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Impact of COVID-19on Stock Exchange Indices: A Comparative Study among Most affected Emerging Markets

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Since the outspread of the pandemic, COVID-19is the most researched topic. The impact of various dimensions of this pandemic on the stock exchanges and their performance is still far from complete. Furthermore, knowledge about the effects of COVID-19 on emerging markets of different continents is still lacking. Therefore, this study is conducted to identify the impact of COVID-19 on the performance of stock markets of the emerging economies of the world. With this reference the stock markets of North and South Americas, Mexico, Colombia, and Brazil are analyzed; these were the most affected emerging markets of America due to COVID-19. The independent variable is operationalized in terms of active cases, the number of deaths, and total vaccinated persons. Stock market indices, returns, volatility, and uncertainty are taken as performance measures. The result shows a significant effect of all the dimensions of COVID-19 on the stock market; however, the impact is different for each market, which is discussed in detail in the results section. This study will assist in assessing the trend of the stock market in any future pandemic or disaster and making profitable investments.

Keywords: COVID-19 active cases, number of deaths, total vaccinated, stock market indices, returns, volatility, and uncertainty.

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Introduction

Stock Markets are susceptible to the environment and developments, which are taking place at any point in time, like natural disasters, economic crises, political uncertainty, announcements, and shocks (Hillier & Loncan, 2019; Guo, Kuai, & Liu, 2020; Lee, Hu, Chen, Huang, & Hsueh, 2020). The importance of monitoring the stock market becomes essential for investors as it acts as the barometer of economies and has a direct connection with the development of a country (Sanyaolo, et al., 2020). The decisions regarding stock trading are conducted rapidly depending on any new information. Any announcement concerning the financial indicators and macroeconomics, like forex rates, discount rates, growth of the economy, the rate of inflation, unemployment, current account, and factors related to political and social changes can

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significantly affect stock markets as reflected in their indices; further, various announcements and the expectations of investors also affect the markets (Hussain & Omrane, 2021).

All countries have recently been confronted with a new problem from a different domain (i.e., the health sector), distinct from other recent challenges such as the financial crisis of 2008-9. Since 2019, the way world dealt with COVID-19, which first appeared in China in late 2019 and gradually spread worldwide. World Health Organization-WHO declared it a pandemic affecting the whole world (Cucinotta & Vanelli, 2020; Kartal, Depren, & Depren, 2020). Since then, the number of cases has increased tremendously, reaching over 3.5 million confirmed cases, and the death toll went up to more than 5.6 million till January 24, 2022 (Worldometer, 2022). Although this pandemic impacted nearly the whole world, the degree of impact for each country is different. For example, the USA, France, Brazil, India, and UK are the countries, which were badly affected, and surprisingly China, from where the pandemic started, is among the least affected countries (Worldometer, 2022). These pandemic diseases like Ebola and SARS not only affected the health sector but these diseases equally affected the stock markets (Ichev & Marinc, 2018). Similarly, COVID-19 also affected the stock exchanges during these times (Engelhardt, Krause, Neukirchen, & Posch, 2021). Moreover, according to (Bloomberg, 2020), it is the most vicious global issue, which has created fear among investors as the pandemic continues and compels them to search for new ventures to secure their investments (Akhtaruzzaman, Boubaker, & Sensoy, 2021). Therefore, this problem has affected the world stock markets, and the degree of this effect varies according to each country.

The effect of various parameters of this disease on the variation of stock markets is of prime importance to investors, unfortunately, not enough literature is available on the subject. Different parameters of this pandemic have a varied effect on the performance of the stock market, which requires extensive research to predict the variation in these markets during future pandemic waves. However, there is still a considerable knowledge gap in covering all the aspects of COVID-19. Therefore, we aimed to determine the impact of this pandemic on the emerging stock market indices; these markets are taken from different continents of the world. Additionally, we took some other factors in our research in addition to the pandemic. In this context, daily data is used from January 1, 2019, to December 31, 2021. Active cases, deaths, and the total number of vaccinated people are used as the primary determinants of the pandemic. Their effect is measured by stock market indices, returns, volatility, and uncertainty. The study is most significant for the investors of these markets as they can learn about the impact of various indicators of a pandemic on stock exchange indices, compare the effect in different emerging markets and make a well-informed decision for investment in these global stock markets.

