

How Did The Financial Markets Respond to The COVID-19 Pandemic? Empirical Evidence from BRICS Countries

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Abstract

The paper aims to evaluate the reaction of stock markets in BRICS countries (Brazil, Russia, India, China, and South Africa) to the outbreak of the COVID-19 pandemic. The study uses ARCH and GARCH models that use daily stock prices from January 1, 2020, to September 2, 2020. The financial market response was analyzed in two phases. The first phase analyses the financial markets' response within 30 to 60 days from the first day of confirmed cases of COVID-19. The second phase analyses the financial market response post 30 to 60 days of initial confirmed cases. The study results conclude that the share prices decreased, but in the second phase, the markets responded positively. Our results conclude that governmental support played an important role in mitigating the repercussions of the COVID-19 outbreak on stock markets in BRICS countries.

Keywords:

BRICS countries, stock market, volatility, Covid-19

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Introduction

The first case of the COVID-19 outbreak was reported in Wuhan, China, in January 2020. It has caught global attention within one month because of the severity of the spread to around 109 countries (Ramelli & Wagner, 2020; Ozili & Arun, 2020). It has a global impact in social distancing, travel restrictions, quarantine and lockdown of countries, government restrictions on commercial activities resulting in a market shutdown. This heightened global uncertainty has resulted in the contraction in economic activity and volatility in the stock markets. The pandemic has made such a massive impact on the global stock markets like no other infectious disease in the past (Baker et al., 2020). The global stock markets have collapsed by 20% in the first quarter of 2020 (Al-Awadhi et al., 2020). The freely available information about the number of cases and mortality rates through media coverage and its dissemination has significantly influenced the stock markets and the investor's sentiments. (Engelberg & Parsons, 2011). This condition resulted in investor pessimism and overreaction in the short-run (Barber & Odean, 2008).

BRICS constitute five countries, namely Brazil, Russia, India, China, and South Africa. These are emerging economies that have an understanding of trade and investment to enhance economic growth. The BRICS countries are considered the fastest-growing economies globally, which constitute about one-third of the global economy. In addition, they play an essential role in influencing the global economy by exporting essential commodities, goods, services, and raw materials. Therefore, it is crucial to study the impact of the spread of pandemics on the economies of these countries. According to the World Health Organization (WHO), as of May 2020, Brazil is the epicenter of Latin America and is responsible for 40.2% of COVID-19 cases and 65% of deaths. Russia and India have the highest number of active cases, with 34.3% and 12% of cases dead. The first COVID-19 case was on February 26, 2020, in Brazil. As of May 2020, Brazil is in the second position in total COVID cases worldwide and the first position in daily-confirmed active cases. The first COVID-19 case in Russia was reported on January 31, 2020. The first COVID-19 case in India is on January 30, 2020. The pandemic affected India on two significant fronts firstly, migrant and unorganized workers, and secondly, many citizens lost jobs as production came to a standstill because of the pandemic. The measures taken by the government are providing relief packages, strict lockdown, and mass testing of COVID-19 cases, working on rolling out the vaccine. China was initially in the pandemic's epicenter, but the government went in for strict lockdown measures to avoid the spread of the virus and controlled the daily number of cases. South Africa reported the first COVID-19 case on March 5, 2020. The cases in South Africa were relatively high, and some of the measures taken are banning travelers from high-risk countries, creating awareness among citizens, increased controls and lockdown, and mass testing of the population.

There are studies done across the globe on the impact of the COVID-19 pandemic on stock markets and returns (Zhang et al., 2020; Pavlyshenko, 2020; Sharif et al., 2020; Topcu & Gulal, 2020; Albulescu, 2020; Mubarok & Al Arif, 2021), the effect of the pandemic on the economy (Ayittey et al., 2020; Estrada et al., 2020; Luo &

