COVID-19, policy responses, and stock returns: Evidence from developed and emerging G20 markets

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ABSTRACT

This study examines the impact of the COVID-19 pandemic on G20 stock market returns and assesses its effects on both developed and emerging economies over an extended period. The study utilized daily closing prices and relevant COVID-19-related data from 1 January 2020 to 31 December 2022. A panel data regression analysis was conducted to investigate the effects of COVID-19 case growth, fatalities, and government interventions on stock market returns. The results revealed that growth in COVID-19 confirmed cases has a statistically significant negative impact on stock market returns in developed economies, indicating that an increase in confirmed cases is associated with a decline in stock market returns. Government support aimed at mitigating the impact of COVID-19 has a statistically significant negative effect on the stock market returns of emerging economies, suggesting that economic support announcements are associated with lower stock market returns. This study aims to empower investors to make informed investment choices based on their economic circumstances, thereby reducing potential negative impacts on their investments. It will also enable regulators to implement safeguarding measures to prevent adverse effects if a similar health crisis recurs in the future.

Contribution/ Originality: This study conducts an in-depth analysis of the diverse impacts of various COVID-19 metrics on G20 stock market performances over a three-year timeframe (2020-2022), featuring a comparative assessment between developed and emerging economies that differs from earlier research methodologies.

1. INTRODUCTION

In late 2019, China experienced a virus outbreak. The severity of the virus was such that, within a short period, it spread across the world, prompting the World Health Organization to declare it a public health emergency initially and subsequently a pandemic. Humanity was helpless, with no option but to stay indoors and protect their families from infection, as the number of cases and deaths increased rapidly. The virus affected developed countries and also resulted in the slow growth of emerging countries. The entire world was brought to a standstill, and the stock market was no exception to such a lethal outbreak. The fear was such that every other person was searching for or reading about the virus, which had not only affected human lives but also impacted the stock market (Subramaniam & Chakraborty, 2021). Various governments imposed restrictions on the public to minimize the spread of the virus. However, the unavailability of a vaccine to neutralize the virus added to public panic and raised various questions, such as "Will we survive?" and "Will the situation return to normal as before?"

COVID-19 had a profound impact on the global economy in a remarkably short period of time. The preventive measures implemented by governments began to negatively affect the economy, further transmitting this impact to financial market ratings and exacerbating chaos. The rapid increase in cases raised anxiety and fear, leading stock market participants to panic and behave irrationally. Stock market volatility increased, raising doubts about returns and liquidity, as well as decisions regarding whether to invest more or to realize profits, primarily driven by the rise in COVID-19-related cases. The increase in infected and deceased individuals decreased stock market returns, whereas improvements in COVID-19 cases and government response policies contributed to increased stock market returns (Gherghina & Simionescu, 2022; Guven, Cetinguc, Guloglu, & Calisir, 2022). The stock market was responsive to both global and country-specific COVID-19 cases. Doko Tchatoka, Puellbeck, and Masson (2022) observed a debatable point, as there were instances of increased stock market returns in some economies with a rise in COVID-19 cases. The impact of the pandemic was not uniform across economies, as it was perceived as more negative for emerging economies than for developed nations (Harjoto & Rossi, 2023).

This study conducts an in-depth examination of the diverse effects of various COVID-19 metrics on G20 stock market performances over three years (2020-2022), including a comparative evaluation between developed and emerging economies that diverges from earlier research approaches. Developed countries are well known for their policy formulation and implementation, as well as for mitigating the negative effects, and for their robust health infrastructure compared to emerging countries. To investigate whether COVID-19 has a similar or differential effect on stock market returns in developed and emerging countries, we formulate the following hypothesis:

H_1: *Growth in COVID-19 confirmed cases has differential effects on stock market returns across groups.*

H_2: *Growth in COVID-19 death cases has differential effects on stock market returns across groups.*

H_3: *The containment and health index have differential effects on stock market returns across groups.*

H_4: *The economic support index has differential effects on stock market returns across groups.*