We chose the three most affected emerging markets from each continent: Asia, Europe, Africa, and the Americas. From Asia, India with more than 39.5 million confirmed cases, Russia with more than 11.1 million cases, and Turkey with more than 11 million cases are selected. From Africa, South Africa with more than 3.5 million cases, Morocco with approximately 1.1 million patients, and Egypt with about four hundred and ten thousand cases are selected. From Europe,

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Poland with more than 4.5 million cases, the Czech Republic with 2,763 million cases, and Greece with about 1.8 million patients are selected. Finally, in North and South America, Brazil had 24,040,000 cases, Colombia had 5,740,000 cases, and Mexico had 4,667,000 cases on the top (Worldometer, 2022). As per Morgan Stanley Capital International (MSCI), these selected countries are the world's emerging markets. Table-1 shows the data on COVID-19 cases in the emerging markets in each continent:

Table 1

Emerging Markets as per MSCI, and the number of confirmed COVID-19 cases

Sr. No	Continent	Country	No. of confirmed cases
1	Asia	India	1st (39,543,328)
2		Russia	2nd (11,173,300)
3		Turkey	3rd (11,014,152)
4	Africa	South Africa	1st (3,581,359)
5		Morocco	2nd (1,101,163)
6		Egypt	3rd (410,098)
7	Europe	Poland	1st (4,547,315)
8		Czech Republic	2nd (2,763,800)
9		Greece	3rd (1,812,384)
10	North + South America	Brazil	1st (24,044,437)
11		Colombia	2nd (5,740,179)
12		Mexico	1st (4,667,829)

The objective of this study is to examine the effect of COVID-19 on the indices of stock exchanges, returns, volatility, and uncertainty with a focus on by focusing on pandemic indicators (number of active cases, number of deaths, and number of COVID-19 vaccinated population)

Literature Review

There are several studies to determine the impact of COVID-19 on various aspects of life and the economy. Impact on businesses and stock markets has also been a popular area of research since the advent of this disease. The related research word is not just found in developed countries but also in developing and underdeveloped countries. Findings of related research show that there is a strong link between COVID-19 and variation in the stock markets. Although, literature regarding the impact of COVID-19 on the stock markets regions is limited, especially in the case of emerging economies. The pandemic hit the world in various negative ways, one of these was issues of cashflows and the crisis of credit generation and this was more common in emerging economies