Tsang, 2020), COVID-19 and financial markets (Baig et al., 2020; Gormsen & Koijen, 2020; He et al., 2020; Singh et al., 2020; Zaremba et al., 2020; Zeren & Hizarci, 2020). It is observed that stock markets are interdependent in various countries as the stock markets more or less behaved the same (Amar et al., 2020; Cepoi, 2020; Okorie & Lin, 2021). The stock markets had a decline of around 30%, but there has been a difference across countries. This is because of the differences in investors' risk tolerance in different countries (Anderson et al., 2011) and how investors interpret and respond to information (Dou et al., 2016). The negative emotions and pessimism affected investors' investment in the stock market and thereby had an impact on the stock market returns. During the pandemic, there was panic, and people were more concerned about their livelihood and less about wealth and returns. There is a correlation between the increase in the confirmed cases and deaths with the decline in market liquidity, because of the pandemic (Peress, 2014; Donadelli, 2015). Baig et al. (2020) reiterate that lockdown reduces liquidity and stability of markets. Bash (2020) used event study methodology to study the effect of COVID-19 on the returns from stock using event study analysis for 30 countries. The findings show that the COVID-19 caused a downward trend in the stock market returns and significant negative returns.

Tetlock (2007) and Kaplanski & Levy (2010) argued that investor sentiments during economic uncertainty cause volatility. On investigating the stock market's reaction to the increase in COVID-19 cases, the markets overreact because of the availability of information. The people take some time to understand the implications, and after some time, the market corrects itself (Phan & Narayan, 2020). The Asian financial markets were investigated by Uddin et al. (2020) during the pandemic and found that the uncertainty and volatility in the stock markets reduce the risk tolerance in investors. The investors exhibit herd behaviour in the stock market with the fear to act and do differently (Lin & Lin, 2014). This fact explains the significant volatility in the stock markets.

Research is done to investigate the government's role in reducing the consequences of the pandemic on stock markets. One such research is to examine if the Government policies like the travel ban, lockdowns, and stimulus packages would reduce the negative consequences of the pandemic. Research is done to examine the impact of these measures on the revival of the stock market. Some timely interventions and announcements by the government in the form of restrictions affect the stock market returns negatively, whereas the policies of testing of people of COVID-19 and policy about quarantine and economic support packages resulted in positive market returns.

Zaremba et al. (2020) found that stringent policy responses taken by various countries resulted in increased volatility in global stock markets during the pandemic. Research by Caggiano et al. (2020) reiterated that timely government response in the form of restrictions on commercial activities and social distancing restore confidence in the investors that the crisis is under control. It is argued that some policy responses by the government during pandemics created uncertainties in global financial markets (Pástor & Veronesi 2012). The study of Narayan et al. (2020) found that measures initiated by the government like lockdown, travel bans, and economic support positively affects

stock markets. When we dwell on the literature, it is understood that the stock markets reacted differently in different countries.

Though there are few studies done globally, the impact of the COVID-19 pandemic on the stock market performance of BRICS countries has attracted less research attention. Against this backdrop, this paper aims to evaluate the reaction of stock markets in BRICS countries (Brazil, Russia, India, China, and South Africa) to the outbreak of the COVID-19 pandemic from January 2020 – September 2020.

Methods

This paper examines the impact of the COVID-19 outbreak on stock markets in BRICS countries (Brazil, Russia, India, China, and South Africa). The paper uses daily closing stock price data for the major indexes of stock markets in BRICS countries. The stock market indexes include IBOVESPA Index (Brazil), Nifty 50 Index (India), MOEX Russia Index (Russia), SSE Composite Index (China), Top 40 index JTOPI (South Africa). The series are converted into natural logarithmic series. The data for the indexes are taken from respective websites of stock markets. The data for the COVID-19 in each country is taken from the World Health Organization (WHO) website. The data relating to COVID-19 cases measured as a cumulative number of the confirmed cases of COVID-19 in each country is taken from World Health Organization for January 1, 2020, and September 2, 2020.

This research uses the ARCH and GARCH models to examine the impact of the COVID-19 pandemic on the stock markets of BRICS countries. The goal of using the ARCH models' family is to overcome autocorrelation and heteroscedasticity problems, which lead to biased results. These models use proper lagged values of independent variables to overcome autocorrelation problems and allow variances of errors to vary over time by conditional heteroscedasticity. The conditional heteroscedasticity allows variances to be dependent on time, and error terms have zero mean.

