"Covid-19 and Stock Market Behavior – An Event Study of BRIC Countries"

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Abstract

The purpose of this research is to estimate the influence of COVID-19 epidemic on the behavior of stock markets in BRIC nations. The effects of infectious disease are important, and they have had a direct effect on financial markets around the world. Our sample is made up of BRIC country indices. The market model event methodology approach was used to conduct the analysis. The event window is considered as 72 days after the announcement of Novel COVID-19 as human transmitted disease in the global press, and estimation window is considered as -150 days from the occurrence of the event date. During the 72-day event window, six sub-event windows have recorded negative CARs. According to the results of this report, from day 0 to day 60 the cumulative average abnormal return (hereafter referred as CAAR) ranges between –0.85 % to –7.28 %, which is result of amplified stress in the financial markets caused by a rise in the counts of COVID-19 infected cases in BRIC nations. CAAR ranges between –7.28 % to –0.10 % from day 60 to day 72 suggests stock market recovery following a significant correction in the closing prices of indices among the selected nations due to COVID-19.

Keyword: Covid-19, BRIC Countries, Event Study, Stock Market, Pandemic, Indices

Introduction

In the literature, there are many observational bits of evidence regarding financial market reactions to important systematic events. Few latest researches analyse the effect of global incidents like the Severe acute respiratory syndrome (SARS) pandemic ailment epidemic (Chen et al., 2007, 2018; Loh, 2006), usual tragedies (Caporale et al., 2019; Tavor & Teitler-Regev, 2019; Wang & Kutan, 2013), national press (Li, 2018; Ormos & Vázsonyi, 2011), business actions (Maitra & Dey, 2012; Ranju & Mallikarjunappa, 2019; Seal & Matharu, 2018), and political activities (Beaulieu et al., 2006) on stock market.

As the novel coronavirus (COVID-19) sweeps through the globe's vast population, the world is suffering unparalleled health shock. The transmission of coronavirus disease has an unavoidable negative impact on capital markets and the economies around the world. At the early stages of studies on COVID-19, Al-Awadhi et al. (2020), Ahmar and Val (2020), Zhang et al. (2020) and Liu et al. (2020) found detrimental influence of COVID-19 on economic markets. A contagious disease was transmitted by a recently discovered virus (COVID-19). According to WHO 2020, majority of individuals infected with virus of COVID-19 will have slight to reasonable respirational symptoms, then will recuperate without the need for specialized treatment. The very first positive case of COVID-19 was established in Wuhan, Central China on 31st December, 2019. The WHO later called COVID-19 epidemic a communal well-being emergency of worldwide importance in January 2020. The epidemic of coronavirus has resulted in a pandemic (COVID-19), causing widespread concern over the physical well-being as well as global economic hardship. On 11th March, recording more than 118,000 positive case of COVID-19 in over 100 countries and terrains globally, as well as the risk of global dissemination, coronavirus was announced as pandemic. However, owing to the dearth of medical knowledge on COVID-19, WHO guidelines on transmission and care are continuously evolving.

Stock markets across the globe began to fall after COVID-19 was declared as pandemic by WHO. Multiple studies on COVID-19 focusing on analyzing the stock price movement reflected panic buying among the investors, hence led to increased instability in domestic and foreign stock markets. Since 1987, the Dow jones and the FTSE both have seen the maximum one-day declines (Nandal et.al.). Because of heightened anxiety and panic trading activities, the leading stock exchanges of India including NSE & BSE halted their trading for two times (13th & 23rd March 2020) during the span of 15 days using circuit breaker. In the USA during March 2020, within the time frame of ten days the circuit breaker stumbled four times (Economic Times, 2020). Post the announcement of Covid-19 an international epidemic, Brazilian shares dropped sharply on March 12, 2020, with stocks closing 8.5 percent lower and the real falling down toward its all-time low against the dollar. After a 10% decline in the benchmark Bovespa index, stock exchange trade was paused for 30 minutes in the afternoon. BVSP set off an automated "circuit breaker". On 17th March, MOEX Index dropped 2.8 percent (May, 2020, themoscowtimes.com). The COVID-19 induced crisis had a negative influence on majority of capital markets globally. Even after when India was barged with multiple opportunities (Sachdeva & Sivakumar, 2017).