2. LITERATURE REVIEW

2.1. Impact of the COVID-19 Pandemic on Global Stock Markets

Chakrabarti, Jawed, and Sarkhel (2021) investigated the changes in stock market behavior and its intermarket linkage after the COVID-19 pandemic outbreak. Following the outbreak, it was discovered that global stock markets began to exhibit similar patterns, losing the benefit of diversifying investments across various countries to mitigate investment risk, except for China, which remained the sole exception. Takyi and Bentum-Ennin (2021) studied the short-term effects of the pandemic on 13 African countries were significant, revealing that the pandemic had a substantial detrimental impact on the performance of all the stock markets analyzed in the investigation. Nguyen, Anh, and Gan (2021) examined the effect of the pandemic on business performance in relation to the two major Chinese stock market indices. The onset of the COVID-19 pandemic marked the beginning of negative returns in stock markets, as evidenced by the results. The study found that the COVID-19 outbreak had a greater impact than previous epidemics, especially once it escalated to a pandemic. Liu, Choo, and Lee (2020) examined the consequences of the official declaration of the COVID-19 pandemic by the World Health Organization, utilizing data collected from 77 countries. Research findings indicate that the declaration of the COVID-19 pandemic had a detrimental effect on stock markets. The study also found that its effects were more pronounced in nations with higher incomes and that these countries recovered more rapidly than low-income countries.

Liu, Manzoor, Wang, Zhang, and Manzoor (2020) assessed the temporary effects of the COVID-19 pandemic on 21 prominent stock indices in countries most severely impacted. Research has shown that stock markets plummeted rapidly after the declaration of the COVID-19 pandemic. The analysis also indicated that countries in Asia experienced negative abnormal returns. Szczygielski, Charteris, Bwanya, and Brzeszczyński (2023) investigated the 35 largest MSCI country indices by market capitalization to determine which information significantly affected the stock market. The findings revealed that COVID-19 had diverse impacts on different countries and regions, and the

research concluded that the pandemic spread geographically from east to west. Bai, Duan, Fan, and Tang (2023) examined the influence of stock market sentiment on returns across 47 different markets in 47 countries. The study discovered that negative emotions about the stock market had a detrimental effect on stock market returns, while positive emotions helped mitigate the losses resulting from the pandemic. Tan et al. (2022) studied the stock market returns of the G7 countries to determine the impact of the COVID-19 pandemic. The COVID-19 pandemic was found to have a substantial negative effect on the G7 countries. As the time period grew, the impact they experienced also diminished. Guven et al. (2022) investigated the effect of the COVID-19 pandemic on 26 emerging stock markets compiled by Morgan Stanley Capital International. The findings indicated that the adverse effects of the pandemic on developing countries diminished steadily as the timeframe lengthened. Researchers also found that the impact on Asian markets was more significant than on the European market.

2.2. Infection Data

Harjoto, Rossi, Lee, and Sergi (2021) analyzed 53 emerging and 23 developed countries to examine the impact of COVID-19 cases and deaths on stock returns, volatility, and trading volume. The research revealed that an increase in COVID-19 cases and fatalities influenced stock returns and heightened stock market fluctuations, with no effect on trading volume in developing countries. In contrast, in developed countries, an increase in COVID-19 cases was the only factor affecting stock returns, volatility, and trading volume. Amin, Arshad, Sultana, and Raoof (2022) examined the correlation between COVID-19 cases, age, and US stock market indexes. Research findings indicated that COVID-19 cases had a detrimental effect on stock indexes, whereas age had a positive impact on stock market indexes. Teitler-Regev and Tavor (2021) examined the influence of COVID-19 case numbers, recovery rates, and various types of variables, including government-imposed restrictions and public behavior, on stock market returns across 16 different countries. The research found that all variables influenced Israeli stock market returns, whereas in other countries, only a few variables had the same effect. According to Shaikh (2021), a daily rise in COVID-19 cases had a significant impact on investors' sentiment worldwide, leading to unprecedentedly negative outcomes in major equity markets.Doko Tchatoka et al. (2022) investigated the relationship between COVID-19 shocks and stock market performance in seven countries reveal that most nations responded negatively to COVID-19 shocks. However, there were instances where an increase in confirmed cases led to higher stock market returns. Ullah (2023) found that a daily increase in COVID-19 cases had a negative impact on stock market returns; however, conducting COVID-19 tests had a positive impact on stock market returns. The researcher also discovered that the daily increase in death cases positively affected the stock market returns of emerging countries, while it negatively impacted the stock market returns of developed countries. Udeaja and Isah (2022) investigated the impact of COVID-19 on African countries and found that during the epidemic period, fluctuations in oil prices and exchange rates decreased stock market returns. COVID-19 had a negative effect only during the pandemic period, due to an increase in confirmed cases and deaths.

