

DOES COVID-19 OUTBREAK AND RUSSIAN INVASION OF UKRAINE GENERATE ABNORMAL RETURNS?

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Abstract *The present study aims to examine the impact of two economic shocks i.e., COVID-19 and Ukraine-Russia war in the Indian equity market using 3 broad market indices and 14 sectoral indices of National Stock Exchange of India (NSE). Four events concerned with COVID-19 i.e., WHO announcement of COVID-19 as global pandemic, first lockdown in India, start of the second wave of COVID-19, peak of second wave and one event of Ukraine-Russia war have been selected for the analysis. In this study, daily stock returns have been used to compile abnormal returns and cumulative abnormal returns and event study methodology has been applied. It has been found that the selected indices show high volatility during various events, however, failed to generate abnormal returns.*

Keywords: COVID-19, Ukraine Russia War, Semi-Strong Form Market Efficiency and Event Study Methodology

JEL Classification: G1, F2, F3, F6

INTRODUCTION

Globalization has interconnected economies worldwide with heightening international financial interdependence along with offering numerous economic benefits. However, this interconnectedness has also posed significant challenges during crises (Liu et al., 2020), leading to rapid disruptions in one region affecting the global financial markets. For instance, the financial crises of 2008 resulted in the collapse of prominent United States financial institutions leading to substantial declines in global stock markets. This demonstrates the vulnerability of global financial systems to the disruptions originating from certain regions (Claessens, Kose & Terrones, 2010). These disruptions or crises result in heightened volatility in stock markets as the investors react to uncertainty and risks (Reinhart & Rogoff, 2009). Thus, it is required to study the repercussions of global crises on stock market (Varma et al., 2021) to avoid the undue impact.

In the past five years, the COVID-19 pandemic and Ukraine-Russia war are major global crises (Kumar et al., 2023) that have tested the resilience of economies, particularly emerging ones. Both crises have resulted in substantial financial difficulties for several economies worldwide. During these times, there has been a significant decline in

financial markets globally. There has been increase in stock market volatility, supply-chain disruptions and consumer behavior changes (Varma et al., 2021). Both the crises have occurred consecutively and affected the Indian stock market to greater extent. Therefore, in the present study, these two major crises have been considered.

The COVID-19 pandemic emerged in China in December, 2019 (Karim & Shetu, 2023; Varma et al., 2021). The pandemic was swiftly disseminated globally, resulting in major economic and health crises (Ningrum et al., 2020). It had a negative impact on nations both socially and psychologically, interrupting the daily lives with bringing considerable stress and anxiety (Saleh & Mujahiddin, 2020). The World Health Organization (WHO) declared it a global emergency on January 30, 2020 and classified it as a pandemic on March 13, 2020 (Varma et al., 2021). As a reaction, Governments worldwide implemented rigorous measures such as lockdowns, travel restrictions and social distancing (Au Yong & Laing, 2021; Umar et al., 2023), which had an additional impact on economic activities and worsen financial stability. Following the announcement of the lockdown on March 23, 2020, India also witnessed significant repercussions on its stock market (Varma et al., 2021). The Sensex of Bombay Stock Exchange (BSE) witnessed a fall on 13.2% on March 23, 2020. The Nifty of

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National Stock Exchange (NSE) declined by 29% in 2020 due to COVID-19 (Bora & Basistha, 2021), indicating the significant economic impact during the initial stage of the pandemic.

Furthermore, the second shock Ukraine Russia war, began on February 24, 2022 (Izzeldin et al., 2023) led to substantial causalities and triggered a refugee crisis in Europe (Sun et al., 2022). The war caused a sudden increase in crude oil prices, which had a negative influence on the financial stability of emerging economies. Initially, global stock markets responded negatively, affecting countries bordering two nations (Boungou & Yatié, 2022) and European Union (EU) countries. It also damaged several sectors such as finance sector, service sector, manufacturing sector and Oil & Gas companies in Russia (Sun et al., 2022). However, the effect weakened over time. Notably the Egyptian stock market's liquidity remained mostly unaffected (Gameel, 2022).

Given the above observations, the present study has tested the market efficiency during the crisis for which Efficient Market Hypothesis (EMH) the basis of market efficiency (Mishra et al., 2021), is selected for analysis purpose. The semi-strong form of EMH which claims that stock prices respond quickly to all historical and publicly available information and prevent investors from consistently securing abnormal profits (Fama, 1970) is most appropriate. The study has employed event study methodology, which is a commonly used methodology in finance (Rizvi et al., 2022). It is useful for understanding the stock market reactions (Mall & Gupta, 2019) by calculating Abnormal Returns (AR), Cumulative Abnormal Returns (CAR) and 't' statistics.

To the best of our knowledge, extensive study has been conducted on the individual consequences on how Indian equity market has reacted to COVID-19 and Ukraine Russia, there is a notable gap in the literature regarding their combined impact. The present study shall provide a comprehensive analysis of Nifty's three broad market indices and fourteen sectoral indices, aiming to fill the gaps in the literature by offering a thorough examination of Indian equity markets. The present research aims to investigate the following research questions and proposes to contribute to the existing literature:

RQ1: What is the impact of COVID-19 on the Indian equity market, particularly in relation to stock returns and sectoral performance?

RQ2: What is the impact of Ukraine Russia war on the Indian equity market?

The findings of the present study shall offer valuable insights into the impacts of economic shocks on stock market returns. It shall assist in strategic investment management

and facilitate future economic recovery. The financial analysts shall enhance their predictions and risk assessment by studying responses of various sectors that improves the accuracy of financial models and investment advice. The findings shall be useful for the investors for Governments to decide the optimum time to provide support to the underperforming sectors.

The subsequent sections of the study are organized as follows: Section 2 provides an overview of the existing literature, Section 3 explains the research methodology, while Section 4 presents the empirical results and discussions based on the analysis and its interpretation. Finally, Section 5 serves as the conclusion, including study's limitations and providing practical implications.

LITERATURE REVIEW

Impact of COVID-19 on Stock Market

The COVID-19 pandemic has shown a significant adverse effect on stock returns worldwide in both developed and emerging economies (Al-Awadhi et al., 2020; Harjoto, Rossi & Paglia, 2021; Kumar et al., 2021 and Uddin et al., 2021). The studies by Chaudhary et al. (2020), Liu et al. (2020) and Zaremba et al. (2020) have analyzed stock indices from the top 10, 21 and 67 countries, respectively. These studies have shown negative daily average returns across all the indices, with majorly affected countries experiencing decline in the stock markets. Asian countries have also witnessed significant adverse stock market returns.

Okorie and Lin (2021) have investigated the fractal contagion effect of pandemic on the stock markets of different countries and found evidence of fractal contagion. Nguyen et al. (2021) have noticed substantial contagion effect from the stock markets of United States and China throughout the pandemic, with some evidence of volatility spillover effects. Similarly, Yousfi et al. (2021) have observed contagion effects on financial markets, particularly in US. Baek, Mohanty and Glamboosky (2020) have found that the stock volatility was affected by both favorable (government interventions and medical advancements) and unfavorable news (infection rates and economic downturns) during COVID-19.

Mazur et al. (2021) have found that stocks in the hospitality, real estate, entertainment and petroleum sectors experienced greater declines to those in the natural gas, healthcare, food and software sectors in US market. In a similar study, Shankar and Dubey (2021) have observed negative effects in the banking sector, automobile sector, consumer durable sector, financial sector, realty sector and IT sector, while metals and

pharmaceutical sectors have been positively affected due to market panic and increased demand for medicines in Indian market.

Al-Awadhi et al. (2020) have examined Hang Seng Index and Shanghai Stock Exchange Composite Index of China, finding that increases in daily COVID-19 cases and fatalities led to decline in stock market returns. Moreover, Apergis and Apergis (2020) and Kumar et al. (2021) have studied the correlation between COVID-19 cases, fatalities and stock returns. The studies have observed adverse impact on stock market returns. These studies have demonstrated positive relationship of COVID-19 with stock market volatility and negative relationship with stock market returns. Ullah et al. (2023) have found that COVID-19 and economic policy uncertainty have significantly affected stock market returns in China, particularly during negative market conditions. He et al. (2020) have observed adverse short term effects on stock markets in countries such as France, Germany, China, Spain, Italy, South Korea, Japan and USA due to pandemic.

A few research studies have examined the impact of two waves of COVID-19 on various economies, where it has been found that first wave (April-June 2020) primarily affected developed countries, while the second wave (March-May 2021) has a significant impact on emerging countries. First wave has increased volatility in European stock markets and the second wave has impacted on Belgium's stock market (Dutillo et al., 2021).