Engle (1982) introduce the Autoregressive Conditional Heteroskedastic Model (q) ARCH (q). In this model, the variances of return are changed with the squared lagged values of the error terms. Bollerslev (1986) introduced GARCH (p, q), which is generalized ARCH (q) and enables the conditional variance h_t to be dependent to h_{t-1} and ε_{t-1}^2 . This model is considered as a symmetric model and is not able to measure asymmetry effect "leverage effect", which exists in the stock market prices. To overcome on asymmetry effect of the stock market prices, the threshold ARCH or TARCH (advanced by Zakoian, 1994) and the Exponential GARCH or EGARCH (proposed by Nelson, 1991) models are utilized.

This paper uses the following general model to examine the impact of the COVID-19 outbreak on stock markets, which is presented in equations 1.

$$P_t = \varphi_1 + \varphi_2 COVID_t + \theta P_{t-1} + \varepsilon_t \quad (1)$$

Where: P is the logarithm of the closing price of the market index at t , and $COVID$ is the cumulative confirmed cases of COVID-19 in each country.

Conditional Variance Equation GARCH:

$$h_t = \omega + \alpha \varepsilon_{t-1}^2 + \beta h_{t-1} \quad (2)$$

In this GARCH model, the conditional variance is expressed as dependent on past shocks and past variances. From the equation of the GARCH model, we can notice that this model responds in a symmetrically way to the past shocks. This means that good news of corporations has the same effect as bad news on financial markets. The shocks on the short-run persistence are expressed by the term α , while the term β expresses the effects of shocks on the long-run persistence.

Result and Discussion

Table 1 presents descriptive statistics for the closing price index and confirmed COVID-19 cases for the BRICS countries from January 1, 2020, to September 2, 2020. It is observed from Table 1 that the average daily closing price for IBOVESPA Index in Brazil is 96016.08 with a standard deviation of 14945.56, and maximum and minimum values are 119528 and 63570, respectively. The average cumulative confirmed cases of COVID-19 in Brazil are 858658.1. In Russia, the average daily closing price for MOEX Russia Index is 2814.039 with a standard deviation of 240.1887, and maximum and minimum values are 7674.56 and 4993.89, respectively. The average cumulative confirmed case of COVID-19 is 329621.8. In India, the average daily closing price for the Nifty 50 Index is 10567.1 with a standard deviation of 1245.664, and maximum and minimum values are 12362.3 and 7610.25 respectively. The average cumulative confirmed case of COVID-19 in India is 574532.2.

Table 1. Descriptive statistics of the variables used in the analysis

Country	Variable	Mean	Median	Maximum	Minimum	Std. Dev.
Brazil	IBOVESPA Index	96016.08	98817	119528	63570	14945.56
	CUMULATIVE_CASES	858658.1	111247.5	3908272	0	1196475
Russia	MOEX Russia Index	2814.039	2794.32	3219.92	2112.64	240.1887
	CUMULATIVE_CASES	329621.8	150319	1005000	0	364438
India	Nifty 50 Index	10567.1	10768.05	12362.3	7610.25	1245.664
	CUMULATIVE_CASES	574532.2	52952	3769523	0	959569.4
China	SSE Composite Index	3026.931	2967.63	3451.09	2660.17	217.8914
	CUMULATIVE_CASES	73244.33	84415	90422	0	27177.74
South Africa	Top 40 Index (JTOPI)	48398.3	49920.09	53350.88	34239.3	4320.17
	CUMULATIVE_CASES	130365.7	7220	628259	0	208808.5

In China, the average daily closing price for the SSE Composite Index is 3026.931, with a standard deviation of 217.8914. The maximum and minimum values are 3451.09 and 2660.17, respectively. The cumulative confirmed case of COVID-19 in China is

73244.33. In South Africa, the average daily closing price for the Top 40 index (JTOPI) is 48398.3 with a standard deviation of 4320.17, and the maximum and minimum values are 53350.88 34239.3, respectively. The average daily-confirmed case of COVID-19 is 130365.7.