Table 1: Casualty and Infection Rates of COVID 19 and other Epidemic Waves

Virus	Ebola	MERS	SARS	COVID-19	Seasonal Flu
Fatality Rate (Deaths/Cases)	50%	34.30%	10%	1%-3.4%	0.05%
Infection Rate (per infected person)	1.5 – 2.5	0.42-0.92	3	1.5-3.5	1.3

Source: World Health Organization, Centre for Disease Control and Prevention, 2020.

This study looks at how the BRIC countries' capital markets fared during the COVID-19 epidemic. To the best of our understanding, this article is a first-of-its-kind review of the behavior of the financial markets in BRIC countries following the COVID-19 pandemic. The remaining study is ordered as the follows: second section represents an analysis of applicable research work. The research's goal is discussed in next section. The reasoning is presented in the fourth part. The approach used in data analysis is explained in the fifth section. Data analysis results are discussed in the sixth and seventh section. The results are summarized in the eighth section.

Literature Review

Virus Epidemic & Economic impact

Ozili and Arun (2020) in their study investigate the effect of communal distancing strategies on the country's economic practices and the stock indices. The study concluded that restrictions on internal migration and increased monetary policy expenditure had an optimistic effect on scale of economic activities, despite the fact that growing number of reported coronavirus cases had little influence on the economic activity levels. Whether the physical propinquity of information spreaded by Ebola epidemic in 2014, along with wide media attention, influenced asset values in the US were explored by Ichev and Marinc (2016). The results revealed that most stock prices have reacted negatively, while a considerable impact on local trade was reported by local media, and the impact is more noticeable in smaller and highly volatile shares, as well as in instable sectors.

Siu and Wong (2004) investigated the escalation of Hong Kong's disease (Severe Acute Respiratory Syndrome), as well as its monetary consequences, and concluded that demand side observed the most significant negative effects, with the short-term seriously impacted by the tourism and travel related services and local consumption. The nation experienced no supply shock since the industrial base of Pearl River Delta remained untouched, and products were typically shipped to Hong Kong. According to Young (2004), the AIDS outbreak in South Africa boosted net future per capita consumption. According to Bell and Gersbach (2004), epidemics have a significant negative effect on economic activity as measured by GDP.

Virus Epidemic & Stock Market Performance

Baker et al. (2020) contrasted the position of COVID-19 trends in current stock market activity to past virus outbreaks. The author compares COVID-19 to various flus hitting the economies like bird and swine flu, SARS, Ebola and MERS. The results showed that no prior infectious disease sincident had resulted in regular variations in the stock market even highly resembling the response to COVID-19 progress in the preceding month. Another study by Ramelli and Wagner (2020) reviews the behavior of market regarding COVID-19 on firm's foreign transactions and financial strategies and discoverd an adverse effect for globally oriented US companies, especially the countries which are exposed China and the US; indices moved

furiously as the coronavirus spread through European and the US nations. Hang (2016) studied the fundamental changing aspects of capital market bubbles in China in the last decade and discovers that knowledge hindrance induced large volatility in the Chinese share market. According to Bai (2012), Baker, Wurgler, and Yuan (2014), when a communicable disease epidemic occurs, investors may become cynical about prospective investment opportunities at a given point of time in market, causing them to liquidate stocks in that market.