2.3. Policy Responses

Caporale, Kang, Spagnolo, and Spagnolo (2022) analyzed the impact of the COVID-19 pandemic on G20 stock market returns by further dividing the sample into G7 and non-G7 countries. The findings revealed that government restrictions had a more significant negative impact on G7 nations compared to COVID-19 cases. In contrast, in non-G7 countries, both government restrictions and COVID-19 cases had a negative impact. Aharon and Siev (2021) studied the effect of government restrictions designed to lower Covid-19 case numbers in 25 emerging countries listed on the MSCI index, discovering that these restrictions had a detrimental impact on stock market returns. Størdal, Lien, Mydland, and Haugom (2021) investigated the consequences of non-pharmaceutical interventions on the returns of the Norwegian and Swedish stock markets during the early stages of the COVID-19 pandemic. The findings showed that non-pharmaceutical interventions had little or no impact on Norwegian stock market returns

but had a positive effect on Swedish stock market returns. However, the strength of this effect diminished as the number of confirmed COVID-19 cases rose.

Scherf, Matschke, and Rieger (2022), analyzing data from 42 different countries, investigated how the stock market responded to news of national lockdown restrictions. The findings indicated that the market's response to the announcement of lockdowns was mixed, with some countries overreacting and others underreacting. Throughout the first half of the sample period, the relaxation of restrictions had a negative effect on the stock market. However, during the second half of the sample, this effect shifted to a positive one, suggesting adaptation or changing investor sentiment over time. Narayan, Phan, and Liu (2021) and Deng, Xu, and Lee (2022) found that government restrictions, including lockdowns, travel bans, and stimulus packages, had a positive impact on stock market returns. Pandey and Kumari (2021) examined the impact of the COVID-19 pandemic, declared a public health emergency, on 49 global stock markets. Research showed that the lockdowns and restrictions implemented by countries in the initial stages successfully mitigated the spread of COVID-19, while also enhancing investor confidence and resulting in higher stock market returns. Guven et al. (2022) found that government intervention policies aimed at controlling the spread of COVID-19 had a positive impact on stock market returns in 21 emerging economies. However, as the number of confirmed cases and deaths increased, the effect weakened. Goel and Dash (2022) examined the impact of government responses to the COVID-19 pandemic and found that government policy responses had a moderating effect on the relationship between sentiment and stock returns. The research conducted by Saif-Alyousfi (2022) found that COVID-19 and government intervention policies had a significant impact on global and regional stock market returns. Specifically, stringent government responses led to a considerable increase in both global and regional stock market returns. Ashraf (2020a) examined the expected economic impact of government actions by analyzing the effect of such actions on the stock market returns of 77 countries. The findings showed that social distancing measures had a detrimental effect on stock market returns. In contrast, public awareness programs, testing and quarantine policies, and financial support packages had a beneficial impact.

Table 1. Previous studies on the COVID-19 pandemic and its impact on stock market returns.

Authors	Period of the Study	Methodology	Key Findings
Caporale et al. (2022)	2 March 2020 to 17 February 2021	Dynamic panel data model with fixed effects	G7 stock markets are more negatively impacted by government restrictions than by the COVID-19 pandemic itself. Conversely, non-G7 countries experience a negative effect from both variables.
Aharon and Siev (2021)	1 January 2020 and 21 April 2020	Event study method and Multivariate regression analysis	Government restrictions are associated with lower market performance, potentially due to anticipated harm to the economy.
Størdal et al. (2021)	1 January 2020 to 5 November 2020	Pooled panel ordinary least squares model	Non-pharmaceutical interventions had little to no influence on Norwegian stock market returns. In contrast, they had a positive effect on the Swedish stock market, although the impact's strength decreased as the number of confirmed COVID-19 cases increased.
Scherf et al. (2022)	22 January 2020 to 20 May 2020	Event study method	Lockdown restrictions elicited varied responses, with a widespread negative impact attributed to the heightened lockdown measures. However, robust evidence suggests a muted reaction during the initial lockdown announcement, preceding instances of overreaction that were subsequently rectified.
Harjoto et al. (2021)	14 January 2020 to 20 August 2020	Multivariate regressions	Cases and deaths influenced stock market returns and price fluctuations in emerging markets. However, only COVID-19 case numbers impacted stock returns, volatility, and trading volume in developed markets.
Amin et al. (2022)	10 March 2020 to 9 April 2020	Panel regression analysis	The presence of COVID-19 cases tends to have a negative effect on stock market indexes, in contrast to the influence of age, which is typically associated with a positive effect on these indexes.