Governments worldwide implemented rigorous measures such as lockdowns to mitigate the impact of COVID-19 and prevent its spread. According to the studies of Alam et al. (2020) and Hardi and Sihombing (2022), the response of stock markets before and after lockdown was different. Before lockdown, stock markets panicked, leading to selling of securities by investors and generating negative average abnormal returns. Baker et al. (2020) have found unprecedented volatility and Singh and Shaik (2021) have witnessed significant downturns in stock market during COVID-19. The reason is the investors lost their confidence leaving them nervous and anxious (Ahmed et al., 2021). Public authorities were advised to intervene during the adverse situation and support affected sectors (Jena & Mishra, 2022). However, after lockdown, positive Average Abnormal Returns (AAR) indicated that investors anticipated event (Alam et al., 2020) and their potential corrections (Phan & Narayan, 2020). Ahmed et al. (2021) have studied stock market performance during India's lockdown along with oil prices, which were initially affected, whereas, gold prices showed positive impact, however, these effects have been temporary, particularly during the second wave in South Asian countries. Liu et al. (2020) have studied the impact of lockdown announcements on stock returns and found negative abnormal returns in short run, which drastically

affected Asian stock markets because of widespread fear.

Bhattacharjee and De (2023) have studied relationship between COVID-19 policies and Indian equity market sentiments, observing temporary impacts and speculative activities. Sinha et al. (2021) have found negative impacts on emerging markets, including, stock returns, investor sentiments and macroeconomic variables. Bhama (2022) has studied COVID-19's impact on Nifty 100 in India, indicating a greater impact compared to other macroeconomic variables. The first wave of pandemic prepared businesses for subsequent pandemic waves, highlighting the importance of adaptive strategies.

Impact of Ukraine-Russia War on Stock Returns

Similarly, studies on Ukraine-Russia war have indicated its initial negative impact on global stock market returns and specific sectors. Federle et al. (2022) have analyzed stock markets in 66 nations, finding lower stock returns in the countries located within 1000 km radius of Ukraine. Bounou and Yatié (2022) have analysed the impact of Ukraine-Russia war on stock returns from 94 countries and found a correlation between the conflict and stock performance. Similarly, Boubaker et al. (2022) have employed event study methodology to investigate the effect and found that global stock market witnessed adverse cumulative abnormal returns. Additionally, Das et al. (2023) have found detrimental effect on stock returns in the industries reliant on suppliers from both countries. Furthermore, Yousaf et al. (2022) have reported negative impacts on Asian and European markets, while Deng et al. (2022) have found that the Ukraine-Russia war affected firm's ESG aspects, reporting inconsistent resilience indicators and geographical disparities due to Russian energy dependency.

The effects of COVID-19 and the Ukraine-Russia war on many economies and stock markets have been well documented. However, there is limited research on the Indian equity markets during both crises together. Additionally, most studies have examined certain sectors or companies rather than offering a broad market perspective by using multiple indices together. Therefore, further study is needed in Indian equity market, particularly sector performance and their empirical testing connected to COVID-19 and Ukraine-Russia war both in a single study.

RESEARCH METHODOLOGY

Based on the previously identified research gap, the objectives of the study have been formulated to examine the impact of two economic shocks on stock returns of the National Stock

Exchange (NSE) of India. To achieve the objectives, we have selected five events related to two economic shocks. Each event has been selected based on its relevance and potential

influence on the stock markets. The selected events along with their corresponding event dates and event windows are described in Table 1 below:

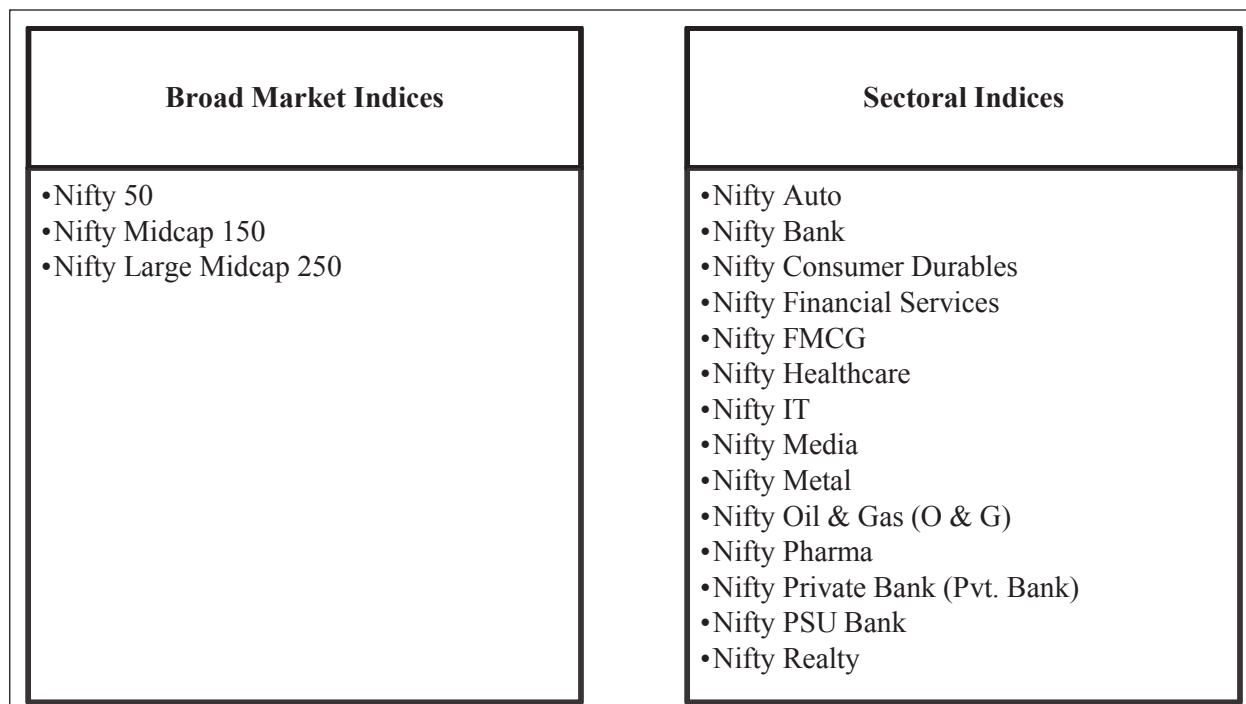
Table 1: Events, Event Dates and Event Window

Sr. No.	Event	Date	Window
1.	WHO Announcement of COVID-19 as global pandemic	11-03-2020	25-02-2020 to 25-03-2020
2.	First Lockdown in India due to COVID-19	25-03-2020	11-03-2020 to 13-04-2020
3.	Start of Second Wave of COVID-19	15-03-2021	26-02-2021 to 30-03-2021
4.	Peak of Second Wave of COVID-19	23-04-2021	07-04-2021 to 07-05-2021
5.	Ukraine-Russia War	24-02-2022	10-02-2022 to 11-03-2022

Source: Compiled by Author

For conducting the study, 3 broad market indices and 14 sectoral indices have been selected, list of which has been described in Fig. 1. The closing prices of the selected indices have been used to calculate abnormal returns during the

event window. NSE 500 has been taken as benchmark index. The study has used secondary data taken from the website of National Stock Exchange of India (www.nseindia.com).



Source: Compiled by author.

Fig. 1: List of Sample Nifty Indices

The study has employed event study methodology to examine the response of Indian equity market towards COVID-19 and Ukraine-Russia war. Event study examines the impact of certain event on securities returns during event window (Maitra & Dey, 2012). To check the impact

of selected events on stock market returns, 21 days event window has been selected where; t_0 is the day of event, $t-10$ is the 10 days before the event, and $t+10$ is the 10 days after the event.

Stock Return

The stock returns of Nifty indices for 21 days window is calculated using daily closing prices taken from NSE website. To calculate daily stock return of each Nifty Indices during observation window the following formula has been used:

$$R = \frac{P_t - P_{t-1}}{P_{t-1}} \quad (1)$$

Where:

R_t = Daily Stock return on t day

P_t = Stock closing price on t day

P_{t-1} = Stock closing price on t-1 day

Standard Returns

Nifty 500 is taken as benchmark index to calculate abnormal returns of stock indices. The data of closing prices of Nifty 500 has been taken for the observation window to calculate standard returns using following formula:

$$SR_t = \frac{(SP_t - SP_{t-1})}{SP_{t-1}} \quad (2)$$

Where:

SR_t = Daily Standard Return on t day

SP_t = Standard Closing Price on t day

SP_{t-1} = Standard Closing Price on t-1 day

Abnormal Returns (ARs)

To calculate ARs, stock returns and standard returns have been compared to get information about alpha generation using following formula:

$$AR_t = R_t - (b * SR_t) - a \quad (3)$$

AR_t = Abnormal return at time t

R_t = Actual return at time t,

b = slope of regression line

SR_t = Expected return at time t,

a = intercept

Cumulative Abnormal Returns (CARs)

From ARs, CARs have been calculated by using following formula:

$$CAR_{t;t+k} = \sum AR_{i,t+k} \quad (4)$$

Where:

$CAR_{t;t+k}$ = CARs for stock at time t

AR_t = Abnormal stock return at time t.