Despite the fact that numerous studies have been steered to quantify the consequence of various national and international activities on stock market results. Perhaps no other field of finance has received as much academic attention over the past forty years as the performance of capital markets around the globe (Saravanakumar, 2011). Ongoing lethal coronavirus epidemic has caused destruction over the people all over the world, disrupting nations' economies along with diminished share market results, harming stock market participants' sentiments. However, a dearth of study focusing on BRIC countries stock performance was observed. Moreover, during the study time, the BRIC countries experienced the most severe outbreaks of the coronavirus.

Table 2: Stock Market Index in BRIC Nations

BRIC Countries	Stock Exchange	Indices	Abbreviation	Economic status of Country
Brazil	Brasil Bolsa Balcao	Bovespa	BVSP	Developing Economy
Russia	Moscow Exchange	MOEX Russia	MOEX	Developed Economy
India	NSE	Nifty50	Nifty50	Developing Economy
China	Shanghai Stock Exchange	Shanghai Composite Index	SSEC	Developing Economy

Source: Author's own compilation

Objective of the Study

The current study primarily emphasis on analyzing the stock response across the BRIC nations towards the COVID-19 epidemic. Also, the study efforts to understand the relationship between abnormal return and index return of the BRIC countries.

Methodology

Event Study Methodology

The event study method is regarded amongst the most traditional and appropriate technique for studying the influence of an event on the return of shares over the lifetime of the event. Event analyses help forecast how markets and indexes would respond when an event is revealed (Anwar et al., 2017). The market model was chosen specifically because it is more accurate than other elaborate methodologies at detecting irregular returns, and it has also been shown that it produces valid results (Salamudin et al., 1999). As a result, the approach employed is

resistant to criticism of the capital asset pricing model. The business model methodology is a relatively successful approach that can be applied in a number of ways (Brown and Warner 1985).

The news of an event will affect stock markets in either a positive or negative way. In general, this technique is employed to analyse the association between the stock market success and the pace of company transactions for instance, in the case of takeover and mergers, distributions, splits, allocation of bonus shares, amalgamations, and so on. Often analysts employ case study method for investigating the impact of events not relating to corporates, like the transmission of ailment, upon the stock system (Liu et al., 2020; Chen et al., 2017, 2018; Pendell & Cho, 2013).

Estimation Model

Initially, the Equation (1) is used to estimate daily returns:

$$R_{it} = \left(\ln P_{i,t} - \ln P_{i,t-1}\right) \times 100 \quad \text{----------(1)}$$

where,
$R_{i,t}$: Return of Index *I* for day *t*,
Ln: Natural logarithm,
$P_{i,t}$*: P*rice of index *i* for day *t*,
$P_{i,t-1}$: Price of index *i* for the preceding trading day.

Further, Equation (2) has been used to calculate expected average return for the index *i*, where $R_{i,t}$ reflects the everyday return of index *i* throughout the estimation time frame (−150 days to −1 day).

$$\bar{R}_i = \frac{1}{N}\sum_{-150}^{-1} R_{i,t} \quad \text{----------(2)}$$

Afterward springing the expected average return, Equation (3) has been used to derive AR (Abnormal Return) for every index for every day:

$$AR_{i,t} = R_{i,t} - \bar{R}_i \quad \text{----------(3)}$$

Over the window from t_0 to t_1, Cumulative Abnormal Return (CAR) of index *i* is estimated using Equation (4):

$$CAR_{i(t_0,t_1)} = \sum_{t=t_0}^{t_1} AR_{i,t} \quad \text{----------(4)}$$

The AAR (average of abnormal returns) for every index on each day is computed using Equation (5), where, *N* is the number of indices.

$$AAR_i = \frac{1}{N}\sum_{t=1}^{N} AR_{i,t} \quad \text{----------(5)}$$

CAARs (Cumulative Average Abnormal Returns) are estimated to investigate cumulative effects of an occurrence over a given time frame. CAAR is the average of the day-to-day Average abnormal returns for specified event window ($t_0 - t_1$). Using Equation 6, CAARs has been calculated for the specified window.