Table 2. Parameter estimates for the ARCH and GARCH models of the impact of COVID-19 on stock markets in Brazil

	ARCH	GARCH	ARCH	GARCH
Mean equation				
	27-02-2020 to 27-03-2020		28-03-2020 to 02-09-2020	
Coefficient	Value	Value	Value	Value
COVID-19	-0.090122***	-0.091751***	0.054819***	0.057933***
Constant	11.70848***	11.71858***	10.70789***	10.65961***
variance equation				
ω	0.003203**	-0.000308	0.000311***	0.0000829
α	0.749213	-0.252091	0.723598**	0.483184*
β	-----	1.543127		0.438101*
R-squared	0.686368	0.679820	0.890083	0.894389

,*,&* represent significant level at 10%, 5% & 1% respectively.

Table 2 presents the results of the ARCH and GARCH models of the impact of COVID-19 on stock markets in Brazil during two phases. The first phase extends from the first day of confirmed cases of COVID-19 in Brazil on February 27, 2020, and for 30 days until March 27, 2020, while the second phase extends from March 28, 2020, to September 2, 2020. The results of the first phase analysis show that the coefficients of ARCH and GARCH models of the effect of total COVID-19 cases on the Brazilian stock market are negative and statistically significant at a 1 percent level. On the other hand, the coefficient value is positive and significant during the second phase analysis of the impact of the COVID -19 outbreak on the Brazilian stock markets. This result indicates the fading of the direct impact of the COVID-19 on the stock markets. It is also noted that the value of the R-square is high in all models, which indicates that the COVID-19 outbreak played a significant role in stock prices movement in the Brazilian stock markets.

It is noticeable through the first and second phases that the financial markets in Brazil have responded quickly to the news of the initial confirmed cases with COVID-19. The response was strong and negative, which led to a decline in stock prices in the Brazilian markets during the first month of the COVID-19 epidemic. Emerging countries, such as Brazil, recorded more than 40% (Ashraf, 2020). However, the negative impact of the increasing number of COVID-19 cases on the markets' financial markets is rebounding. This condition can be explained by the solid economic support provided

by the government to mitigate the effects of the COVID-19 outbreak on the economy (Hale et al., 2020).

Table 3 presents the results of the ARCH and GARCH models of the impact of COVID-19 on stock markets in Russia during two phases. The first phase extended from the first day of confirmed cases of COVID-19 in Russia on January 31, 2020, and for 30 days until March 1, 2020, while the second phase extended from March 2, 2020, to September 2, 2020. The results of the first phase analysis that the coefficients of ARCH and GARCH models of the effect of total COVID-19 cases on the Russian stock market are negative and statistically significant at a 1 percent level. On the other hand, the value of the coefficients in the second phase is statistically positive but small, reflecting the receding of the negative impact of the spread of COVID-19 on the Russian stock markets. The value of the R-square is high in all models, confirming the critical impact of the spread of COVID-19 on price movements in the Russian stock markets.

Table 3. Parameter estimates for the ARCH and GARCH models of the impact of COVID-19 on stock markets in Russia

	ARCH	GARCH	ARCH	GARCH
Mean equation				
	31-01-2020 to 1-03-2020		02-03-2020 to 02-09-2020	
Coefficient	Value	Value	Value	Value
COVID-19	-0.641901**	-0.595321***	0.019858***	0.019816***
Constant	9.184337***	9.103328***	7.665184***	7.665342***
variance equation				
ω	0.0000409	-0.0000235	0.0000863	0.0000498
α	1.676640	0.450634	1.121570***	0.813688
β	-----	1.272544*		0.216268
R-squared	0.476813	0.880478	0.493678	0.492248

*, **, & *** represent significant level at 10%, 5% & 1% respectively

It is observed through the results of the first and second phases that the financial markets in Russia have responded quickly to the news of the initial confirmed cases with COVID-19. The response was solid and negative on Russian stock markets and led to a sharp decline in the stock prices during the first month of the COVID-19 outbreak in Russia. After that, the government began to provide economically solid support packages to mitigate the repercussions of the spread of COVID-19 on the economy. This policy led to a decline and disappearance of the negative impact of COVID-19 on the financial markets.