't' Statistics

't' statistics is used to test significance of hypothesis. If 't' statistics values are greater than critical values, results are considered to be significant. Following formula has been used:

$$t \text{ stats} = CAR_{it} / SE \quad (5)$$

't' stats = 't' statistic of CARs for stock at time t

it = CAR for each category,

SE = Standard Error

RESULTS ANALYSIS AND DISCUSSION

Using event study methodology, data pertaining to five events of economic shocks have been analyzed and presented in following sections:

WHO Announcement on COVID-19 as Pandemic

The announcement by WHO that COVID-19 was a pandemic has varied impact on different indices (Table 2). The significant ARs are observed in nifty auto on t+6 day, nifty bank on t+7 day, nifty consumer durable on t+6 day, nifty financial services on t+7 day, nifty FMCG on t+7 day, nifty IT on t+9 day, nifty metal on t-5 day, nifty midcap-150 on t+10 day, nifty oil and gas on t+7 day, nifty PSU banks on t+2 day, nifty private bank on t+7 day and nifty realty on t+9 day. Despite these significant ARs, the CARs have exhibited erratic patterns, ultimately balancing out to zero by the end of the observation window.

Table 2: AR and CAR of Nifty Indices for WHO Announcement of COVID-19 as Pandemic (25-02-2020 to 25-03-2020)

Period	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	
Nifty 50	AR	-0.0010	-0.0010	-0.0011	-0.0012	-0.0016	0.0008	-0.0029	-0.0017	-0.0009	0.0003	0.0029	0.0010	-0.0041	-0.0028	0.0005	0.0044	0.0015	0.0036	0.0023	0.0047	
	CAR	-0.0010	-0.0021	-0.0032	-0.0044	-0.0061	-0.0095	-0.0087	-0.0116	-0.0133	-0.0143	-0.0140	-0.0111	-0.0100	-0.0142	-0.0170	-0.0165	-0.0121	-0.0106	-0.0070	-0.0047	0.0000
Auto	AR	-0.0026	-0.0089	0.0029	-0.0018	0.0017	0.0066	0.0025	0.0026	0.0166	0.0092	-0.0055	-0.0003	-0.0040	0.0140	0.0175	0.0050	-0.0309*	-0.0097	-0.0149	-0.0014	0.0012
	CAR	-0.0026	-0.0115	-0.0086	-0.0104	-0.0087	-0.0021	0.0005	0.0030	0.0197	0.0289	0.0234	0.0231	0.0191	0.0331	0.0506	0.0556	0.0247	0.0151	0.0002	-0.0012	0.0000
Bank	AR	0.0062	0.0109	0.0042	0.0098	0.0005	-0.0047	0.0269	0.0201	0.0304	0.0057	0.0039	0.0146	0.0146	-0.0115	-0.0048	0.0123	-0.0452*	-0.0166	-0.0085	0.0182	
	CAR	0.0062	0.0046	0.0092	0.0096	0.0060	0.0004	0.0019	0.0095	0.0079	0.0098	0.0034	0.0036	0.0546	0.0446	0.0398	0.0521	0.0069	-0.0097	-0.0182	0.0000	
Consumer Durables	AR	0.0008	0.0054	0.0145	0.0241	0.0301	0.0305	0.0325	0.0420	0.0499	0.0563	0.0599	0.0514	0.0501	0.0565	0.0553	0.0365	0.0243	0.0102	-0.0042	0.0000	
	CAR	0.0035	0.0046	0.0015	0.0050	0.0034	-0.0107	-0.0066	-0.0009	-0.0014	0.0126	0.0043	0.0099	0.0167	0.0015	-0.0192	-0.0122	0.0132	-0.0334*	-0.0083	-0.0093	0.0259
Financial Services	AR	0.0035	0.0081	0.0096	0.0146	0.0179	0.0073	0.0006	-0.0003	0.0017	0.0109	0.0153	0.0251	0.0418	0.0433	0.0241	0.0119	0.0251	-0.0084	-0.0166	-0.0259	0.0000
	CAR	-0.0006	-0.0027	-0.0001	0.0023	-0.0051	-0.0079	-0.0047	0.0043	-0.0052	0.0036	-0.0022	-0.0081	-0.0263	-0.0049	0.0233	0.0103	0.0103	0.0356*	-0.0066	0.0123	-0.0274
FMCG	AR	-0.0006	-0.0033	-0.0034	-0.0011	-0.0062	-0.0141	-0.0188	-0.0145	-0.0197	-0.0162	-0.0184	-0.0265	-0.0527	-0.0577	-0.0344	-0.0241	-0.0138	0.0218	0.0151	0.0274	0.0000
	CAR	0.0065	-0.0003	-0.0116	-0.0367	-0.0196	-0.0185	-0.0057	-0.0104	-0.0037	-0.0130	-0.0261	-0.0377	-0.0608	-0.0770	-0.0862	-0.0652	-0.0755	-0.0378	-0.0138	0.0258	0.0000
IT	AR	0.0083	0.0131	-0.0082	-0.0114	0.0171	0.0011	0.0128	-0.0047	0.0067	-0.0092	-0.0131	-0.0116	-0.0231	-0.0163	-0.0092	0.0210	-0.0103	0.0377	0.0240	0.0396*	-0.0258
	CAR	0.0065	0.0003	-0.0116	-0.0367	-0.0196	-0.0185	-0.0057	-0.0104	-0.0037	-0.0130	-0.0261	-0.0377	-0.0608	-0.0770	-0.0862	-0.0652	-0.0755	-0.0378	-0.0138	0.0258	0.0000
Media	AR	0.0083	0.0214	0.0132	0.0018	-0.0265	0.0071	0.0067	0.0103	-0.0085	-0.0266	0.0071	-0.0205	-0.0499	-0.0282	-0.0578	-0.0142	-0.0272	0.0117	0.0092	0.0136	-0.0073
	CAR	0.0074	-0.0018	0.0000	-0.0269	-0.0116	0.0429*	0.0038	-0.0074	-0.0158	-0.0218	-0.0113	-0.0029	0.0258	-0.0138	0.0160	0.0341	-0.0201	0.0244	0.0220	-0.0131	-0.0299
Metal	AR	0.0074	0.0056	0.0056	-0.0213	-0.0329	0.0100	0.0138	0.0064	-0.0093	-0.0312	-0.0425	-0.0454	-0.0196	-0.0334	-0.0174	0.0167	-0.0034	0.0210	0.0430	0.0299	0.0000
	CAR	0.0029	0.0021	0.0011	0.0063	0.0031	0.0073	-0.0048	0.0045	0.0055	0.0046	-0.0018	0.0001	-0.0024	0.0080	0.0004	-0.0006	-0.0100	0.0016	-0.0119	-0.0030	-0.0132*
Mid Cap 150	AR	0.0029	0.0049	0.0061	0.0124	0.0155	0.0229	0.0181	0.0226	0.0281	0.0327	0.0309	0.0310	0.0286	0.0366	0.0371	0.0365	0.0265	0.0280	0.0161	0.0132	0.0000
	CAR	-0.0115	-0.0080	-0.0080	0.0023	-0.0126	0.0100	-0.0001	-0.0137	-0.0033	-0.0174	-0.0093	-0.0097	0.0153	0.0120	0.0133	0.0230	-0.0193	0.0348*	0.0157	-0.0080	-0.0055
O&G	AR	-0.0115	-0.0195	-0.0275	-0.0252	-0.0378	-0.0277	-0.0278	-0.0415	-0.0448	-0.0622	-0.0715	-0.0812	-0.0659	-0.0539	-0.0406	-0.0176	-0.0370	-0.0022	0.0135	0.0055	0.0000
	CAR	-0.0231	-0.0086	0.0053	-0.0164	-0.0048	0.0355	0.0223	0.0017	-0.0020	-0.0015	-0.0199	-0.0315	0.0185	0.0055	0.0160	-0.0024	0.0101	0.0023	0.0163	0.0094	-0.0328
Pharma	AR	-0.0231	-0.0317	-0.0264	-0.0428	-0.0476	-0.0121	0.0103	0.0120	0.0101	0.0086	-0.0113	-0.0428	-0.0244	-0.0189	-0.0029	-0.0053	0.0049	0.0071	0.0234	0.0328	0.0000
	CAR	0.0080	0.0085	-0.0138	-0.0116	-0.0347	0.0020	0.0032	0.0162	-0.0240	-0.0094	-0.0250	-0.0473	0.0802*	0.0235	0.0219	0.0506	0.0043	-0.0281	0.0006	0.0073	-0.0325
PSU	AR	0.0080	0.0165	0.0027	-0.0089	-0.0436	-0.0415	-0.0383	-0.0221	-0.0461	-0.0555	-0.0805	-0.1277	-0.0475	-0.0240	-0.0022	0.0484	0.0527	0.0246	0.0252	0.0325	0.0000
	CAR	0.0053	0.0106	0.0077	0.0149	0.0054	-0.0028	-0.0061	0.0068	-0.0055	0.0088	0.0103	0.0119	0.0030	0.0006	-0.0091	-0.0128	0.0129	-0.0448*	-0.0232	-0.0109	0.0172
Private Banks	AR	0.0053	0.0159	0.0236	0.0384	0.0438	0.0410	0.0350	0.0418	0.0362	0.0450	0.0553	0.0672	0.0702	0.0708	0.0616	0.0489	0.0617	0.0169	-0.0063	-0.0172	0.0000
	CAR	0.0228	0.0027	-0.0098	0.0070	0.0126	0.0134	0.0056	-0.0028	0.0013	0.0141	-0.0064	-0.0175	0.0070	-0.0143	0.0060	-0.0062	0.0018	-0.0056	0.0043	-0.0256*	-0.0105
Realty	AR	0.0228	0.0255	0.0157	0.0227	0.0353	0.0488	0.0544	0.0517	0.0530	0.0671	0.0607	0.0432	0.0502	0.0358	0.0418	0.0356	0.0374	0.0318	0.0361	0.0105	0.0000
	CAR	0.0228	0.0255	0.0157	0.0227	0.0353	0.0488	0.0544	0.0517	0.0530	0.0671	0.0607	0.0432	0.0502	0.0358	0.0418	0.0356	0.0374	0.0318	0.0361	0.0105	0.0000

Source: Based on Author's Calculations

Note: * shows significant values at 5% level of significance.