$$CAAR_{(t_0,t_1)} = \sum_{t=t_0}^{t_1} AAR_t \quad \text{----------(6)}$$

Date of Event

Numerous latest reports have endeavored to examine the short-range impact of outbreak of COVID-19 on the returns of stock-market (Nicola et al., Liu et al., 2020; 2020; Zhang et al., 2020); similarly, reporting about COVID-19 on international platform is of concern to this research. WHO has been consistently monitoring the occurrence of any incident regarding COVID-19. Finally, WHO declared COVID-19 can be transmitted to humans. Keeping this into consideration, the date of the case in this analysis is then selected as 11th January 2020 (WHO, 2020 Disease outbreak news), when information about coronavirus appeared publicly for the first time.

Estimation Period & Event Window

The returns were estimated using the pre-defined estimation window. In line with existing studies, the estimation window is assumed from –150 days to –1day, just a day before the event day when details on the latest virus surfaced on stock exchange, consisting a total 150 transaction days (Lalwani et al., 2019: Anwar et al., 2017).

Event window for assessing the effects of coronavirus on stock indices is 72 days, which includes 71 days post declaration of details on the communicable infection as well as declaration day also. Stock markets are said to behave differently at various points of the pandemic cycle. As a result, the full event window is split in seven windows in order to analyse the effects of the outbreak at different times: (0–9), (10–20), (21–30), (31–40), (41–50), (51–60), and (61–72).

Sample & Data Collection

The analysis's aim is to estimate the impact of COVID-19 epidemic on indices of BRIC nations (Brazil, Russia, India China). BRIC is made up of the world's most developing nations. The survey consists of four economic indexes. According to media sources, countries are having a tough time stemming the dissemination of coronavirus. Global indexes such as the Dow Jones Global Index are also adversely impacted, as COVID-19 is structural in nature. To compute estimated returns for corresponding nations, we have employed a comparative time mean modified model.

Intraday closing prices of BRIC nation indices were accessed from the investment.com website (an open-access website that displays the world's real-time portfolio and index values) from May 31, 2019 to April 30, 2020. Furthermore, data on positive coronavirus cases were gathered for the BRIC countries through the website that provides information on coronavirus cases across the globe (ourworldindata.org). Furthermore, Microsoft Excel spreadsheets and SPSS (V25)was used for data analysis.

Results & Analysis

Mean Return Analysis

Table 3 represents the descriptive statistics of BRIC indices during pre-event period. Part A represents that all BRIC indices have recorded positive mean return before the pandemic outbreak, also the returns are not must deviated from their mean value. Part B of Table 3 represents the descriptive statistics of BRIC Indices during event time frame. Following the epidemic of the lethal virus, the mean returns are negative corresponding to all BRIC indices, with higher standard deviations than before the existence of COVID-19, reflecting increased stock market uncertainty. Among the all selected indices, Brazil's index has reacted more adversely toward the pandemic, followed by Indian Index. Regardless of China being the initiation point of COVID-19, Chinese stock exchange had a lesser negative average return (-0.10) than the other stock markets included in the research, which could be due to the Chinese government's rapid remedial measures and virus containment. However, it is evident that stock markets of BRIC countries were adversely impacted by COVID-19.

Table 3 (Part A): Pre-Event Period: Mean Returns and Standard Deviation

Indices (BRIC Countries)	Trading days	Mean Returns (%)	Std. Dev. Of Returns (%)
BVSP	153	0.114	1.005
MOEX	155	0.103	0.712
Nifty50	150	0.018	0.928
SSEC	153	0.042	0.821

Source: Author's own calculation

Table 3 (Part B): During Event Period: Mean Returns and Standard Deviation

Indices (BRIC Countries)	Trading days	Mean Returns (%)	Std. Dev. Of Returns (%)
BVSP	75	-0.481	4.675
MOEX	77	-0.213	2.529
Nifty50	73	-0.298	3.211
SSEC	72	-0.108	1.671