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(Ahmed, Hoek, Kamin, Smith, & Yoldas, 2020), this makes these economies vulnerable to external shocks and the stock markets are likely to show enormous respond creating a high risk for the investors. Some of the indicators of this pandemic are common in most of the research works done by the scholars such as the number of new cases, the number of deaths, and the number of vaccinated persons. The data collected by the researchers related to the indicators of this pandemic played a crucial role in determining its impact, particularly on the stock markets and investors (Alfaro, Chari, Greenland, & Schott, 2020). Albulescu (2020) explained the unpredicted changes in the COVID-19 infections and their impact on US stock market returns; the data on the number of infected persons and the number of deaths due to this disease brought huge unrest and made the situation extremely uncertain, which also greatly affected the markets by increasing the volatility and level of risk; the data was regularly provided by the World Health Organization, which was certainly credible. Zhang, Hu, and Ji (2020) and other researchers found that COVID-19 had a drastic impact on the increase in the unrest in the world market with the increase in the levels of risk. A similar study (Okorie & Lin, 2021) showed that there was certainly a short-term impact on the stock markets, which could go further into the long run. Research also confirmed that efficient markets, which quickly reflect the information in stock prices responded in the same way in the case of COVID-19 (Ashraf, 2020). Other studies, which looked at the other side of the picture is the positive impact found that the increase in the number of people recovering from this disease had a positive impact on the stock markets; nevertheless, as several other studies increase in the number of positive cases, hospitalization, and deaths harmed the economies and markets (Yar & Ahmed, 2020). A study by Azimli (2020) found that social distancing, lockdowns, and similar measures taken to control the pandemic severely affected the economy and also the security prices. Adekoya and Nti (2020) found that there is a negative relationship between stock market indices with pandemic indicators. Surrounding uncertainty due to the reason that COVID-19 was pervasive and the changing impact of the pandemic had a mixed effect on the world economies (McKibbin, Warwick, & Fernando., 2021). Further, looking at it from the perspective of its impact on bigger economies like the USA, it was found that the impact was in terms of returns and fluctuations of returns (Baig et al., 2020). Sharif, Aloui, and Yarovaya (2020) mentioned in their article that the response was not the same in the US, as with the increase in the number of cases the bad news impact furthered this causing desperate measures like the Reserve Bank to increase the risk level, and changes in the monetary policy of the country. It is also worth considering that a few studies have performed comparative analysis to see the impact in terms of differences at regional and global levels. The pandemic has triggered a massive spike in uncertainty. Research work done as a comparison of the effect of this pandemic on the economy as compared to other financial and natural disasters found that COVID-19 affected the economies more than them (Goodell, 2020). Ozili and Arun (2020) considered another important aspect related to the impact of this disease that is, social distancing and the ways this was implemented and how it affected the business operations; this also had a spillover effect like the spread of the disease itself. It was found that Asia, the largest continent in the world, was most badly hit by it, and compared to it other continents faced somewhat different consequences; various indicators of the impact of COVID-19 have varying results in the other continents of the world like Europe, North, and Latin America. Baker et al. (2020) found some interesting facts such as the situation remained uncertain because

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there was not much knowledge of the disease and pharmaceutical companies were ready to combat anything like this; it was uncertain how infectious the disease was and how deadly it can be. As the situation remained uncertain wither reference to finding the cure, the market conditions and trade activities also remained dubious (Goodell, 2020). In Asian markets, like Turkey, it was observed businesses were deeply affected by the COVID-19 pandemic and it was from the very start of the disease in the area. The findings of the research showed that there was a strong connection between pandemic indicators and mobility (Kartal, Depren, & Depren, 2021). Researchers also found a strong relationship, including spillover, between the stock markets of various countries individually and the region of Asia as a whole. However, in some cases the results were a little different; in Singapore, the country and regional comparison were not the same as in the other countries (Sharma, 2020). On the other hand, scholars also worked on the relationship between the currency and stock markets during and after the pandemic period. The nature of the interdependence between stock prices and exchange rates has consequences for several vital issues in international finance; the financial and nonfinancial markets, both in developed and emerging countries are affected (Harjoto & Rossi, 2021).

Based on the literature review, we have deduced four models which will be tested on each country independently.

Model 1

$$SE_{it} = \alpha i + \beta_1 CP_{it} + \beta_2 TD_{it} + \beta_3 TV_{it} + \varepsilon_{it}$$

SE = Stock exchange indices

CP = Covid patients

TD = Total deaths

TV = Total Vaccinated

α = intercept point

ε = error

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Model 2

$$SR_{it} = \alpha i + \beta_1 CP_{it} + \beta_2 TD_{it} + \beta_3 TV_{it} + \varepsilon_{it}$$

SR = Returns

CP = Covid patients

TD = Total deaths

TV = Total Vaccinated

α = intercept point

ε = error

Model 3

$$SV_{it} = \alpha i + \beta_1 CP_{it} + \beta_2 TD_{it} + \beta_3 TV_{it} + \varepsilon_{it}$$

SV = Volatility

CP = Covid patients

TD = Total deaths

TV = Total Vaccinated

α = intercept point

ε = error

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Model 4

$$SU_{it} = \alpha i + \beta_1 CP_{it} + \beta_2 TD_{it} + \beta_3 TV_{it} + \varepsilon_{it}$$

SU = Uncertainty

CP = Covid patients

TD = Total deaths

TV = Total Vaccinated

α = intercept point

ε = error

Data and Methodology

In this study, we have concentrated on emerging markets severely affected by the COVID-19 pandemic. Therefore, we have selected the top three countries from each continent that were severely affected, including Brazil, Colombia, and Mexico from South and North America.