Lockdown Announcement due to COVID-19

Lockdown announcement has affected indices severely (Table 3). The nifty auto sector saw significant ARs on t+9 day, nifty bank on t-3 day, nifty consumer durable on t+9 day, nifty IT on t-3 and t-1 days, nifty midcap 150 on t+8 day, nifty oil and gas on t+4 day, nifty pharma on t+6 day, nifty PSU banks on t-8 day, nifty pvt. bank on t-3 day and nifty realty on t+1 day. Similar to the first event, the CARs have noticed to be inconsistent ultimately converged to zero by the end of the observation period.

Beginning of Second Wave of COVID-19

Beginning of second wave of COVID-19 has a significant impact on stock market indices (Table 4). The nifty auto is significant on t-8, t-7 day, nifty bank on t+5 day, nifty consumer durable on t+9 day, nifty financial services on t-3 day, nifty IT on t+3 day, nifty media on t-9 day, nifty metal on t-3 day, nifty midcap 150 on t-10 day, nifty PSU banks on t+6 day, nifty pvt. bank on t+5 day, nifty realty on t+5 day, and nifty large midcap 250 on t-10 day. The CAR have been showing mixed reactions. ARs gained have cumulated and resulted in zero at last.

Peak of Second Wave of COVID-19

Peak of second wave of COVID-19 event has affected indices severely (Table 5). Significant values for nifty 50 are showing on t+5 day, nifty auto has significant value on t-6 day, nifty consumer durable on t-9 and t-1 day, nifty FMCG on t+6 day, nifty IT on t-6 day, nifty media on t-2 day, nifty metal on t+3 and t+4 day, nifty midcap 150 on t+5 day, nifty pharma on t+8 day, nifty PSU banks on t+7 day, nifty realty on t+1 day, nifty healthcare on t+8 day and nifty large midcap t+5 and t+10 day. The CAR has erratic reactions, however, all ARs gained have cumulatively resulted in zero in end.

Ukraine-Russia War

Ukraine-Russia war event has affected indices severely (Table 6). The nifty 50 is significant on t+3 day, nifty consumer durable on t0 (event day) and t+5 day, nifty financial services on t0 and t+5 day, nifty FMCG on t+9 day, nifty media on t+3 day, nifty metal on t+3 day, nifty midcap 150 on t+1 day, nifty pharma on t+10 day, nifty pvt. bank on t0 and t+5 day, nifty realty on t-1 day, nifty healthcare on t+5 and t+10 day, nifty large midcap 250 on t0 and t+5 day and nifty oil and gas on t-3 day. The CARs have been showing zero or near to zero effects of event.

Table 3: AR and CAR of Nifty Indices for First Lockdown in India during COVID-19 (11-03-2020 to 13-04-2020)

	Period	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
Nifty 50	AR	0.0013	0.0044	0.0019	-0.0028	-0.0016	0.0018	0.0056	0.0022	0.0053	0.0032	0.0054	-0.0047	-0.0003	-0.0062	-0.0017	-0.0053	-0.0022	0.0049	-0.0078	-0.0011	-0.0023
	CAR	0.0013	0.0057	0.0076	0.0048	0.0032	0.0050	0.0105	0.0128	0.0155	0.0214	0.0267	0.0220	0.0217	0.0155	0.0138	0.0085	0.0063	0.0112	0.0034	0.0023	0.0000
Auto	AR	-0.0066	0.0059	-0.0082	0.0190	0.0183	0.0086	-0.0295	-0.0155	-0.0048	-0.0044	-0.0051	-0.0147	-0.0242	-0.0157	-0.0232	0.0205	-0.0097	0.0180	0.0182	0.0650*	-0.0118
	CAR	-0.0066	-0.0008	-0.0089	0.0100	0.0283	0.0369	0.0074	0.0074	-0.0082	-0.0129	-0.0173	-0.0224	-0.0371	-0.0613	-0.0770	-0.1002	-0.0797	-0.0894	-0.0714	-0.0533	0.0118
Bank	AR	0.0075	0.0116	0.0140	0.0084	-0.0081	0.0009	0.0161	-0.0472*	-0.0057	-0.0081	0.0160	0.0168	0.0211	-0.0103	-0.0210	-0.0030	-0.0256	0.0156	-0.0035	0.0078	-0.0033
	CAR	0.0075	0.0191	0.0331	0.0415	0.0334	0.0343	0.0504	0.0032	-0.0025	-0.0106	0.0054	0.0222	0.0433	0.0331	0.0121	0.0090	-0.0166	-0.0010	-0.0045	0.0033	0.0000
Consumer Durables	AR	-0.0032	0.0071	-0.0097	0.0017	0.0074	0.0011	-0.0175	-0.0143	-0.0087	-0.0152	0.0020	0.0170	0.0100	0.0026	-0.0063	0.0237	-0.0012	-0.0055	0.0002	0.0296*	-0.0207
	CAR	-0.0032	0.0039	-0.0059	-0.0042	0.0032	0.0043	-0.0132	-0.0275	-0.0361	-0.0513	-0.0493	-0.0323	-0.0223	-0.0198	-0.0261	-0.0024	-0.0036	-0.0091	-0.0088	0.0207	0.0000
Financial Service's	AR	0.0083	0.0168	0.0194	0.0079	-0.0145	-0.0063	0.0182	-0.0314	0.0003	-0.0061	0.0278	0.0082	0.0075	-0.0265	-0.0096	0.0041	-0.0169	-0.0068	-0.0025	0.0162	-0.0141
	CAR	0.0083	0.0251	0.0446	0.0525	0.0380	0.0317	0.0499	0.0185	0.0188	0.0127	0.0405	0.0488	0.0562	0.0297	0.0201	0.0242	0.0073	0.0005	-0.0020	0.0141	0.0000
FMCG	AR	-0.0049	-0.0091	-0.0297	-0.0062	0.0210	0.0087	0.0081	0.0318	-0.0068	0.0091	-0.0313	0.0091	-0.0058	0.0266	0.0202	-0.0143	0.0149	0.0124	-0.0052	-0.0355	-0.0133
	CAR	-0.0049	-0.0141	-0.0437	-0.0500	-0.0289	-0.0203	-0.0121	0.0197	0.0129	0.0221	-0.0092	-0.0001	-0.0059	0.0207	0.0409	0.0266	0.0415	0.0539	0.0488	0.0133	0.0000
IT	AR	-0.0094	-0.0114	-0.0179	-0.0155	-0.0065	0.0224	-0.0078	0.0437*	0.0222	0.0442*	-0.0197	-0.0112	0.0023	0.0141	0.0034	-0.0247	-0.0128	0.0083	-0.0085	-0.0160	0.0010
	CAR	-0.0094	-0.0209	-0.0388	-0.0543	-0.0608	-0.0384	-0.0462	-0.0025	0.0197	0.0639	0.0442	0.0331	0.0353	0.0494	0.0528	0.0281	0.0152	0.0235	0.0150	-0.0010	0.0000
Media	AR	0.293	-0.327	-0.336	0.167	-0.342	0.387	-0.176	0.0077	0.0037	0.0093	-0.0114	-0.0108	-0.0044	0.0035	-0.0019	-0.0040	0.0077	0.0092	0.0246	0.0173	-0.0172
	CAR	0.293	-0.0034	-0.0371	-0.0204	-0.0546	-0.0158	-0.0335	-0.0258	-0.0258	-0.0220	-0.0127	-0.0241	-0.0349	-0.0392	-0.0376	-0.0416	-0.0339	-0.0247	-0.0001	0.0172	0.0000
Metal	AR	-0.0152	-0.0139	0.0249	-0.0236	0.0102	0.0256	-0.0264	0.0251	0.0071	-0.0152	-0.0287	-0.0378	0.0061	0.0043	0.0162	0.0116	-0.0024	0.0005	-0.0094	0.0116	0.0296
	CAR	-0.0152	-0.0291	-0.0043	-0.0279	-0.0177	0.0078	-0.0186	0.0065	0.0136	-0.0016	-0.0304	-0.0682	-0.0621	-0.0577	-0.0415	-0.0299	-0.0323	-0.0318	-0.0412	-0.0296	0.0000
Mid Cap 150	AR	-0.0022	-0.0029	-0.0017	0.0054	-0.0007	-0.0027	-0.0113	0.0029	-0.0164	-0.0027	-0.0117	0.0061	-0.0012	0.0115	-0.0025	0.0146	0.0061	-0.0141	0.0189*	0.0024	0.0021
	CAR	-0.0022	-0.0051	-0.0068	-0.0014	-0.0020	-0.0047	-0.0161	-0.0131	-0.0295	-0.0322	-0.0439	-0.0378	-0.0390	-0.0275	-0.0300	-0.0155	-0.0094	-0.0234	-0.0046	-0.0021	0.0000
O&G	AR	-0.0140	-0.0182	0.0123	0.0041	0.0076	0.0158	-0.0253	0.0326	0.0050	-0.0116	-0.0075	-0.0292	-0.0182	0.0120	0.0401*	0.0040	0.0286	-0.0037	-0.0057	-0.0189	-0.0099
	CAR	-0.0140	-0.0322	-0.0199	-0.0158	-0.0082	0.0076	-0.0177	0.0150	0.0200	0.0083	0.0009	-0.0283	-0.0465	-0.0346	0.0055	0.0096	0.0382	0.0345	0.0289	0.0099	0.0000
Pharma	AR	-0.0291	-0.0398	0.0089	-0.0029	0.0071	-0.0109	0.0013	-0.0075	0.0086	0.0000	-0.0426	-0.0313	-0.0084	0.0264	0.0001	-0.0087	0.0484*	0.0328	0.0210	0.0037	0.0229
	CAR	-0.0291	-0.0688	-0.0599	-0.0628	-0.0557	-0.0666	-0.0653	-0.0728	-0.0643	-0.0642	-0.1069	-0.1382	-0.1466	-0.1202	-0.1201	-0.1288	-0.0804	-0.0476	-0.0266	-0.0229	0.0000
PSU	AR	-0.0231	-0.0558	0.0866*	0.0166	0.0210	0.0457	0.0026	-0.0193	-0.0138	0.0120	-0.0231	-0.0209	0.0089	0.0038	-0.0011	0.0030	-0.0177	-0.0332	0.0048	0.0068	-0.0037
	CAR	-0.0231	-0.0789	0.0077	0.0243	0.0453	0.0910	0.0936	0.0743	0.0605	0.0725	0.0494	0.0285	0.0374	0.0412	0.0401	0.0432	0.0254	-0.0078	-0.0030	0.0037	0.0000
Pvt. Banks	AR	0.0116	0.0201	0.0013	0.0077	-0.0060	-0.0069	0.0165	-0.0481*	-0.0111	-0.0115	0.0135	0.0338	0.0205	-0.0094	-0.0333	-0.0005	-0.0264	0.0178	0.0017	0.0081	0.0007
	CAR	0.0116	0.0317	0.0330	0.0407	0.0347	0.0277	0.0442	-0.0039	-0.0150	-0.0265	-0.0129	0.0208	0.0413	0.0319	-0.0014	-0.0018	-0.0282	-0.0104	-0.0087	-0.0007	0.0000
Realty	AR	-0.0056	-0.0108	0.0053	-0.0086	0.0084	-0.0016	0.0046	-0.0086	0.0142	-0.0263	-0.0138	0.0359*	0.0061	-0.0284	0.0007	0.0225	0.0276	0.0050	-0.0039	0.0048	-0.0275
	CAR	-0.0056	-0.0164	-0.0111	-0.0197	-0.0113	-0.0129	-0.0083	-0.0169	-0.0027	-0.0290	-0.0429	-0.0069	-0.0009	-0.0292	-0.0286	-0.0061	0.0215	0.0266	0.0226	0.0275	0.0000

