non-Linear Causality Test | | | Granger Linear Causality Test | | |
|---|---|---|---|---|---|---|
| | Lagging | Test f | P-value | Lagging | Test f | P-value |
| **Volatility-Infection growth COVID-19** | 1 | -10.3321 | 1.0000 | 1 | 4.2609 | 0.0395 |
| | 2 | -2.07156 | 1.0000 | 2 | 19.131 | 0.0000 |
| | 3 | 5.68587 | 0.0000 | 3 | 24.757 | 0.0000 |
| | 4 | 11.964 | 0.0000 | 4 | 8.5693 | 0.0000 |
| | 5 | 13.1377 | 0.0000 | 5 | 19.316 | 0.0000 |
| | 6 | 11.5337 | 0.0000 | 6 | 17.188 | 0.0000 |
| | 7 | 7.67409 | 0.0000 | 7 | 15.393 | 0.0000 |
| | 8 | 4.56968 | 0.0000 | 8 | 14.16 | 0.0000 |
| | 9 | 2.49796 | 0.0000 | 9 | 12.797 | 0.0000 |
| | 10 | 1.53312 | 0.0079 | 10 | 7.232 | 0.0000 |
| | 11 | 0.903252 | 0.6935 | 11 | 2.2344 | 0.0119 |
| **Volatility- Ln (Number of COVID- 19 infections)** | 1 | 9.25046 | 0.0000 | 1 | 8.8702 | 0.0030 |
| | 2 | 36.5777 | 0.0000 | 2 | 0.8921 | 0.4104 |
| | 3 | 27.3365 | 0.0000 | 3 | 2.3782 | 0.0690 |
| | 4 | 19.3441 | 0.0000 | 4 | 4.7663 | 0.0009 |
| | 5 | 14.1551 | 0.0000 | 5 | 6.7231 | 0.0000 |
| | 6 | 9.32704 | 0.0000 | 6 | 7.2446 | 0.0000 |
| | 7 | 6.823 | 0.0000 | 7 | 9.8502 | 0.0000 |
| | 8 | 3.97918 | 0.0000 | 8 | 23.759 | 0.0000 |
| | 9 | -7.4668 | 1.0000 | 9 | 12.711 | 0.0000 |
| | 10 | -6.68368 | 1.0000 | 10 | 12.23 | 0.0000 |
| | 11 | -5.99186 | 1.0000 | 11 | 11.659 | 0.0000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Volatility - Growth in number of COVID-19 deaths** | 1 | -0.380382 | 1.0000 | 1 | 1.0352 | 0.3094 |
| | 2 | 6.07997 | 0.0000 | 2 | 1.2364 | 0.2913 |
| | 3 | 11.9357 | 0.0000 | 3 | 4.1398 | 0.0065 |
| | 4 | 17.7108 | 0.0000 | 4 | 3.0723 | 0.0162 |
| | 5 | 21.9285 | 0.0000 | 5 | 1.1195 | 0.3489 |
| | 6 | 23.838 | 0.0000 | 6 | 1.0528 | 0.3902 |
| | 7 | 21.6613 | 0.0000 | 7 | 1.1568 | 0.3262 |
| | 8 | 17.8076 | 0.0000 | 8 | 1.0686 | 0.3838 |
| | 9 | 13.2868 | 0.0000 | 9 | 1.6888 | 0.0889 |
| | 10 | 9.58563 | 0.0000 | 10 | 1.7519 | 0.0670 |
| | 11 | 6.48749 | 0.0000 | 11 | 2.1433 | 0.0164 |
| | 12 | 4.44416 | 0.0000 | 12 | 2.3117 | 0.0071 |
| | 13 | 2.88464 | 0.0000 | 13 | 2.3456 | 0.0049 |
| | 14 | 1.87158 | 0.0000 | 14 | 2.3085 | 0.0045 |
| | 15 | 1.15348 | 0.1796 | 15 | 2.2203 | 0.0053 |
| **Volatility- Ln (Number of COVID- 19 Deaths)** | 1 | 43.2961 | 0.0000 | 1 | 6.2179 | 0.0130 |
| | 2 | 103.786 | 0.0000 | 2 | 0.6681 | 0.5131 |
| | 3 | 87.5079 | 0.0000 | 3 | 0.9581 | 0.4123 |
| | 4 | 62.3466 | 0.0000 | 4 | 3.1241 | 0.0148 |
| | 5 | 47.0739 | 0.0000 | 5 | 2.6175 | 0.0238 |
| | 6 | 33.6894 | 0.0000 | 6 | 2.0791 | 0.0542 |
| | 7 | 23.7275 | 0.0000 | 7 | 1.7029 | 0.1060 |
| | 8 | 16.3273 | 0.0000 | 8 | 0.7367 | 0.6591 |
| | 9 | 11.0156 | 0.0000 | 9 | 0.7836 | 0.6317 |
| | 10 | 7.14009 | 0.0000 | 10 | 1.3487 | 0.2015 |
| | 11 | 4.28138 | 0.0000 | 11 | 1.2812 | 0.2318 |
| | 12 | -5.091 | 1.0000 | 12 | 1.9801 | 0.0243 |

# Conclusions

Based on the research and the results obtained, the following conclusions are proposed: In 2019, the volatility of the Colcap index was positive and stable, exhibiting a high quotation trend. In contrast, during the pandemic, the volatility of the Colcap index increased, showing an overreaction to the rise in COVID-19 infections and deaths. Non-linear and linear Granger causality tests indicate that COVID-19 infections and deaths were the drivers of volatility in the Colcap index on the Colombian Stock Exchange (Bvc). Furthermore, the non-linear Granger test suggests that investors considered the progression of infections over the last three to 10 days and the trend in the number of

deaths over the last 15 days. Conversely, the linear Granger test indicates that investors took into account the evolution of infections and deaths over the last 11 days when making investment decisions on the Bvc.

However, it is crucial to acknowledge that other factors may have also contributed to this volatility. These include changes in economic policies, the management and technological adaptability of companies, and pandemic containment policies, among others. Nonetheless, this work underscores the decision to focus on COVID-19 infections and deaths due to their direct and immediate impact on investor decisions and market dynamics. This approach does not deny the influence of other factors but highlights the significance of infections and deaths as a critical driver of volatility in an unprecedented global health crisis context.

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