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Vulnerability of financial markets in India: The contagious effect of COVID-19

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\textbf{ABSTRACT}

This study aims to examine the impact of COVID-19 on financial markets, using emerging market data. Specifically, panel data regression is applied on 3200 observations for daily market returns during lockdown in India. The event study methodology is adopted to show abnormal returns registered in the lockdown period. A contrasting breakdown effect of COVID-19 on various Indian industries has been observed through sectoral analysis. The study also provides empirical evidence for lockdown measures taken by the government on stock market returns and post-lockdown impact of COVID-19 on daily market returns for over 6550 observations.

\textbf{1. Introduction}

According to Liu (2012), uncertainty is an unavoidable characteristic of the world. It primarily refers to exclusive situations that might not be predicted beforehand and the global pandemic COVID-19 is quite certainly an uncertain event. The economic impact of COVID-19 has been markedly striking its presence all over the world (Zhang et al., 2020). This unanticipated disease called coronavirus originated from the Wuhan province of China in late 2019 and has made a disastrous impact around the globe within a very short period. The economic and financial consequences of COVID-19 and its precautionary impositions have been visibly detrimental for the most goods and service industries globally (Akhtaruzzaman et al., 2020). This economic downturn is far worse than that of the financial crisis in 2008 and it can be the worst recession since the Great Depression (Barraffrem et al., 2020). All countries including India were under lockdown and are continuing social distancing with limited economic activity to avoid the spread of this deadly disease.

India recorded the first case of the disease on January 30, 2020. Since then, the cases have increased rapidly and significantly. India
has recorded significant growth in the number of cases (approximately 9,500,000 total confirmed cases and 138,000 deaths as on 30 Nov. 2020) and placed at 2nd position after the United States (Total cases 14,100,000).

To study the economic effects of COVID-19, researchers have looked toward previous literature that suggests extreme events from the past can significantly affect the stock market (Al-Awadhi et al., 2020; Papakyriakou et al., 2019). Events such as infectious disease epidemics can make negative changes in investors’ sentiment that intensely affect their investment decisions and, consequently, stock market prices (Liu et al., 2020).

Indian financial market volatility breached the circuit two times in March 2020 alone; this has not happened in the last 12 years. It indicates that the stock market has witnessed panic sell-off of stocks as the country has confirmed COVID-19 cases. In the above context, we can simply conclude that the market is very much reactive, and it is affected by the new piece of information. It reflects a

Table 1
Empirical Studies on COVID-19 and Financial Markets.