Secondary data was utilized for this study, and the data regarding Stock exchange indices, Returns, Volatility, and uncertainty were gathered from online websites. At the same time, the data regarding COVID-19 was extracted from www.worldometers.com. As the study aims to identify the relationship between COVID-19 of stock exchange performance, daily data is used from January 3, 2019, to December 31, 2021, including pre-pandemic and pandemic periods. The duration of the pre-pandemic period varies between each country depending on the first reported case of covid-19. For example, based on the given information pre-pandemic period for Brazil is from January 3, 2019, to February 26, 2020, Colombia from January 3, 2019, to March 6, 2020, and for Mexico, it was from January 3, 2019, to February 28, 2020.

This study used Least Squares Regression to perform the analysis and to predict the behavior of dependent variables. LSR is a suitable method to perform analysis like this as was used by various other researchers. This is a panel data analysis with several countries over some time are studied.

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Results and Discussion

Initially, the results of each emerging market are analyzed separately, and the impact of COVID-19was measured on the stock market indices, returns, volatility, and uncertainty

The results of Mexico are given here. Before analyzing the data, the homoscedasticity test of the gathered data was carried out. Table 2 confirms the homoscedasticity of data with the low value of chi-square.

Table 2

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	6.530583	Prob. F(3,254)	0.0003
Obs*R-squared	18.47523	Prob. Chi-Square (3)	0.0004
Scaled explained SS	17.53196	Prob. Chi-Square (3)	0.0005

Based on Table 3, we can deduce that the R-squared value of 0.654 explains the acceptability of our model, whereby independent variables explain 65.43% of the variation in the dependent variable. The Prob(F-statistics) value lesser than .05 indicates the significance of the model. No of death relation with stock exchange indices is insignificant (p = 0.1933), whereas no of active cases have significant negative and total vaccinated have a significant positive relation with stock exchange indices (p = 0.000, coefficient = -4.82; p = 0.0417, coefficient = 2.02 respectively).

Table 3

Dependent Variable: STOCK_EXCHANGE

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NO__OF_DEATHS	1.21E-05	9.26E-06	1.304209	0.1933
NO__OF_ACTIVE_CASES	-4.82E-06	9.66E-07	-4.993355	0.0000
TOTAL_VACCINATED	2.02E-08	9.87E-09	2.046504	0.0417
C	51.14419	1.188693	43.02557	0.0000

R-squared	0.654284	Mean dependent var	41.59955
Adjusted R-squared	0.650200	S.D. dependent var	2.708395
S.E. of regression	1.601850	Akaike info criterion	3.795577
Sum squared residual	651.7443	Schwarz criterion	3.850662

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Log-likelihood	-485.6295	Hannan-Quinn criterion	3.817727
F-statistic	160.2354	Durbin-Watson stat	0.141793
Prob(F-statistic)	0.000000		

Table 4 describes model 2; the R-squared value of 0.0012 and Prob(F-statistics) value of 0.95 indicates the insignificance of the model. Also, there is no significant relation of Returns with active cases, number of deaths, and number of people vaccinated (p = 0.6969; p = 0.9635; p = 0.5888 respectively)

Table 4

Dependent Variable: RETURNS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NO__OF_ACTIVE_CASES	-3.46E-09	8.86E-09	-0.389949	0.6969
NO__OF_DEATHS	3.89E-09	8.50E-08	0.045760	0.9635
TOTAL_VACCINATED	4.91E-11	9.06E-11	0.541304	0.5888
C	0.005682	0.010910	0.520814	0.6030