Source: Based on Author's Calculations

Note: * shows significant values at 5% level of significance.

Table 4: AR and CAR of Nifty Indices for Beginning of Second of COVID-19 (26-02-2021 to 30-03-2021)

Period	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	
Nifty 50	AR	-0.0045	-0.0004	-0.0024	0.0009	-0.0044	0.0033	-0.0004	0.0046	-0.0012	0.0005	-0.0014	0.0039	0.0016	0.0005	-0.0026	-0.0015	0.0012	0.0026	-0.0012	0.0022	
	CAR	-0.0045	-0.0050	-0.0074	-0.0065	-0.0109	-0.0076	-0.0080	-0.0035	-0.0047	-0.0058	-0.0068	-0.0029	-0.0012	-0.0008	-0.0033	-0.0048	-0.0036	-0.0010	-0.0022	0.0000	
Auto	AR	-0.0001	0.0116	0.0227*	0.0034	0.0038	-0.0008	-0.0062	0.0058	-0.0071	0.0038	0.0036	-0.0018	0.0119	-0.0043	0.0009	0.0009	-0.0068	0.0025	0.0025	-0.0066	
	CAR	-0.0001	0.0116	0.0343	0.0115	0.0150	0.0188	0.0180	0.0118	0.0176	0.0143	0.0179	0.0162	0.0280	0.0237	0.0196	0.0205	0.0137	0.0041	0.0066	0.0000	
Bank	AR	-0.0092	-0.0009	-0.0079	0.0067	-0.0059	0.0023	0.0141	-0.0020	-0.0006	0.0017	-0.0082	0.0042	0.0056	-0.0016	-0.0158*	0.0126	-0.0027	0.0136	-0.0029	-0.0034	
	CAR	-0.0092	-0.0102	-0.0181	-0.0113	-0.0172	-0.0145	-0.0004	-0.0024	-0.0030	-0.0014	-0.0096	-0.0054	0.0002	-0.0014	-0.0173	-0.0046	-0.0073	0.0063	0.0034	0.0000	
Consumer Durables	AR	0.0045	0.0005	0.0055	-0.0079	0.0059	-0.0027	-0.0030	0.0076	0.0060	0.0044	-0.0055	-0.0077	0.0029	-0.0044	-0.0069	-0.0027	-0.0005	-0.0061	0.0138*	-0.0011	
	CAR	0.0045	0.0050	0.0105	0.0026	0.0085	0.0032	0.0002	0.0078	0.0138	0.0182	0.0127	0.0050	0.0079	0.0035	-0.0034	-0.0061	-0.0066	-0.0127	0.0011	0.0000	
Financial services	AR	-0.0116	0.0016	-0.0110	0.0065	-0.0094	-0.0039	0.0186*	-0.0028	-0.0003	-0.0029	-0.0068	0.0080	0.0075	-0.0031	-0.0121	0.0032	0.0011	0.0130	0.0022	-0.0009	
	CAR	-0.0116	-0.0100	-0.0210	-0.0145	-0.0239	-0.0246	-0.0060	-0.0087	-0.0090	-0.0120	-0.0188	-0.0108	-0.0033	-0.0065	-0.0185	-0.0153	-0.0142	-0.0012	0.0009	0.0000	
FMCG	AR	0.0034	-0.0033	0.0019	-0.0113	0.0014	0.0036	-0.0090	-0.0055	-0.0015	0.0019	0.0060	0.0041	0.0069	0.0129	0.0128	-0.0114	-0.0036	-0.0130	0.0058	0.0050	
	CAR	0.0034	0.0000	0.0020	-0.0094	-0.0080	-0.0044	-0.0134	-0.0189	-0.0204	-0.0254	-0.0195	-0.0154	-0.0085	0.0044	0.0172	0.0058	0.0022	-0.0108	-0.0050	0.0000	
IT	AR	0.0054	-0.0083	0.0148	-0.0045	-0.0025	-0.0067	0.0000	0.0014	0.0076	0.0001	0.0093	0.0058	-0.0219*	-0.0074	0.0134	-0.0069	0.0034	-0.0079	-0.0105	0.0058	
	CAR	0.0054	-0.0029	0.0119	0.0074	0.0049	-0.0017	-0.0018	-0.0003	0.0073	0.0074	0.0261	0.0320	0.0100	0.0026	0.0160	0.0091	0.0126	0.0047	-0.0058	0.0000	
Media	AR	0.0042	0.0367	0.0369	0.0289	0.0531	0.0577	0.0694	0.0539	0.0548	0.0502	0.0522	0.0388	0.0519	0.0541	0.0454	0.0398	0.0335	0.0205	0.0126	0.0000	
	CAR	0.0042	0.0367	0.0369	0.0289	0.0531	0.0577	0.0694	0.0539	0.0548	0.0502	0.0522	0.0388	0.0519	0.0541	0.0454	0.0398	0.0335	0.0205	0.0126	0.0000	
Metal	AR	0.0087	-0.0004	-0.0082	0.0084	-0.0143	-0.0141	0.0048	-0.0321*	0.0102	-0.0007	0.0170	-0.0100	-0.0074	0.0133	0.0056	0.0054	-0.0156	0.0190	0.0199	0.0029	
	CAR	0.0087	0.0083	0.0001	0.0085	-0.0058	-0.0200	-0.0151	-0.0472	-0.0370	-0.0377	-0.0307	-0.0381	-0.0248	-0.0192	-0.0137	-0.0294	-0.0417	-0.0228	-0.0029	0.0000	
Mid Cap 150	AR	0.0136*	0.0012	0.0044	-0.0018	0.0093	-0.0100	0.0016	-0.0085	0.0017	-0.0032	-0.0018	0.0021	-0.0096	-0.0045	0.0056	0.0007	-0.0035	-0.0043	0.0033	-0.0005	
	CAR	0.0136	0.0148	0.0192	0.0174	0.0268	0.0168	0.0183	0.0099	0.0116	0.0148	0.0150	0.0054	0.0009	-0.0013	0.0043	0.0050	0.0015	-0.0028	0.0005	0.0000	
Pharma	AR	0.0063	0.0006	0.0030	-0.0066	0.0017	-0.0042	0.0018	-0.0132	0.0092	-0.0051	-0.0086	-0.0019	-0.0072	-0.0145	0.0032	-0.0012	0.0142	0.0043	-0.0056	0.0106	
	CAR	0.0063	0.0070	0.0099	0.0033	0.0050	0.0008	0.0026	-0.0106	-0.0014	-0.0065	-0.0170	-0.0242	-0.0387	-0.0355	-0.0222	-0.0234	-0.0092	-0.0049	-0.0106	0.0000	
PSU	AR	0.0052	-0.0162	-0.0104	0.0136	0.0065	-0.0180	0.0205	-0.0090	-0.0024	-0.0009	0.0164	-0.0069	0.0016	0.0068	-0.0068	0.0276*	-0.0044	0.0016	-0.0017	-0.0110	
	CAR	0.0052	-0.0111	-0.0215	-0.0079	-0.0014	-0.0195	0.0011	-0.0079	-0.0103	-0.0112	0.0052	-0.0018	-0.0137	-0.0121	-0.0054	-0.0121	0.0155	0.0111	0.0126	0.0110	0.0000
Pvt. Banks	AR	-0.0092	-0.0012	-0.0058	0.0078	-0.0034	0.0002	-0.0001	0.0151	-0.0010	-0.0006	-0.0074	0.0047	0.0043	-0.0014	-0.0166*	0.0127	-0.0028	0.0138	-0.0038	-0.0055	
	CAR	-0.0092	-0.0104	-0.0162	-0.0084	-0.0117	-0.0115	-0.0116	0.0035	0.0025	0.0026	-0.0054	-0.0007	0.0036	0.0022	-0.0144	-0.0017	-0.0045	0.0093	0.0055	0.0000	
Realty	AR	0.0109	0.0036	0.0004	0.0017	0.0094	-0.0010	-0.0086	-0.0116	0.0044	0.0015	-0.0025	-0.0133	-0.0015	-0.0118	0.0286*	0.0084	-0.0112	-0.0077	0.0091	-0.0137	
	CAR	0.0109	0.0144	0.0148	0.0165	0.0259	0.0249	0.0163	0.0048	0.0092	0.0107	0.0130	-0.0003	-0.0018	-0.0136	0.0150	0.0234	0.0122	0.0046	0.0137	0.0000	
Health-care	AR	0.0076	0.0022	0.0013	-0.0073	0.0025	-0.0065	0.0020	-0.0103	0.0055	-0.0017	-0.0052	0.0019	-0.0088	-0.0118	0.0006	0.0100	0.0009	0.0105	0.0014	-0.0043	
	CAR	0.0076	0.0098	0.0111	0.0038	0.0063	-0.0001	0.0019	-0.0085	-0.0029	-0.0047	-0.0099	-0.0167	-0.0285	-0.0279	-0.0179	-0.0170	-0.0065	-0.0051	-0.0094	0.0000	
Large Mid Cap 250	AR	0.0053*	0.0002	0.0018	-0.0005	0.0035	-0.0040	0.0004	-0.0030	0.0005	0.0009	0.0008	-0.0035	-0.0017	-0.0008	0.0023	0.0002	-0.0013	-0.0013	0.0013	-0.0001	
	CAR	0.0053	0.0055	0.0073	0.0068	0.0102	0.0062	0.0066	0.0036	0.0041	0.0050	0.0043	0.0015	-0.0002	-0.0002	0.0014	0.0016	0.0003	-0.0012	0.0001	0.0000	