Table 4. Parameter estimates for the ARCH and GARCH models of the impact of COVID-19 on stock markets in India

	ARCH	GARCH	ARCH	GARCH
Mean equation				
	30-01-2020 to 30-03-2020		24-03-2020 to 02-09-2020	
Coefficient	Value	Value	Value	Value
COVID-19	-0.071626***	-0.071308***	0.045126***	0.045274***
Constant	9.537209***	9.534381***	8.666409***	8.664180***
variance equation				
ω	0.000114	0.0000414	0.0000785***	0.0000708*
α	1.736168***	1.312038**	1.094770***	1.027879**
β	-----	0.154632		0.045783
R-squared	0.877589	0.880478	0.887822	0.888549

*, **, & *** represent significant level at 10%, 5% & 1% respectively

Table 4 presents the results of the ARCH and GARCH models of the impact of COVID-19 on stock markets in India during two phases. The first phase extended from the first day of cases of COVID-19 in India on January 30, 2020, and for a period of 60 days until March 30, 2020, while the second phase extended from April 1, 2020, to September 2, 2020. The first phase analysis shows that the coefficients of ARCH and GARCH models for the total COVID-19 cases effect on the Indian stock market are negative. On the other side, the value of the coefficients in the second phase is statistically positive, reflecting the disappearance of the negative impact of the spread of COVID-19 on the Indian stock markets. It can be seen that the value of the R-square is too high in all models, confirming that the stock price movements during the crisis were affected by the spread of COVID-19 in the Indian stock markets.

It is evident through the results of the first and second phases that the financial markets in India have responded quickly to the news of the initial confirmed cases with COVID-19. The response was solid and negative on Indian stock markets, and it lasted for two months. The negative abnormal returns are observed more in Asian countries than in other countries (Liu et al., 2020). Haldrar & Sethi (2021) show significant effects of COVID-19 related media coverage on the stock market.

The developed countries' stock markets influence the developing countries' stock markets, indicating enormous interdependence. In India, the COVID-19 outbreak is considered the most crucial factor that led to a decline in stock prices in the Indian stock markets during the first two months. However, after that, the negative impact of the increasing number of COVID-19 on the financial markets started to diminish and disappear with the start of government economic packages to unorganized labour sector workers as they are the worst hit and rapid controls by the government to mitigate the repercussions of the COVID-19 outbreak on stock markets. This result is in line with

the study of Avery & Zemsky (1998) and Bouri et al. (2021) that government response and support can reduce uncertainty in investors.

Table 5. Parameter estimates for the ARCH and GARCH models of the impact of COVID-19 on stock markets in China

	ARCH	GARCH	ARCH	GARCH
Mean equation				
	06-01-2020 to 06-02-2020		07-02-2020 to 02-09-2020	
Coefficient	Value	Value	Value	Value
COVID-19	-0.009405***	-0.009391***	2.339700***	0.001887
Constant	8.058792***	8.058710***	-18.56758***	7.960181***
variance equation				
ω	0.000350**	0.000321	0.0000448***	0.0000663
α	0.077409	0.080857	0.978737***	1.026211***
β	-----	0.071505		0.060531
R-squared	0.761350	0.761290	0.08169035	0.181880

*, **, & *** represent significant level at 10%, 5% & 1% respectively

Table 5 presents the results of the ARCH and GARCH models of the impact of COVID-19 on stock markets in China during the two phases. The first phase extended from the first day of confirmed cases of COVID-19 in China on January 6, 2020, and for 30 days until February 6, 2020, while the second phase extended from February 7, 2020, to September 2, 2020. It is observed from the first phase analysis that the coefficients of ARCH and GARCH models of the effect of total COVID-19 cases on the Chinese stock market are negative and statistically significant at a 1 percent level. On the contrary, the value of the coefficients in the second phase is statistically positive, showing the disappearance of the negative impact of the spread of COVID-19 on the Chinese stock markets. The values of the R-square for the first phase analysis models are high, while they are considered low in the second-phase analysis models. This result indicates that the Chinese markets were severely affected during the first phase of the spread of COVID-19, and then the impact on prices became limited during the second phase.