R-squared	0.001286	Mean dependent var	-0.000296
Adjusted R-squared	-0.010510	S.D. dependent var	0.014625
S.E. of regression	0.014702	Akaike info criterion	-5.586349
Sum squared residual	0.054898	Schwarz criterion	-5.531265
Log-likelihood	724.6391	Hannan-Quinn criterion	-5.564199
F-statistic	0.108995	Durbin-Watson stat	2.243878
Prob(F-statistic)	0.954792		

Table 5 indicates that model 3 is significant as R-squared is 0.1472 and Prob(F-statistic) is 0.000. There is no significant relationship between the number of active cases and volatility. However, the number of deaths has significant and negative relationships, and the total number of people vaccinated has a significant and positive relation with volatility (p = 0.0001, coefficient = -1.48; p = 0.011, coefficient = 1.04 respectively)

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Table 5

Dependent Variable: VOLATILITY

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NO__OF_ACTIVE_CASES	4.54E-08	3.99E-08	1.137233	0.2565
NO__OF_DEATHS	-1.48E-06	3.83E-07	-3.873187	0.0001
TOTAL_VACCINATED	1.04E-09	4.08E-10	2.558028	0.0111
C	0.378702	0.049127	7.708572	0.0000

R-squared	0.157192	Mean dependent var	0.221079
Adjusted R-squared	0.147238	S.D. dependent var	0.071691
S.E. of regression	0.066203	Akaike info criterion	-2.576806
Sum squared residual	1.113233	Schwarz criterion	-2.521722
Log-likelihood	336.4080	Hannan-Quinn criterion	-2.554657
F-statistic	15.79121	Durbin-Watson stat	0.153517
Prob(F-statistic)	0.000000		

According to Table 6, the model is significant as the R-squared is 0.1572 and Prob(F-statistic) is 0.000. There is no significant relationship between the number of active cases and uncertainty. However, the number of deaths has significant and negative relationships and the total number of people vaccinated has a significant and positive relation with volatility (p = 0.0001, coefficient = -4.69; p = 0.011, coefficient = 3.30 respectively)

Table 6

Dependent Variable: UNCERTAINTY

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NO__OF_ACTIVE_CASES	1.44E-08	1.26E-08	1.137233	0.2565
NO__OF_DEATHS	-4.69E-07	1.21E-07	-3.873187	0.0001
TOTAL_VACCINATED	3.30E-10	1.29E-10	2.558028	0.0111
C	0.119756	0.015535	7.708572	0.0000

R-squared	0.157192	Mean dependent var	0.069911
Adjusted R-squared	0.147238	S.D. dependent var	0.022671
S.E. of regression	0.020935	Akaike info criterion	-4.879392
Sum squared residual	0.111323	Schwarz criterion	-4.824307

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Log-likelihood	633.4415	Hannan-Quinn criterion	-4.857242
F-statistic	15.79121	Durbin-Watson stat	0.153517
Prob(F-statistic)	0.000000		

The findings related to Colombia are provided in the next discussion. Table 7 shows the homoscedasticity of data collected for Colombia with low Chi-square values. Furthermore, Table 8 indicates the significance of model 1 as the r-square value is 0.9425, which specifies that the I.V.s explain 94.25% of DV variation. Furthermore, the number of active cases of COVID-19 has a significant positive relation with stock, whereas the number of deaths and number of vaccinated populations have a significant negative relation with stock exchange indices (p = 0.000, coefficient = 0.007; p = 0.000, coefficient = -0.304; p = 0.000, coefficient = -1.41 respectively)

Table 7

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	7.115876	Prob. F(3,218)	0.0001
Obs*R-squared	19.80038	Prob. Chi-Square (3)	0.0002
Scaled explained SS	61.68406	Prob. Chi-Square (3)	0.0000

Table 8

Dependent Variable: STOCK_EXCHANGE

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NO__OF_ACTIVE_CASES	0.006780	0.000596	11.36836	0.0000
NO__OF_DEATHS	-0.303804	0.024932	-12.18507	0.0000
TOTAL_VACCINATED	-1.41E-05	2.15E-06	-6.562067	0.0000
C	15175.61	182.5435	83.13417	0.0000