Source: Author's own calculation

AR and CAR Analysis of BRIC Indices

Abnormal Returns (ARs)

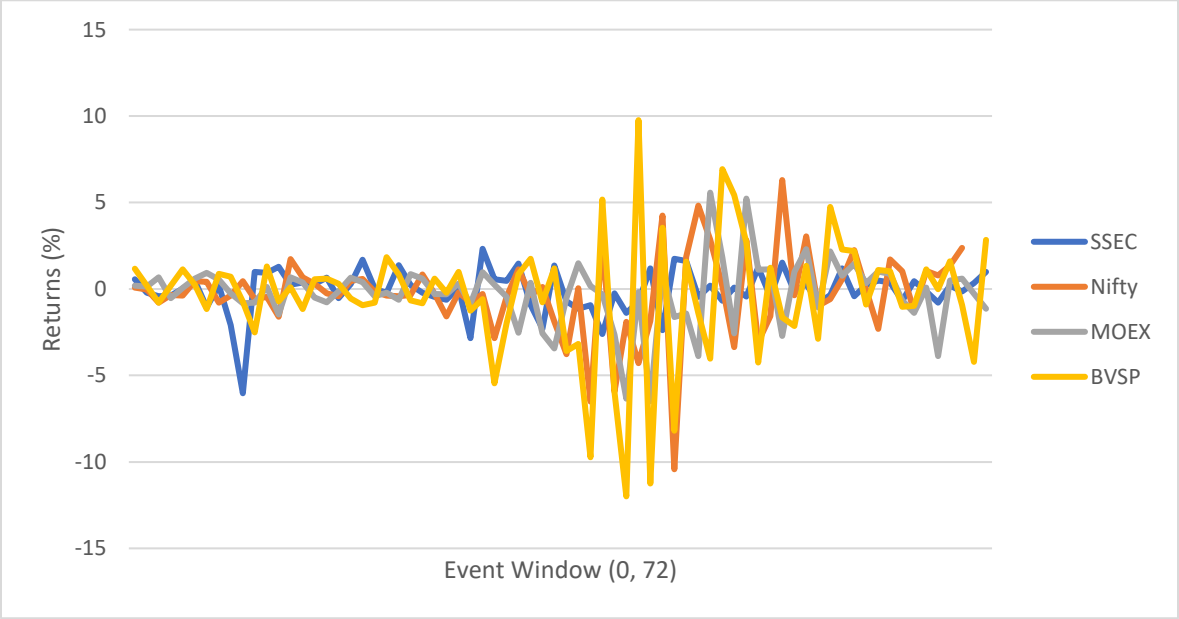
Table 4 shows ARs of the event date and the next date. On the day of the occurrence, the Indian stock market had a negative AR. The table also shows the ARs the next day after the coronavirus was made public. All BRIC country indices recorded negative ARs on t_1, the event date. Because the sell-off was unequally distributed across stock markets, BVSP recorded the maximum negative abnormal return and Nifty50 recorded the least negative abnormal return among all BRIC nations on that day.

Table 4: Abnormal Returns (From $t_0 - t_1$)

Indices (BRIC Countries)	t_0	t_1
BVSP	0.215	-1.652
MOEX	0.628	-0.423
Nifty50	-1.167	-0.467
SSEC	0.658	-1.348

Source: Author's own calculation

Fig 1: Abnormal returns of BRIC Indices during Event Window



Source: Author's own compilation

Cumulative Abnormal Returns (CAR)

Cumulative Abnormal Returns: Event Window (0-9)

The CAR in coronavirus-affected emerging economies is determined by aggregating daily ARs corresponding to BRIC indices. Table 5 depicts the CAR of the BRIC stock market indices of first event window of 0–9 days. Due of the surprising broadcast of novel coronavirus pandemic

in media within the first ten days of first event window, the all selected indices reported negative CARs. Chinese stock market reacted most negatively among all towards the COVID-19 outburst in the event window (0–9). The Chinese index, SSEC had the highest negative CAR among the BRIC indices, which is found significant at 1% level of significance, followed by MOEX. The dissemination of information about the COVID-19 caused financial markets in the BRIC economies to panic during this time frame.