Authors	Period of the Study	Methodology	Key Findings
Narayan et al. (2021)	1 July 2019 to 16 April 2020	Regression model	G7 stock markets experienced a positive impact from lockdowns, travel bans, and economic stimulus packages. The study concluded that lockdowns were the most effective method for reducing the impact of COVID-19.
Pandey and Kumari (2021)	30 January 2020 to 31 March 2020	Event study method	The global stock markets have been severely affected by the COVID-19 outbreak, with Asian markets experiencing the most significant losses; however, the swift implementation of lockdowns and restrictions has led to promising outcomes.
Liu et al. (2020)	14 February 2020 to 17 March 2020	Event study method	A pandemic announcement has a significant negative impact on the global stock market.
Teitler-Regev and Tavor (2021)	2 January 2020 to 30 June 2020	OLS regression analysis	In Israel, all variables affected stock index returns, whereas in other countries, only a few variables had this effect.
Yiu and Tsang (2023)	2 January 2020 to 30 April 2021	Dynamic panel regression model	The current pandemic has had a significant, albeit smaller, impact on ASEAN5 stock markets compared to the Global Financial Crisis.
Shaikh (2021)	January 2020 to March 2020	Panel regression	The number of new cases and deaths recorded daily due to COVID-19 has disrupted investors' sentiments globally, and the market has experienced an unprecedented negative return.
Doko Tchatoka et al. (2022)	January 2020 to July 2020	Quantile-on-quantile (QQ) regression analysis	Stock markets responded to COVID-19 shocks mostly negatively. However, we also observe instances where an increase in the number of confirmed COVID-19 cases resulted in higher stock returns.
Sakawa and Watanabel (2022)	23 January 2020 to 17 July 2020	Event study method	The government's response weakens the negative relationship between COVID-19 cases and ARs in Japanese tourism and travel-related industries.
Liu et al. (2020)	21 February 2019 to 18 March 2020	Event study method	Stock markets in major affected countries and areas fell quickly after the virus outbreak. Countries in Asia experienced more negative abnormal returns than other countries.
Bai et al. (2023)	January 2020 to April 2020	Simple regression	Negative financial market sentiment amplifies the impact of the crisis on the stock market, and positive financial market sentiment can help mitigate the losses caused by the shock.
Tan et al. (2022)	27 January 2020 to 23 December 2021	TVP-VAR-SV model	The spread of the COVID-19 pandemic has a significant negative impact on stock returns, but the impact decreases as the time window increases.
Guven et al. (2022)	22 January 2020 to 31 December 2020	CCEMG estimator	Government response policies to COVID-19 have a positive impact on stock returns. Additionally, the daily increases in deaths and cases have a negative impact on stock market returns.
Deng et al. (2022)	January 2020 to July 2020	Difference-In-Difference method	Policy actions have a significant and positive impact on stock market performance.
Goel and Dash (2022)	3 January 2020 to 18 May 2020	Panel regression model	Government policy responses have a moderating effect on the relationship between sentiment and stock returns.
Saif-Alyousfi (2022)	1 January 2020 to 10 May 2021	Pooled-ordinary least squares (OLS) and panel data techniques	The daily increase in confirmed cases and deaths caused by COVID-19 has a significant negative impact on stock returns across all markets.
Topcu and Gulal (2020)	10 March 2020 to 30 April 2020	Pooled Ordinary Least Squares (OLS) regression method with robust standard errors	The negative impact of the pandemic on emerging stock markets has gradually decreased over time, with the outbreak having the most significant impact on Asian emerging markets, while those in Europe have experienced the least impact.
Ashraf (2020a)	22 January 2020 to 17 April 2020	Pooled panel ordinary least squares regression model	The announcement of government social distancing measures had a negative effect on stock market returns. At the same time, the number of confirmed COVID-19 cases, along with government announcements regarding public awareness programs, testing and quarantining policies, and income support packages, had a positive effect.

Table 1 presents a review of previous studies on the COVID-19 pandemic and stock market returns, focusing on the study period and the methodologies employed. The literature analysis revealed that numerous researchers investigated the COVID-19 pandemic from multiple perspectives. The results of most evaluated research are likely less accurate because they focus on a relatively short period. Whether the effect persists or not is influenced by the

short-term nature of these studies. This study will focus on the impact of these factors on the outcomes, specifically to establish whether the effects are consistent over time. G20 countries are analyzed using Panel Data Regression Analysis with a fixed effects model to assess how the containment and health index, the economic support index, the daily increase in confirmed cases, and the daily rise in death cases affect both developed and emerging economies. It will also monitor which group experiences a greater or lesser negative impact, as well as a greater or lesser positive impact on returns. Notably, previous studies have not applied this method to investigate these key indicators across G20 nations over an extended time frame. This study examines these variables over a period spanning from 1 January 2020 to 31 December 2022.