R-squared	0.942490	Mean dependent var	10808.15
Adjusted R-squared	0.941699	S.D. dependent var	1045.094
S.E. of regression	252.3446	Akaike info criterion	13.91732
Sum squared residual	13881759	Schwarz criterion	13.97863

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Log-likelihood	-1540.823	Hannan-Quinn criterion	13.94207
F-statistic	1190.887	Durbin-Watson stat	0.271671
Prob(F-statistic)	0.000000		

As per Table 9, model 2 is not significant for Colombia as depicted by a very low value of R-square 0.007 and Prob (F-statistic) = 0.665. Returns have a non-significant relation with the number of active cases of covid-19, number of deaths, and number of people vaccinated (p = 0.917; 0.863; 0.232, respectively)

Table 9

Dependent Variable: RETURNS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NO__OF_ACTIVE_CASES	3.07E-09	2.94E-08	0.104350	0.9170
NO__OF_DEATHS	-2.12E-07	1.23E-06	-0.172126	0.8635
TOTAL_VACCINATED	1.27E-10	1.06E-10	1.199373	0.2317
C	0.005126	0.009001	0.569456	0.5696

R-squared	0.007176	Mean dependent var	-0.000980
Adjusted R-squared	-0.006486	S.D. dependent var	0.012403
S.E. of regression	0.012443	Akaike info criterion	-5.917409
Sum squared residual	0.033754	Schwarz criterion	-5.856099
Log-likelihood	660.8324	Hannan-Quinn criterion	-5.892656
F-statistic	0.525248	Durbin-Watson stat	1.888650
Prob(F-statistic)	0.665375		

According to Table 10, model 3 is significant for Colombia with an R-square of 0.135 and Prob (F-statistic) = 0.000. Furthermore, there is a significant and negative relation between the number of active cases of COVID-19with volatility, a significant and positive relation between the number of deaths, and non-significant relation with total vaccinated (p = 0.001, coefficient = -6.54; p = 0.001, coefficient = 2.67; p = 0.116 respectively).

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Table 10

Dependent Variable: VOLATILITY

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NO__OF_ACTIVE_CASES	-6.54E-07	1.88E-07	-3.487971	0.0006
NO__OF_DEATHS	2.67E-05	7.84E-06	3.400859	0.0008
TOTAL_VACCINATED	1.07E-09	6.77E-10	1.578667	0.1159
C	0.038387	0.057428	0.668436	0.5046

R-squared	0.135278	Mean dependent var	0.176289
Adjusted R-squared	0.123378	S.D. dependent var	0.084791
S.E. of regression	0.079388	Akaike info criterion	-2.211086
Sum squared residual	1.373934	Schwarz criterion	-2.149777
Log-likelihood	249.4306	Hannan-Quinn criterion	-2.186333
F-statistic	11.36806	Durbin-Watson stat	0.136309
Prob(F-statistic)	0.000001		

Based on Table 11, the significance of model 4 can be established with an R-square value of 0.1353 and Prob (F-statistic) of 0.000. Uncertainty has a significant and negative relationship with the number of active COVID-19 cases, significant and positive relationship with the number of deaths, and insignificant relation with total vaccinated people (p = 0.001, coefficient = -2.07; p = 0.001, coefficient = 8.44; p = 0.116 respectively).

Table 11

Dependent Variable: UNCERTAINTY

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NO__OF_ACTIVE_CASES	-2.07E-07	5.93E-08	-3.487971	0.0006
NO__OF_DEATHS	8.44E-06	2.48E-06	3.400859	0.0008
TOTAL_VACCINATED	3.38E-10	2.14E-10	1.578667	0.1159
C	0.012139	0.018160	0.668436	0.5046

R-squared	0.135278	Mean dependent var	0.055748
Adjusted R-squared	0.123378	S.D. dependent var	0.026813