Source: Based on Author's Calculations

Note: * shows significant values at 5% level of significance.

Table 5: AR and CAR of Nifty Indices for Second Wave Peak of COVID-19 (07-04-2021 to 07-05-2021)

Period	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
Nifty 50	AR	-0.0001	-0.0007	-0.0012	0.0039	0.0008	-0.0020	0.0001	-0.0024	0.0018	-0.0021	0.0014	0.0004	0.0026	0.0012	-0.0044*	-0.0019	-0.0017	-0.0002	0.0007	0.0022
	CAR	-0.0001	-0.0008	-0.0020	0.0019	0.0027	0.0022	0.0023	-0.0001	0.0017	-0.0003	0.0011	0.0014	0.0040	0.0052	0.0008	-0.0011	-0.0028	-0.0029	-0.0022	0.0000
Auto	AR	0.0036	-0.0033	-0.0014	0.0025	0.0258*	0.0064	-0.0038	0.0134	-0.0061	-0.0013	-0.0067	-0.0080	0.0011	-0.0107	0.0048	-0.0002	0.0020	-0.0044	0.0092	-0.0052
	CAR	0.0036	0.0003	-0.0011	0.0013	0.0271	0.0159	0.0121	0.0255	0.0194	0.0181	0.0114	0.0034	0.0045	-0.0062	-0.0013	-0.0016	0.0004	-0.0040	0.0052	0.0000
Bank	AR	0.0012	-0.0128	-0.0081	0.0072	0.0128	-0.0109	0.0023	-0.0001	0.0129	0.0017	0.0047	-0.0024	0.0126	-0.0015	-0.0079	-0.0128	0.0054	0.0032	-0.0085	-0.0042
	CAR	0.0012	-0.0116	-0.0197	-0.0125	0.0003	-0.0054	-0.0031	-0.0032	0.0097	0.0114	0.0161	0.0137	0.0262	0.0247	0.0168	0.0041	0.0095	0.0127	0.0042	0.0000
Consumer Durables	AR	-0.0017	0.0166*	0.0065	-0.0065	-0.0049	0.0052	0.0048	0.0066	-0.0167*	0.0002	0.0032	0.0081	-0.0016	-0.0054	0.0079	-0.0145	-0.0005	0.0016	-0.0007	-0.0074
	CAR	-0.0017	0.0149	0.0214	0.0149	0.0100	0.0144	0.0193	0.0259	0.0092	0.0094	0.0125	0.0206	0.0190	0.0136	0.0215	0.0070	0.0065	0.0081	0.0074	0.0000
Financial services	AR	-0.0019	-0.0101	-0.0058	0.0093	0.0152	-0.0085	0.0013	-0.0034	0.0124	0.0028	-0.0127	0.0066	0.0116	-0.0013	-0.0121	-0.0055	0.0021	-0.0026	-0.0037	0.0006
	CAR	-0.0019	-0.0120	-0.0179	-0.0086	0.0066	0.0040	0.0053	0.0019	0.0143	0.0171	0.0044	0.0110	0.0225	0.0212	0.0091	0.0035	0.0056	0.0031	-0.0006	0.0000
FMCG	AR	0.0024	0.0030	0.0094	0.0011	-0.0009	0.0043	0.0003	-0.0045	-0.0094	-0.0072	0.0007	-0.0005	-0.0016	-0.0030	-0.0037	0.0109*	-0.0002	-0.0012	0.0020	0.0009
	CAR	0.0024	0.0054	0.0147	0.0159	0.0149	0.0165	0.0168	0.0123	0.0028	-0.0043	-0.0036	-0.0041	-0.0057	-0.0087	-0.0124	-0.0015	-0.0017	-0.0029	-0.0009	0.0000
IT	AR	0.0076	0.0104	0.0094	-0.0045	-0.0381*	0.0106	0.0055	-0.0121	-0.0040	-0.0067	-0.0006	0.0007	0.0008	-0.0031	-0.0013	0.0001	-0.0031	0.0084	0.0159	-0.0010
	CAR	0.0076	0.0180	0.0274	0.0229	-0.0152	0.0005	0.0060	-0.0061	-0.0101	-0.0168	-0.0174	-0.0167	-0.0159	-0.0190	-0.0203	-0.0202	-0.0232	-0.0149	0.0010	0.0000
Media	AR	-0.0075	-0.0040	0.0097	-0.0205	-0.0023	0.0110	0.0007	0.0330*	0.0086	0.0078	-0.0125	-0.0012	-0.0087	-0.0048	0.0165	-0.0174	0.0104	-0.0097	0.0025	0.0015
	CAR	-0.0075	-0.0115	-0.0018	-0.0223	-0.0246	-0.0267	-0.0260	0.0069	0.0156	0.0234	0.0109	0.0097	0.0010	-0.0038	0.0127	-0.0047	0.0057	-0.0040	-0.0015	0.0000
Metal	AR	-0.0153	0.0225	-0.0139	-0.0105	0.0043	-0.0020	0.0020	-0.0027	-0.0015	-0.0094	-0.0030	-0.0001	-0.0312*	0.0340*	0.0090	0.0084	-0.0043	-0.0132	0.0050	0.0305
	CAR	-0.0153	0.0072	-0.0067	-0.0172	-0.0130	-0.0235	-0.0215	-0.0242	-0.0256	-0.0350	-0.0381	-0.0381	-0.0693	-0.0353	-0.0263	-0.0180	-0.0223	-0.0355	-0.0305	0.0000
Mid Cap	AR	0.0011	0.0006	0.0026	-0.0081	-0.0006	0.0048	0.0002	0.0040	-0.0031	0.0055	-0.0023	0.0013	-0.0033	-0.0037	0.0102*	0.0012	0.0051	-0.0017	-0.0009	-0.0088
	CAR	0.0011	0.0017	0.0043	-0.0038	-0.0044	-0.0040	-0.0037	0.0002	-0.0028	0.0027	0.0004	0.0017	-0.0015	-0.0052	0.0050	0.0062	0.0113	0.0096	0.0088	0.0000
Pharma	AR	0.0001	-0.0052	0.0262	-0.0033	-0.0175	0.0142	-0.0011	0.0087	-0.0085	-0.0086	-0.0139	0.0016	-0.0088	-0.0010	0.0097	-0.0018	-0.0239	0.0360*	-0.0073	-0.0049
	CAR	0.0001	-0.0050	0.0211	0.0178	0.0003	0.0238	0.0227	0.0314	0.0229	0.0143	0.0004	0.0020	-0.0068	-0.0078	0.0018	0.0001	-0.0238	0.0122	0.0049	0.0000
PSU	AR	0.0021	-0.0162	0.0244	-0.0158	0.0209	-0.0138	-0.0079	0.0025	-0.0031	0.0085	0.0018	0.0019	0.0035	-0.0123	0.0162	-0.0093	0.0501*	-0.0011	-0.0238	-0.0093
	CAR	0.0021	-0.0141	0.0104	-0.0054	0.0155	-0.0178	-0.0257	-0.0232	-0.0263	-0.0178	-0.0160	-0.0141	-0.0106	-0.0229	-0.0066	-0.0160	0.0341	0.0330	0.0093	0.0000
Pvt.	AR	0.0015	-0.0127	-0.0069	0.0065	0.0135	-0.0100	0.0009	0.0010	0.0094	0.0033	-0.0127	0.0153	0.0123	0.0007	-0.0035	-0.0141	0.0052	0.0029	-0.0104	-0.0051
	CAR	0.0015	-0.0112	-0.0181	-0.0117	0.0019	-0.0054	-0.0044	-0.0035	0.0059	0.0092	-0.0035	0.0119	0.0242	0.0249	0.0214	0.0074	0.0126	0.0155	0.0051	0.0000
Realty	AR	-0.0017	0.0048	-0.0002	-0.0085	0.0109	-0.0079	-0.0086	0.0100	0.0072	-0.0034	0.0239*	-0.0071	-0.0212	0.0015	0.0167	-0.0060	0.0115	-0.0200	0.0001	0.0041
	CAR	-0.0017	0.0031	0.0029	-0.0056	0.0053	-0.0088	-0.0174	-0.0073	-0.0001	-0.0035	0.0204	0.0132	-0.0080	-0.0064	0.0103	0.0042	0.0157	-0.0043	-0.0041	0.0000
Health-care	AR	0.0042	-0.0023	0.0205	-0.0034	-0.0155	0.0059	0.0133	0.0009	-0.0097	-0.0079	-0.0129	0.0010	-0.0084	-0.0016	0.0067	0.0020	-0.0195	0.0298*	-0.0080	-0.0031
	CAR	0.0042	0.0019	0.0224	0.0190	0.0035	0.0094	0.0226	0.0317	0.0220	0.0141	0.0012	0.0021	-0.0062	-0.0079	-0.0011	0.0009	-0.0187	0.0111	0.0031	0.0000
Large Mid Cap	AR	0.0004	0.0001	0.0009	-0.0030	-0.0002	0.0019	0.0002	0.0013	-0.0012	0.0021	-0.0009	0.0005	-0.0010	-0.0015	0.0038*	0.0002	0.0021	-0.0005	-0.0003	0.0000
	CAR	0.0004	0.0006	0.0015	-0.0015	-0.0018	-0.0032	-0.0012	0.0003	-0.0009	0.0012	0.0003	0.0008	-0.0002	-0.0017	0.0021	0.0022	0.0043	0.0039	0.0036	0.0000

Source: Based on Author's Calculations

Note: * shows significant values at 5% level of significance.

Table 6: AR and CAR of Nifty Indices for Ukraine-Russia War (10-02-2022 to 11-03-2022)