3. METHODOLOGY

This study examines the impact of the COVID-19 pandemic on the G20 stock market performance, with a further distinction made between two subgroups: developed and emerging economies within the G20. We evaluated the panel data regression model, incorporating both fixed effects for individuals and time periods. We prefer the panel data analysis method over the conventional event study approach for several reasons: Firstly, COVID-19 does not spread across a country overnight; instead, it emerges over several days. Additionally, panel data regression effectively captures the relationship between independent and dependent variables over time. Third, panel data analysis minimizes problems such as estimation bias, heteroscedasticity, and multicollinearity while extracting cross-sectional and time-series variation from the underlying panel data.

$$\ln \text{ stock returns}_{it} = \beta_1 \ln \text{ growth in confirmed Cases }_{it} + \beta_2 \ln \text{ growth in death cases }_{it} + \beta_3 \text{ containment and health index }_{it} + \beta_4 \text{ economic support index }_{it} + \alpha_i + \gamma_t + \varepsilon_{it} \qquad (1)$$

Where $\ln \text{ Stock Returns}_{it}$ represents the parameter that is dependent on an individual for country i at time t at daily frequency, $\ln \text{ growth in confirmed cases}_{it}$, $\ln \text{ growth in death cases}_{it}$, containment and health index $_{it}$, and economic support index $_{it}$ is the independent variables for an individual for country i at time t at daily frequency. B_1, β_2, β_3, and β_4 represent the coefficients of the independent variable. α_i represents individual fixed effects. γ_t represents time-fixed effects, and ε_{it} represents the time-varying general error term.

The previously mentioned Model 1 examines the impact of the COVID-19 epidemic on the stock market outcomes of the G20 nations. Additionally, two more models are calculated to analyze the effects of developed and emerging nations within the G20 on stock market returns. All model sets were estimated using daily data. The Hausman test is employed to identify the optimal models between random and fixed effect specifications.

Table 2. List of countries considered for the analysis, along with their stock indices and economic statuses.

Country	Index	Economic Status
Australia	S&P/ASX 200	Developed
Canada	S&P/TSX composite	Developed
France	CAC 40	Developed
Germany	DAX Index	Developed
Italy	FTSE MIB	Developed
Japan	Nikkei 225	Developed
South Korea	KOSPI composite index	Developed
Spain	IBEX 35 Index	Developed
United Kingdom	FTSE 100 Index	Developed
United States	S&P 500 Index	Developed
Argentina	MERVAL Index	Emerging
Brazil	Bovespa	Emerging
China	Shanghai composite index	Emerging
India	Nifty 50	Emerging
Indonesia	Jakarta composite index	Emerging
Mexico	IPC MEXICO	Emerging
Russia	MOEX Russia	Emerging
Saudi Arabia	Tadawul all share	Emerging
South Africa	FTSE/JSE AFRICA Index	Emerging
Turkey	BIST 100	Emerging

The study examined 19 G20 countries, excluding the European Union. The exclusion is based on the fact that the European Union, as one of the major international organizations, encompasses countries such as France, Germany, Italy, the Netherlands, and Belgium. Certain countries within the European Union are often viewed as separate entities in the G20 stock markets (Li, Zhuang, Wang, & Dong, 2021). The data were stratified according to economic classification, distinguishing between developed and emerging economies (Source: International Monetary Fund https://www.imf.org/en/publications/weo/weo-database/2023/april/groups-and-aggregates). For each selected economy, we choose an equity index comprising the most frequently traded equities, which are widely regarded as benchmarks in those economies. The sample includes the Spanish index IBEX, as Spain has a permanent seat in the current G20 group. Table 2 lists each country's stock market index and economic status.

3.1. Data Sources and Description

The focus of this section is on the constituent variables of the econometric model. Table 3 presents the data variables and their corresponding data sources.

Table 3. Data variables and data sources.

Variables	Description	Source
Stock market returns	The log return of the country's stock market index.	Bloomberg
Growth in confirmed cases	The log growth rate of confirmed COVID-19 cases.	Oxford COVID-19 Government Response Tracker (OxCGRT) Website
Growth in death cases	The rate of increase in COVID-19 death cases over time.	
Containment & health index	Government response index	
Economic support index	Income support and Debt relief policies	

3.2. Dependent Variable

3.2.1. Stock Market Returns

We obtained the daily closing prices of the G20 stock market indices from Bloomberg. Consistency was ensured by using data from each country's respective stock market index. These indices were selected due to their substantial market capitalization and widespread use as benchmarks. The formula we use to calculate stock returns is as follows.

$$\text{returns } i,t = \ln (\text{daily closing price } i,t +1 \ / \ \text{daily closing price } i,t\text{-}1 +1)*100 \qquad (2)$$

Where returns i,t represent log returns, daily closing price i,t, and daily closing Price i,t-1 represent the daily closing prices of a representative index of country i on day t and t-1, respectively.