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S.E. of regression	0.025105	Akaike info criterion	-4.513671
Sum squared residual	0.137393	Schwarz criterion	-4.452362
Log-likelihood	505.0175	Hannan-Quinn criterion	-4.488918
F-statistic	11.36806	Durbin-Watson stat	0.136309
Prob(F-statistic)	0.000001		

Brazil

Table 12 shows the homoscedasticity of data collected for Colombia with low Chi-square values. Furthermore, Table 13 indicates the significance of model 1 as the r-square value is 0.9474, which specifies that the I.V.s explain 94.74% of DV variation. Furthermore, the number of active cases of COVID-19 has significant negative relation with stock, whereas the number of deaths has a significant positive and the number of vaccinated populations has a significant negative relation with stock exchange indices (p = 0.000, coefficient = -1.20; p = 0.000, coefficient = 3.20; p = 0.000, coefficient = -1.33 respectively).

Table 12

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	3.698102	Prob. F(3,228)	0.0125
Obs*R-squared	10.76512	Prob. Chi-Square (3)	0.0131
Scaled explained SS	8.020959	Prob. Chi-Square (3)	0.0456

Table 13

Dependent Variable: STOCK_EXCHANGE

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NO__OF_ACTIVE_CASES	-1.20E-06	1.93E-07	-6.202326	0.0000
NO__OF_DEATHS	3.20E-05	5.75E-06	5.573425	0.0000
TOTAL_VACCINATED	-1.33E-08	1.07E-09	-12.34588	0.0000
C	22.27524	0.572343	38.91940	0.0000

R-squared	0.947453	Mean dependent var	15.05357
Adjusted R-squared	0.946762	S.D. dependent var	2.378715

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S.E. of regression	0.548851	Akaike info criterion	1.655112
Sum squared residual	68.68216	Schwarz criterion	1.714538
Log-likelihood	-187.9930	Hannan-Quinn criterion	1.679078
F-statistic	1370.327	Durbin-Watson stat	0.383176
Prob(F-statistic)	0.000000		

Table 14 signifies that model 2 is not significant for Brazil as depicted by a very low value of R-square 0.001 and Prob(F-statistic) = 0.981. Returns have a non-significant relation with the number of active cases of covid-19, number of deaths, and number of people vaccinated (p = 0.872; 0.893; 0.865, respectively)

Table 14

Dependent Variable: RETURNS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NO__OF_ACTIVE_CASES	-1.33E-09	8.23E-09	-0.161620	0.8717
NO__OF_DEATHS	3.32E-08	2.45E-07	0.135292	0.8925
TOTAL_VACCINATED	7.83E-12	4.58E-11	0.170970	0.8644
C	0.004350	0.024411	0.178215	0.8587

R-squared	0.000786	Mean dependent var	-0.001913
Adjusted R-squared	-0.012361	S.D. dependent var	0.023266
S.E. of regression	0.023409	Akaike info criterion	-4.654272
Sum squared residual	0.124943	Schwarz criterion	-4.594845
Log-likelihood	543.8955	Hannan-Quinn criterion	-4.630305
F-statistic	0.059805	Durbin-Watson stat	2.391520
Prob(F-statistic)	0.980792		

According to Table 15, model 3 is significant for Brazil with an R-square of 0.221 and Prob(F-statistic) = 0.000. Furthermore, there is a significant and positive relation between the number of active cases of COVID-19with volatility, a significant and negative relation between the number of deaths, and non-significant relation with total vaccinated (p = 0.056, coefficient = 7.28; p = 0.057, coefficient = 1.13; p = 0.224 respectively).