Table 5: CAR for Event Window (0-9 days)

Indices	CAR	't' Statistic	P value
SSEC	-5.935	-4.872	0.001*
Nifty	-1.875	0.387	0.709
MOEX	-4.715	3.970	0.004*
BVSP	-4.217	6.633	0.000*

Source: Author's own calculation
*Notes: *, **, *** indicates 99%, 95% & 99% confidence level*

Table 6: CAR for Event Window (10-19 days)

Indices	CAR	't' Statistic	P value
SSEC	-4.2075	-4.902	0.001*
Nifty	-1.515	-3.079	0.013**
MOEX	-2.9025	-5.685	0.000*
BVSP	-2.115	-10.349	0.000*

Source: Author's own calculation
*Notes: *, **, *** indicates 99%, 95% & 99% confidence level*

Table 6 displays negative CARs for all market indices during the event window (10–19). Indices for all BRIC countries continued to fall, showing a panic-like situation in all of the selected developing countries. Precisely, during this time frame, indices of all economies reacted undesirably and quickly as the count of coronavirus infected people began to increase across the world.

Table 7: CAR for Event Window (20-29 days)

Indices	CAR	't' Statistic	P value
SSEC	1.545	0.442	0.669
Nifty	0.075	-0.836	0.425
MOEX	-0.57	2.226	0.053***
BVSP	-0.375	3.059	0.014**

Source: Author's own calculation
*Notes: *, **, *** indicates 99%, 95% & 99% confidence level*

Table 7 presents the response of all indices during the event window (20–29), it is evident form the results that majorly the stock markets have started recovering and had absorbed the shocks resulted because of COVID-19 to considerable degree. SSEC, the Chinese index and NIFTY, the Indian index resulted in positive CARs to the tune of 1.545% and 0.075%. However, the

indices in Brazil, and Russia are assumed to be following noise trading and panic selling which triggered them having adverse CARs. More than five weeks after the world's second-largest economy Chinese leadership shut down, to halt a persistent coronavirus epidemic, factories and workplaces began to reopen (*The New York Times*, 2020). Since the opening of the economy eased a revitalization in Chinese markets, resulting which SSEC registered a CAR of 1.545, which was substantially higher than the CAR of other countries' indices.

Table 8 depicts negative CARs for all market indices during this event window (30–39). Brazil's market was heavily impacted, and as a result, it reported the highest significant negative CAR of -8.812 % during this event window, followed by Russia's market (-6.262 %). As these countries witnessed a strong wave of covid-19 during this time, the financial market appears to have correctly reflected the impact of the same.

Table 8: CAR for Event Window (30-39 days)

Indices	CAR	't' Statistic	P value
SSEC	-0.4845	-0.381	0.712
Nifty	-4.785	-4.444	0.002*
MOEX	-6.2625	-5.812	0.000*
BVSP	-8.8125	-5.257	0.001*

Source: Author's own calculation

*Notes: *, **, *** indicates 99%, 95% & 99% confidence level*

Table 9: CAR for Event Window (40-49 days)

Indices	CAR	't' Statistic	P value
SSEC	-4.875	-3.965	0.003*
Nifty	-23.145	-5.064	0.001*
MOEX	-16.297	-5.965	0.000*
BVSP	-30.217	-8.431	0.000*

Source: Author's own calculation

*Notes: *, **, *** indicates 99%, 95% & 99% confidence level*

Table 9 displays CARs for indices in BRIC countries during 40–49 days. The main outbreaks of COVID-19 triggered widespread uncertainty and panic in global financial markets. During this event window, all BRIC economies' indices registered a substantial negative Vehicle. Because of major outbreaks in Brazil and India, the BVSP and NIFTY registered CARs of 30.217 percent and 23.145 percent, respectively, in this event window. All indices recorded significant CARS with 1% level of significance. Chinese index, SSEC registered a cumulative abnormal return of -4.87 percent, which was very less in comparison to the indices of other nations, this may be resulted as China restarted its operational activities. Further to be more precise, for this event window, the Chinese stock market suffered lesser decline than other nations capital markets.