3.3. Independent Variables

The Government Reaction Indices and COVID-19 case data are sourced from the Oxford COVID-19 Government Response Tracker (OxCGRT) website. OxCGRT monitors indicators, including daily infection rates and COVID-19-related mortality, to collect data on standard policy measures implemented by governments worldwide in response to the outbreak.

3.3.1. COVID-19 Confirmed Cases

The daily increase in confirmed COVID-19 cases in a country is used to determine the total number of confirmed cases. We utilize the logarithmic growth rate as a proxy variable to calculate the daily rise in confirmed COVID-19 cases.

$$\text{COVID-19 Confirmed Cases } i,t = \ln (\text{COVID-19\_Confirmed Cases } i,t +1 \ / \ \text{COVID-19\_Confirmed Cases } i,t\text{-}1 +1)*100 \qquad (3)$$

Where COVID-19_Confirmed Cases i,t represents the log growth rate of confirmed COVID-19 cases, COVID-19_Confirmed Cases i,t and COVID-19_Confirmed Cases i,t-1 represent the number of confirmed cases in country i on day t and t-1, respectively.

3.3.2. COVID-19 Death Cases

The daily increase in the number of COVID-19 patients who have died is used to calculate COVID-19 death cases. We determine daily increases in mortality using the log growth rate as a proxy for COVID-19 shocks.

$$\text{COVID-19\_ Death Cases } i,t = \ln (\text{COVID-19\_ Death Cases } i,t +1 /\text{COVID}-19 \text{ Death cases } i,t-1 +1)*100$$

(4)

Where COVID-19_Death Cases i,t represents the growth rate of mortality cases, COVID-19_Death Cases i,t and COVID-19 Death Cases i,t−1 represent the number of mortality cases in country i on day t and t-1, respectively.

3.3.3. Containment and Health Index (CHI)

Eight policy indicators related to containment and closure are combined with six policy indicators from the healthcare system, specifically testing policies, healthcare expenditure, and vaccination initiatives.

3.3.4. Economic Support Index (ESI)

It evaluates debt relief strategies, including debt rescheduling and partial debt forgiveness, as well as income support measures such as stimulus packages.

The effect of COVID-19 data on the stock market becomes evident the day after the data is announced. Stock exchanges operate from Monday to Friday; therefore, in our analysis, we considered COVID data from Sunday to Thursday of the preceding week. After examining the data, we observed that smaller numbers occur more frequently than larger ones. This observation suggests the advantage of applying the logarithm to daily data. To avoid taking the logarithm of zero, we add one to the daily data for each economy before calculating the logarithm (Hui & Chan, 2022).

4. RESULTS

This section outlines the findings of the analysis.

Table 4. Summary statistics.

Variable Name	N	Mean	SD	1st Qu.	Median	3rd Qu.	Min	Max	ADF
Panel A: All G20 economies									
Stock market returns	15660	0.02	1.56	−0.58	0.02	0.73	−40.45	18.25	0.01
Growth in confirmed cases	15660	2.10	10.45	0.05	0.29	0.98	−21.08	630.62	0.01
Growth in death cases	15660	1.48	7.23	0.02	0.13	0.60	−7.41	289.03	0.01
Containment and health index	15660	52.55	18.76	41.21	56.25	66.07	0.00	91.96	0.01
Economic support index	15660	42.13	33.12	0.00	50.00	62.50	0.00	100.00	0.01
Panel B: Developed economies									
Stock market returns	7830	0.01	1.47	−0.61	0.04	0.70	−18.54	11.29	0.01
Growth in confirmed cases	7830	2.16	9.59	0.11	0.40	1.14	−21.08	366.35	0.01
Growth in death cases	7830	1.47	7.21	0.04	0.15	0.55	−7.41	164.45	0.01
Containment and health index	7830	51.62	17.59	41.72	54.50	64.70	0.00	85.42	0.01
Economic support index	7830	49.3	35.31	25.0	50.0	75.0	0.00	100.0	0.01
Panel C: Emerging economies									
Stock market returns	7830	0.04	1.65	−0.55	0.01	0.76	−40.45	18.25	0.01
Growth in confirmed cases	7830	2.03	11.25	0.02	0.19	0.82	−0.00	630.62	0.01
Growth in death cases	7830	1.49	7.25	0.01	0.10	0.68	−5.99	289.03	0.01
Containment and health index	7830	53.49	19.83	40.39	57.51	69.35	0.00	91.96	0.01
Economic support index	7830	34.97	29.06	0.00	37.50	62.50	0.00	100.00	0.01