Period	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
Nifty 50	AR	0.0020	0.0007	0.0008	0.0033	-0.0008	0.0022	0.0033	0.0003	-0.0030	0.0002	-0.0034	-0.0001	-0.0041*	-0.0023	0.0010	-0.0010	-0.0006	0.0016	0.0009	-0.0012
	CAR	0.0020	0.0027	0.0035	0.0068	0.0060	0.0082	0.0115	0.0118	0.0089	0.0091	0.0058	0.0057	0.0016	-0.0007	0.0003	-0.0007	-0.0013	0.0003	0.0012	0.0000
Auto	AR	-0.0041	0.0119	0.0063	0.0097	0.0019	0.0043	0.0031	0.0086	0.0117	0.0006	-0.0057	-0.0131	-0.0160	-0.0130	-0.0101	-0.0086	-0.0003	0.0082	0.0048	-0.0039
	CAR	-0.0041	0.0078	0.0140	0.0237	0.0256	0.0299	0.0329	0.0416	0.0533	0.0539	0.0520	0.0389	0.0229	0.0099	-0.0002	-0.0089	-0.0092	-0.0009	0.0039	0.0000
Bank	AR	0.0051	0.0068	-0.0008	0.0034	-0.0022	-0.0075	0.0089	0.0136	0.0026	0.0013	0.0036	0.0013	-0.0139	-0.0046	0.0071	-0.0146	-0.0014	-0.0013	0.0042	0.0003
	CAR	0.0051	0.0119	0.0111	0.0145	0.0123	0.0048	0.0137	0.0273	0.0300	0.0349	0.0362	0.0222	0.0104	0.0058	0.0128	-0.0018	-0.0031	-0.0045	-0.0003	0.0000
Consumer Durables	AR	-0.0017	-0.0133	-0.0070	0.0151	0.0096	0.0003	0.0003	-0.0045	0.0015	0.0279*	-0.0151	-0.0037	0.0049	0.0033	-0.0350*	-0.0084	-0.0037	0.0044	0.0152	0.0007
	CAR	-0.0017	-0.0151	-0.0221	-0.0070	0.0026	0.0029	0.0032	-0.0013	0.0002	0.0094	0.0222	0.0186	0.0235	0.0268	-0.0082	-0.0166	-0.0203	-0.0159	-0.0007	0.0000
Financial Services	AR	0.0096	-0.0011	-0.0146	0.0126	0.0012	0.0084	0.0087	0.0044	-0.0002	0.0402*	-0.0195	-0.0036	0.0083	0.0061	-0.0619*	-0.0225	0.0038	0.0083	0.0098	0.0021
	CAR	0.0096	0.0085	-0.0061	0.0065	0.0077	0.0076	0.0160	0.0248	0.0291	0.0290	0.0497	0.0460	0.0544	0.0604	-0.0015	-0.0240	-0.0202	-0.0119	-0.0021	0.0000
FMCG	AR	-0.0018	0.0027	-0.0022	-0.0005	0.0011	0.0037	0.0009	-0.0025	-0.0034	0.0002	-0.0076	-0.0007	0.0013	-0.0066	0.0019	-0.0099	0.0018	-0.0018	0.0182*	-0.0006
	CAR	-0.0018	0.0009	-0.0013	-0.0018	-0.0007	0.0030	0.0039	0.0014	-0.0020	-0.0018	-0.0038	-0.0044	-0.0031	-0.0097	-0.0078	-0.0177	-0.0158	-0.0176	0.0006	0.0000
IT	AR	0.0029	-0.0184	0.0085	0.0063	-0.0048	-0.0064	-0.0036	0.0032	-0.0067	-0.0039	0.0030	0.0021	-0.0004	0.0132	0.0122	0.0146	0.0164	-0.0068	-0.0152	-0.0065
	CAR	0.0029	-0.0156	-0.0071	-0.0008	-0.0056	-0.0120	-0.0156	-0.0124	-0.0191	-0.0230	-0.0294	-0.0274	-0.0278	-0.0146	-0.0024	0.0121	0.0285	0.0217	0.0065	0.0000
Media	AR	0.0064	0.0041	-0.0001	-0.0013	-0.0063	-0.0076	-0.0031	-0.0185	-0.0249	0.0040	0.0055	-0.0062	0.0270*	0.0082	-0.0076	0.0251	0.0119	0.0124	-0.0184	-0.0065
	CAR	0.0064	0.0106	0.0105	0.0091	0.0028	-0.0047	-0.0078	-0.0263	-0.0512	-0.0472	-0.0459	-0.0521	-0.0169	-0.0169	-0.0245	0.0006	0.0125	0.0249	0.0065	0.0000
Metal	AR	0.0016	0.0046	-0.0215	-0.0108	-0.0090	-0.0064	-0.0028	-0.0172	-0.0080	-0.0033	0.0227	0.0365	0.0440*	0.0122	-0.0192	0.0406	-0.0298	-0.0280	0.0032	-0.0033
	CAR	0.0016	0.0061	-0.0154	-0.0262	-0.0352	-0.0416	-0.0444	-0.0616	-0.0696	-0.0729	-0.0788	-0.0561	-0.0196	0.0243	0.0365	0.0579	0.0281	0.0001	0.0033	0.0000
Mid Cap 150	AR	-0.0039	-0.0031	-0.0022	-0.0038	0.0002	-0.0008	-0.0034	-0.0025	-0.0008	0.0031	0.0074*	0.0001	0.0064	0.0029	-0.0014	0.0041	0.0000	-0.0004	-0.0050	0.0024
	CAR	-0.0039	-0.0070	-0.0093	-0.0131	-0.0129	-0.0137	-0.0171	-0.0196	-0.0204	-0.0173	-0.0165	-0.0091	-0.0091	0.0002	-0.0011	0.0030	0.0030	0.0026	-0.0024	0.0000
O&G	AR	0.0024	0.0020	-0.0161	0.0100	0.0045	0.0074	-0.0102	-0.0180*	-0.0074	-0.0014	0.0119	-0.0077	-0.0025	0.0014	0.0007	0.0103	0.0041	-0.0100	0.0062	0.0071
	CAR	0.0024	0.0044	-0.0117	-0.0017	0.0028	0.0102	0.0000	-0.0180	-0.0254	-0.0268	-0.0150	-0.0226	-0.0251	-0.0237	-0.0230	-0.0127	-0.0086	-0.0186	-0.0133	0.0000
Pharma	AR	-0.0023	0.0012	0.0021	-0.0123	0.0047	-0.0078	-0.0070	-0.0094	-0.0019	-0.0003	-0.0036	0.0106	-0.0047	-0.0144	0.0071	0.0107	0.0155	0.0021	-0.0099	0.0212*
	CAR	-0.0023	-0.0010	0.0011	-0.0112	-0.0065	-0.0143	-0.0213	-0.0307	-0.0326	-0.0328	-0.0365	-0.0259	-0.0306	-0.0467	-0.0396	-0.0289	-0.0134	-0.0113	-0.0212	0.0000
PSU	AR	-0.0084	0.0047	-0.0060	-0.0019	-0.0081	-0.0080	0.0068	0.0003	-0.0012	0.0105	-0.0020	0.0024	-0.0099	0.0032	0.0020	-0.0068	0.0113	-0.0098	0.0020	0.0060
	CAR	-0.0084	-0.0037	-0.0097	-0.0117	-0.0197	-0.0278	-0.0209	-0.0206	-0.0218	-0.0113	-0.0133	-0.0109	-0.0209	-0.0177	-0.0157	-0.0027	-0.0096	0.0018	-0.0080	0.0000
Pvt. Banks	AR	0.0082	0.0040	-0.0124	0.0144	-0.0003	-0.0078	0.0068	0.0114	0.0021	0.0042	0.0410*	-0.0194	-0.0033	0.0088	0.0065	-0.0623*	0.0065	0.0078	0.0098	0.0010
	CAR	0.0082	0.0122	-0.0002	0.0142	0.0139	0.0060	0.0129	0.0243	0.0264	0.0306	0.0716	0.0522	0.0489	0.0576	0.0641	0.0018	-0.0251	-0.0186	-0.0108	0.0000
Realty	AR	-0.0015	0.0030	-0.0009	-0.0147	0.0126	-0.0008	-0.0063	-0.0017	-0.0177	0.0292*	0.0081	0.0056	-0.0077	-0.0001	0.0016	-0.0023	-0.0175	0.0155	-0.0015	-0.0011