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Table 15

Dependent Variable: VOLATILITY

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NO__OF_ACTIVE_CASES	7.28E-08	3.80E-08	1.915104	0.0567
NO__OF_DEATHS	-2.16E-06	1.13E-06	-1.909213	0.0575
TOTAL_VACCINATED	2.58E-10	2.12E-10	1.218372	0.2243
C	0.091064	0.112829	0.807101	0.4204

R-squared	0.220746	Mean dependent var	0.359601
Adjusted R-squared	0.210492	S.D. dependent var	0.121770
S.E. of regression	0.108198	Akaike info criterion	-1.592624
Sum squared residual	2.669133	Schwarz criterion	-1.533197
Log-likelihood	188.7444	Hannan-Quinn criterion	-1.568658
F-statistic	21.52913	Durbin-Watson stat	0.173362
Prob(F-statistic)	0.000000		

Based on Table 16, the significance of model 4 can be established with an R-square value of 0.221 and Prob (F-statistic) of 0.000. Uncertainty has a significant and positive relationship with the number of active COVID-19 cases, a significant and negative relation with the number of deaths, and insignificant relation with total vaccinated people (p = 0.056, coefficient = 2.30; p = 0.057, coefficient = -6.84; p = 0.224 respectively).

Table 16

Dependent Variable: UNCERTAINTY

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NO__OF_ACTIVE_CASES	2.30E-08	1.20E-08	1.915104	0.0567
NO__OF_DEATHS	-6.84E-07	3.58E-07	-1.909213	0.0575
TOTAL_VACCINATED	8.16E-11	6.69E-11	1.218372	0.2243
C	0.028797	0.035680	0.807101	0.4204

R-squared	0.220746	Mean dependent var	0.113716
Adjusted R-squared	0.210492	S.D. dependent var	0.038507
S.E. of regression	0.034215	Akaike info criterion	-3.895209
Sum squared residual	0.266913	Schwarz criterion	-3.835783

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Log-likelihood	455.8442	Hannan-Quinn criterion	-3.871243
F-statistic	21.52913	Durbin-Watson stat	0.173362
Prob(F-statistic)	0.000000		

Discussion

Based on Table 17, we can establish that stock exchange indices were negatively affected by active cases of COVID-19in Mexico and Brazil only. The number of deaths remained insignificant in Mexico and Colombia, and only Brazil had a positive impact. In contrast, total vaccinated persons positively affected Mexico and showed a negative impact on the market of Brazil and Colombia. Returns had insignificant relation with all the dimensions of COVID-19in all the selected emerging markets. Volatility displayed a negative impact on the number of active cases in Colombia and a positive impact in Brazil.

In contrast, it had been negatively impacted by the number of deaths in Mexico and Brazil while positively impacted in Colombia, positively impacted with total vaccinated persons in Mexico and Colombia only. Finally, the uncertainty had a negative impact on the increase in the number of patients in Colombia and positively affected Brazil. The number of deaths had negatively affected Mexico and Brazil and positively in Colombia. At the same time, the total number of vaccinated persons positively impacted uncertainty in Mexico only.

Table 17

COVID-19and Emerging Markets' Stock Performance Matrix

	Mexico				Colombia				Brazil			
	SI	RN	VY	UC	SI	RN	VY	UC	SI	RN	VY	UC
Active Cases	-4.82	Insights	Insig	Insig	0.06	Insig	-6.54	-2.07	-1.20	Insig	7.28	2.30
No. of Deaths	Insig	Insig	-1.48	-4.69	-0.30	Insig	2.67	8.44	3.20	Insig	-2.16	-6.84
Total Vaccinated	2.02	Insig	1.04	3.30	-1.41	Insig	1.07	Insig	-1.33	Insig	Insig	Insig

SI = Stock exchange Indices

RN = Returns

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VY = Volatility

UC = Uncertainty

Conclusion

The pandemic of COVID-19had affected various dimensions of life, one of which is the stock markets the world, where a significant decline was observed with this pandemic, which made the impact of various parameters of COVID-19on the variation of stock market indices of prime importance for investors. This research has contributed to filling the gap of knowledge in this aspect. Different parameters of the pandemic will have a different impact on stock market performance, which differs from one country to another. This study proved that there is no one solution for assessing all of the markets, as each call is affected differently by Covid-19. In this study, we have established the impact of active cases, the number of deaths, and total vaccinated persons as the predictor of covid-19. Each dimension had various effects on all the dimensions of the stock market. This research will also assist in predicting the future trend of that specific market in case of any other pandemic or disaster and in making safe investments for the investors

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