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We present the summary statistics in Table 4 for the G20 economies (Panel A), developed economies (Panel B), and emerging economies (Panel C). The summary statistics clearly illustrate the varied financial and policy responses of the G20 economies to the COVID-19 pandemic. Emerging economies achieved higher average stock market returns of 0.04% compared to 0.01% in developed economies, despite their stock markets being more volatile, with a standard deviation of 1.65 versus 1.47. Although emerging markets experienced more extreme fluctuations, they also saw more substantial short-term rebounds.

Developed nations generally provided more robust economic support compared to developing economies, with a measure of 49.3 against 34.97. The averages for health and containment measures were 53.49 and 51.62, respectively, indicating a degree of similarity. The daily increase in confirmed COVID-19 cases in developed economies was slightly higher than in emerging economies, possibly due to differences in testing or early exposure (mean = 2.16 in developed economies, mean = 2.03 in emerging economies). These figures illustrate the divergence in financial markets and policy responses, which are influenced by institutional strength and fiscal flexibility, despite the pandemic impacting all economies.

Table 5. Correlation matrix.

Panel A: All G20 economies					
Stock market returns	Growth in confirmed cases	Growth in death cases	CHI	ESI	Variable Name
1	−0.1307	−0.0811	0.0592	0.0418	Stock market returns
	1	0.6275	−0.0504	−0.0804	Growth in confirmed cases
		1	0.0557	−0.0353	Growth in death cases
			1	0.4968	CHI
				1	ESI
	1.6706	1.6736	1.3466	1.3354	VIF
Panel B: Developed economies					
Stock market returns	Growth in confirmed cases	Growth in death cases	CHI	ESI	
1	−0.1463	−0.1254	0.0642	0.0587	Stock market returns
	1	0.5882	−0.1038	−0.1176	Growth in confirmed cases
		1	0.0024	−0.0578	Growth in death cases
			1	0.4823	CHI
				1	ESI
	1.5587	1.5396	1.3158	1.3119	VIF
Panel C: Emerging economies					
Stock market returns	Growth in confirmed cases	Growth in death cases	CHI	ESI	
1	−0.1189	−0.0422	0.0542	0.0332	Stock market returns
	1	0.6643	−0.0095	−0.0513	Growth in confirmed cases
		1	0.1029	−0.01	Growth in death cases
			1	0.5752	CHI
				1	ESI
	1.8097	1.8364	1.5326	1.5052	VIF

Table 5 also presents the correlation matrix, covering all G20 economies (Panel A), developed economies (Panel B), and emerging economies (Panel C), along with the VIF values.

To enhance the reliability of regression estimates, we calculate the VIF values for each independent variable used in this study.

VIF values below 10 for all variables indicate the absence of multicollinearity among the variables.

Table 6. Impact of COVID-19 on G20 stock market returns.

Variable Name	G20 countries (Panel A)		Developed countries (Panel B)		Emerging countries (Panel C)	
	Coeffi.	P-value	Coeffi.	P-value	Coeffi.	P-value
Growth in confirmed cases	-0.0026	0.2942	-0.0038	0.0457*	-0.0011	0.8230
Growth in death cases	-0.0032	0.4252	-0.0028	0.6115	-0.0042	0.6011
Containment and health index	0.0013	0.4744	0.0002	0.8784	0.0019	0.4780
Economic support index	-0.0007	0.0237*	-0.0004	0.1493	-0.0013	0.0170*
Country fixed effects	Yes		Yes		Yes	
Time fixed effects	Yes		Yes		Yes	
N	15660		7830		7830	

Note: *Significant at 10% level.

The results of the regression analysis are presented in Table 6 for each panel's data. The outcomes of this research will enable us to determine whether the impacts of the COVID-19 pandemic on the G20 economies (Panel A), developed economies (Panel B), and emerging economies (Panel C) are consistent or differ across the G20 groups.

4.1. G20 Countries

The data contained in Panel A of Table 6 indicate that the economic support index has a negative and statistically significant effect on the stock market returns of G20 countries. Specifically, a 1% increase in government economic support is associated with a 0.0007% decrease in stock market returns within these countries. Investors seem to be concerned that government economic policies, implemented to mitigate the effects of the COVID-19 pandemic, could potentially lead to additional long-term financial burdens. Furthermore, government agencies may face challenges in effectively executing these economic policies. Although there was a negative correlation between infected cases, death cases, and stock market returns, this relationship was not statistically significant.