Table 10: CAR for Event Window (50-59 days)

Indices	CAR	't' Statistic	P value
SSEC	1.185	4.106	0.003*
Nifty	-1.65	7.934	0.000*
MOEX	8.422	3.950	0.003*
BVSP	4.185	5.243	0.001*

Source: Author's own calculation
*Notes: *, **, *** indicates 99%, 95% & 99% confidence level*

CAR of event window (51-60), Table 10 reveals that stock markets recovered in 75% of the cases. Furthermore, Table 10 shows that financial markets across the world re-arose post the coronavirus outbreak. Except for NIFTY, all selected indices had optimistic CARs. China's, Russia's, and Brazil's indices received substantially positive CARs of 1.185 percent, 8.422 percent, and 4.185 percent, respectively. This was attributed to significant initiatives carried out by numerous nationwide and worldwide bodies throughout the former event window of 40 to 49 days to control the COVID-19 outbreak. The strong positive indication of economies emerging from the coronavirus's clutches are reflected in Table 11.

Table 11: CAR for Event Window (60-72 days)

Indices	CAR	't' Statistic	P value
SSEC	0.2775	0.324	0.752
Nifty	9.33	1.809	0.096***
MOEX	0.5926	-2.498	0.024**
BVSP	8.28	6.246	0.000*

Source: Author's own calculation
*Notes: *, **, *** indicates 99%, 95% & 99% confidence level*

Conclusion and Practical Implications

The COVID-19 epidemic has caused widespread devastation. Because of the latest pandemic, the bulk of economic operations around the world have been ceased. As a consequence, all of the main macroeconomic parameters point to bleak upcoming prospects. COVID-19's immediate effects and financial consequences can be realized by the fluctuation in stock market. In light of this, current study sought to analyse the forthwith impact of COVID-19 on stock markets for the sample of BRIC countries. This study complements to the body of knowledge by investigating the unpredictable epidemic impact of a feared disease on financial markets. From investor's perspective, the results of this study demonstrate the significance for not just the company's market conditions, but also for the investment risks posed by such unexpected incidents. The findings show that following the COVID-19 outburst, financial markets around the world underperformed and recorded undesirable returns as seen in the tables above. However, the study also discovered that the financial markets were steadily improving from the obstruction of the coronavirus outbreak during the later phases of the event window, as indicated by optimistic CARs. Overall, our findings indicate that initial panic selling in financial markets around the world was caused by potential uncertainty caused by the

COVID-19 outbreak. Stock markets are currently seeing an influx of money, which is encouraging their recovery.

Our results have important policy consequences. To address this challenge, a alliance of government officials, central bank, investment bank and stock market regulators, will be needed. Bank authorities have to be merciful towards companies in severely affected sectors like industrial, travel and tourism by rolling over existing loans. COVID-19 crisis management involves a pragmatic strategy in which officials continuously inform people about what the mechanism can do to trigger uncertainty in order to improve investor confidence.

Finally, in this time of volatility, markets are being powered by noise trading. There is a requirement to analyse market fluctuations in light of noise trading hypothesis, and it is recommended to examine this in future research studies. Furthermore, there is a strong need for additional investigation into the investor trust within and between international markets. The study on investor sentiment and uncertainty can also be used as a basis in future studies.

Given the applicability of the findings, it is concluded that the findings of present research will be useful to financial analysts, large as well as retail investors, fund managers and industrial analysts. Our research indicates that in times of market weakness, investors should consider long-term investment strategies, and the appropriate answer will be to buy stocks.

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