	CAR	-0.0015	0.0015	0.0006	-0.0140	-0.0014	-0.0022	-0.0085	-0.0102	-0.0279	0.0013	0.0094	0.0150	0.0072	0.0071	0.0087	0.0064	-0.0111	0.0044	0.0029	0.0011
Health care	AR	0.0011	-0.0057	-0.0094	0.0015	0.0027	-0.0069	-0.0067	-0.0122	0.0003	0.0004	0.0176	-0.0113	-0.0036	0.0022	0.0011	-0.0222*	0.0029	0.0200	0.0078	0.0242*
	CAR	0.0011	-0.0046	-0.0140	-0.0125	-0.0098	-0.0167	-0.0235	-0.0356	-0.0353	-0.0350	-0.0174	-0.0287	-0.0323	-0.0301	-0.0290	-0.0512	-0.0483	-0.0283	-0.0242	0.0000
Large Mid Cap 250	AR	0.0027	-0.0067	-0.0145	0.0130	0.0003	0.0005	-0.0020	-0.0026	0.0021	0.0024	0.0299*	-0.0155	-0.0034	0.0057	0.0039	-0.0082	0.0059	0.0101	0.0061	0.0034
	CAR	0.0027	-0.0039	-0.0185	-0.0055	-0.0052	-0.0047	-0.0066	-0.0092	-0.0113	-0.0088	0.0211	0.0056	0.0021	0.0117	-0.0172	-0.0254	-0.0196	-0.0095	-0.0034	0.0000

Source: Based on Author's Calculations.

Note: * shows significant values at 5 % level of significance.

From above findings, it can be observed that there has been short-term volatility across different indices. Events like WHO announcement of COVID-19 as pandemic and the Ukraine-Russia war caused immediate, however, brief abnormal returns in various indices. The Indian stock market returns during pre-lockdown phase have showed detrimental effects linked to panic, fear and uncertainty and the findings are consistent with Jena and Mishra (2022) and Liu et al. (2020). However, lockdown period has exhibited positive AR in some sectors, indicating that investors anticipated event and expected improvements and the findings are consistent with the study of Alam, Alam and Chavali (2020). The sectors such as auto, banking (both PSU and private), consumer durables, IT, midcap-150, metal, pharmaceuticals, financial services and real estate demonstrate short-term volatility to the economic shocks. Health and Pharmaceuticals sectors have failed to generate consistent ARs contrasting with the finding of Alam et al. (2020). Furthermore, Ukraine-Russia war has correlated negatively with stock market returns consistent with the findings of Boungou and Yatié (2022). Despite these ARs, the CARs for all events balanced out to zero, indicating that the market efficiency processed from the new information and only one or two days in observation window, showing significant ARs, however, no index consistently has generated ARs as the assumptions of EMH in five events. Both selected economic shocks have showed short lived impacts on selected stock market indices.

CONCLUSION

The present study has examined COVID-19 and Ukraine-Russia war's impact on Indian equity market. It has analyzed 3 board market indices and 14 sectoral indices of NSE using an event study methodology for the five events i.e. WHO Announcement of COVID-19 as global pandemic, First Lockdown in India due to COVID-19, Start of Second Wave of COVID-19, Peak of Second Wave of COVID-19 and Ukraine-Russia War. Daily stock prices of selected indices have been used for determining AR, CAR, and 't' statistics. As per the findings, high volatility in stock market returns have been observed. However, the indices have failed to generate consistent ARs. The events reflected share prices across all indices, however, overall stock returns have minimally affected with CARs overall zero by observations period's end, aligned with results of Hardi and Sihombing (2022).

The study has encountered limitations, suggesting that future research should include more Nifty indices and individual sectors. The researchers might include estimation window and macro-economic variables to enhance comprehensiveness of the analysis.

PRACTICAL IMPLICATIONS

The findings of the study suggest to the investors that although there may be significant short-term fluctuations in profits or losses during economic crises, it is important to maintain a long term perspective that helps in reducing panic-driven decisions as the markets adjust and stabilize quickly. The financial analysts can enhance their predictions and risk assessment by studying responses of various sectors that improves the accuracy of financial models and investment advice. Nonetheless, understanding market behavior assist Government and regulatory bodies in taking corrective actions to mitigate adverse economic conditions. Overall the indices of NSE have similar reactions, supporting the EMH. This understanding helps in increasing the confidence in market stability during economic uncertainties.

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