4.2. Developed Countries

Findings from Panel B in Table 6 indicate that a substantial rise in confirmed COVID-19 cases had a significant and negative impact on stock market returns in developed G20 countries. This suggests that a 1% increase in confirmed COVID-19 cases leads to a 0.0038% decrease in stock market returns in these countries. It also indicates that economies that are highly industrialized are particularly susceptible to the virus's spread, primarily due to their internationally interconnected markets and heightened investor responsiveness to public health announcements. Additionally, increases in the Economic Support Index (ESI) and mortality rates also had negative impacts; however, these effects were not found to be statistically significant. These findings are consistent with prior research by Harjoto et al. (2021), Ullah (2023), and Ashraf (2020b), which also found that stock market performance decreased in both developed and emerging economies when COVID-19 cases increased. Notably, Doko Tchatoka et al. (2022) found that despite rising domestic and international COVID-19 case numbers, stock market returns increased in seven countries when market performance was weak.

4.3. Emerging Countries

In contrast to developed countries within G20, emerging countries saw little impact from the surge in confirmed cases, as indicated by the data in Panel C of Table 6. ESI has a statistically significant negative impact on stock market returns, indicating that a 1% increase in government economic support leads to a 0.0013% decrease in stock market returns in emerging G20 countries. Suggesting investor concerns about the consequences of the epidemic that will be viewed as a result of the country's economic efforts to contain its repercussions. Our findings align with those of Aharon and Siev (2021), who examined the impact of the most severe pandemic on record on the MSCI Emerging Markets Index and found that the ESI had a detrimental effect on market performance.

5. CONCLUSION

This study examines the impact of the COVID-19 pandemic on G20 stock market performance over an extended period through panel data regression analysis across three groups: all G20 economies, developed economies, and emerging economies. The results reveal that growth in COVID-19 confirmed cases has a statistically significant negative impact on stock market returns in developed economies, indicating that an increase in confirmed cases is associated with a decline in stock market returns. Government support aimed at mitigating the impact of COVID-19 has a statistically significant negative effect on the stock market returns of emerging economies, suggesting that economic support announcements are associated with lower stock market returns. The COVID-19 pandemic had an uneven impact on the G20 and its affiliated bodies. The differential impact on developed and emerging economies was likely due to factors such as governance quality, international cash flow, market participants' behavior, health infrastructure, vaccine distribution, lockdowns, and other preventive measures implemented. This study will enable investors to make informed investment decisions based on their economic situation, thereby mitigating potential risks to their investments. Regulators can also implement safeguarding measures to reduce the consequences of their actions in the event of future health crises.

The research offers numerous practical policy recommendations for governments, regulatory bodies, and market stakeholders. The significant and negative impact of rising confirmed cases on the stock market returns of developed economies underscores the necessity of early detection systems, rapid testing capacity, and transparent communication in reducing investor uncertainty. Governments should invest in real-time epidemiological monitoring and establish clear guidelines for managing outbreaks to prevent sudden market sentiment impacts. According to the economic support index, emerging economies perceive support announcements as indicators of deteriorating economic conditions. Policymakers can counter this by creating proactive support packages that clearly outline the objectives, scale, and duration of their interventions to prevent misinterpretation by investors. Improving the credibility of fiscal measures via medium-term fiscal frameworks and independent policy assessments can also boost investor confidence. Financial regulators may implement market-stabilization tools, including temporary short-selling restrictions, modified circuit breakers, and liquidity measures during episodes of severe market instability. Enhancing digital infrastructure, facilitating remote business operations, and supporting key industries can also alleviate more extensive economic disruptions. Countries should ultimately bolster international collaboration by exchanging health data, coordinating policy responses, and implementing cross-border financial assistance, which will help reduce the spread of global economic disruption during future pandemics.

In this study, we employed COVID-19 confirmed cases and death cases as health-related data, excluding other indicators such as vaccination progress and recovery rates due to the unavailability of data for the specific countries considered. This exclusion represents the first limitation of this study. Second, we used the CHI and ESI as policy response indicators to mitigate the negative impact of the virus; however, it is not possible to directly measure the intensity and effectiveness of policy implementation. Third, we considered global markets, which may mask the pandemic's impact on different sectors of the economy. These limitations present opportunities for future research to investigate the pandemic's impact by including additional indicators or examining effects at the sectoral level.

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