It can be noticed through the results of the first and second phases that the financial markets in China responded quickly to the news of the initial confirmed cases with COVID-19. The response was negative on Chinese stock markets and led to a fall in the stock prices during the first month of the COVID-19 outbreak in China. The results of the second phase confirm that there was no negative impact on stock markets in China. This result can be attributed to the rapid procedures taken by the Chinese government to limit the negative impact of the COVID-19 pandemic on the economy. Countries that imposed strict restrictive measures to curtail the spread during pandemics like China have positively influenced financial markets.

Table 6. Parameter estimates for the ARCH and GARCH models of the impact of COVID-19 on stock markets in South Africa

	ARCH	GARCH	ARCH	GARCH
Mean equation				
	05-02-2020 to 05-04-2020		06-04-2020 to 02-09-2020	
Coefficient	Value	Value	Value	Value
COVID-19	-0.034555***	-0.033027***	0.030047***	0.029840***
Constant	10.84749***	10.84539***	10.46744***	10.47041***
variance equation				
ω	0.000292*	0.0000975	0.000190***	0.00000813
α	1.145170**	0.950139	0.150123	0.144218
β	-----	0.224200		0.812058***
R-squared	0.520421	0.501070	0.937321	0.937214

*, **, & *** represent significant level at 10%, 5% & 1% respectively

Table 6 presents the results of the ARCH and GARCH models of the impact of COVID-19 on stock markets in South Africa during two phases. The first confirmed case of COVID-19 in South Africa was on March 5, 2020. However, the negative impact on financial markets began a month earlier in South Africa, affected by the outbreak of the COVID-19 around the world. This phase begins from February 5, 2020, to April 5, 2020, while the second phase extends from April 6, 2020, to September 2, 2020.

It is evident through the results of the first and second phases that the financial markets in South Africa responded quickly to the news of the outbreak of COVID-19. The response was significantly negative on stock markets, and it lasted for two months. During the pandemic, investors in the first quarter of 2020 are affected by emotions of uncertainty and fear and make irrational decisions. This condition led to the sell-off of shares resulting in market volatility. The developing countries, such as South Africa, recorded more than 40% losses at the beginning of 2020 compared to China, which had losses of 10% (Phan & Narayan, 2020). The COVID-19 outbreak was the main factor driving the financial markets during this period. However, the negative impact on the financial markets faded. In the times of the pandemic, the government policy support in the form of relief packages revived the stock markets (Zaremba, 2021).

Conclusion

This paper aims to evaluate the reactions of stock markets in BRICS countries (China, Russia, India, and Brazil, and South Africa) to the pandemic of the COVID-19 outbreak. The paper uses ARCH, GARCH models using daily data from January 1, 2020 – to September 2, 2020. The financial market response was analyzed during two phases. The first phase included analyzing the financial markets' response within 30 to 60 days from the first days of confirmed cases of COVID-19. The second phase analyzes the

financial market response after 30 to 60 days of initial confirmed cases. The results of the first phase analysis show that the negative impact of the spread of the COVID-19 on the financial markets in the BRICS countries lasted for about 30 days in Brazil, Russia and China, while it lasted for about 60 days in India and South Africa. On the other hand, the results of the second phase analysis indicate the disappearance of the negative impact on financial markets that resulted from government interventions in the economy to limit the economic repercussions of the spread of the COVID-19.

The empirical results confirm that the response of stock markets in BRICS countries to confirmed COVID-19 cases was negative and strong during 30 to 60 days of the initial confirmed cases. After that, the negative response of the financial markets faded over time. Governments responded with numerous policies related to travel bans, lockdowns, and stimulus packages to minimize the effects of the pandemic. The results conclude that governmental support played an important role in mitigating the repercussions of the COVID-19 outbreak on stock markets in BRICS countries. The study's results cannot be generalized to other markets and countries or during a different period that is a limitation of the study. The study is helpful to the policymakers to take the required precautions and policy measures to stabilize the stock markets to reduce volatility and losses in markets.

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