| No | Authors Name and Year | Sample Country | Research Objectives | Findings |
|----|------------------------|----------------|---------------------|----------|
| 1  | Akhtaruzzaman et al. (2020) | Multiple | To observe the occurrence of financial contagion through financial and nonfinancial firms between China and G7 countries during the COVID-19 period. | Significant increase has been experienced in the conditional correlations between China and G7 countries stock returns. |
| 2  | Cepoi (2020) | Multiple | To explore the stock market’s reaction to coronavirus news in the top six most affected countries. | Top most affected countries stock markets present asymmetric dependencies with COVID-19 related information such as fake news, media coverage, or contagion. |
| 3  | Conlon and McGee (2020) | USA | To identify whether Bitcoin is a safe haven or can be deemed as risky during the COVID-19 pandemic. | Empirical evidence shows that Bitcoin does not consistently act as a safe haven for the S&P 500 during times of crisis. |
| 4  | Okorie and Lin (2020) | Multiple | To investigate the fractal contagion effect of the COVID-19 pandemic on the stock markets. | Considerable fractal contagion effect was found on market return and market volatility. |
| 5  | Zhang et al. (2020) | Multiple | To map the general patterns of country-specific risks and systemic risks in the global financial markets. | Patterns of systemic risk has been identified in the financial markets during the COVID-19 pandemic. |
| 6  | McKibbin and Fernando (2020) | Multiple | To quantify the potential global economic costs of COVID-19 under different possible scenarios. | Due to limited outbreak a significant effect has been found on the global economy in the short run. |
| 7  | Oxili and Arun (2020) | Multiple | To observe the impact of social distancing policies on economic activities and stock market indexes. | An increasing number of lockdown days, monetary policy decisions, and international travel restrictions severely affected the level of economic activities and stock prices on major stock market indexes. |
| 8  | Sansa (2020) | China & USA | To analyze the impact of COVID-19 on financial markets. | A positive significant relationship has been found between the COVID-19 confirmed cases and all the financial markets. |
| 9  | Ramelli and Wagner (2020) | USA | To highlight the stock market reaction to COVID-19 by focusing on international trade and financial policies for firm value. | Stock market participants predicted the real economic effects of the COVID-19 health crisis to be amplified by financial channels. |
| 10 | Baker et al. (2020) | USA | To explore the probable explanations for the stock market reaction to the COVID-19 pandemic. | Empirical evidences show that government restrictions on commercial activity, voluntary social distancing, and disruption in global supply chain are the main reasons that the U.S. stock market reacted the way it did due to COVID-19. |
| 11 | Schell et al. (2020) | Multiple | To analyze the differences in stock market reactions to the same kind of disease-related news. | Among all the diseases considered in this study, a significant negative effect has been found on stock markets only due to COVID-19. |
| 12 | Goodell and Huynh (2020) | USA | To assess the reactions of US industries to sudden COVID-19 related news announcements. | The study found that out of 46 industries, 15 industries were having abnormal returns due to COVID-19 related news announcements. |
| 13 | Albulescu (2020) | USA | To investigate the effect of the official announcements regarding the COVID-19 new cases of infection and fatality ratio, on the financial markets volatility. | Financial markets volatility is affected due to continuation of the coronavirus pandemic. |
| 14 | Shehzad et al. (2020) | Multiple | To identify the impact of COVID-19 and GFC on the returns and variance of stock markets of the US, Germany, Italy, China, and Japan. | Substantial and harmful impact of COVID-19 is high on stock returns of European and the US markets as compared to the GFC. |
| 15 | Mirza et al. (2020) | Europe | To assess the price reaction, performance and volatility timing of European investment funds during the outbreak of COVID-19. | This study has assessed that most of the investment funds exhibit stressed performance while social entrepreneurship funds endured resilience. |
| 16 | Ashraf (2020) | Multiple | To investigate the expected economic impact of government actions by analyzing the effect of such actions on stock market returns. | A negative effect on stock market returns has been found due to the announcements of government social distancing actions. |
| 17 | Haroon and Rizvi (2020) | Multiple | To analyze the relationship between sentiment generated by COVID-19 related news and volatility of stock market | A significant increase in volatility in the equity markets has been observed due to panic generated by the news outlets. |
| 18 | Czech et al. (2020) | Europe | To assess the short-term reaction of COVID-19 pandemic on the four Central European countries financial markets | A significant and negative link has been identified between the European countries’ stock market indices and the COVID-19 spread. |
weak form of efficient market hypothesis, which shows that no patterns exists in the market. Hence, fundamental analysis and technical analysis will not work. Thus, in this study, the impact of COVID-19 on the daily market returns of the 50 companies of the NIFTY-50 indexed in National Stock Exchange (NSE) of India are addressed.

The remainder of the study is organized in the following sections. The next section explains the theoretical background, followed by the study’s research design and data analysis before and concluding with its key takeaways.

2. Theoretical background

The stock market’s reaction in response to pandemic is highly heterogeneous across and within nations. Recent research by Capelle-Blancard and Desroziers (2020) reveals that stock prices are reflective of publicly available information. However, the impact is not homogenous and thereby, high volatility has been observed. They have also concluded that pandemic effect has been coupled with structural economic fragility of the respective country and thereby the effect varies in different countries despite of being more vulnerable to current pandemic. At first instance, the reaction of stock market toward pandemic looks abrupt, irrational, and highly unsystematic. But a closer analysis reveals that financial markets have discounted most vulnerable sectors. The sectors that are less resilient, unable to follow social distancing norms and affected by disruption in global supply chain have experienced a hard hit and therefore, markets have observed instability. The ancillary industries are also leading the list among most suffered industries due to pandemic. Krugman (2020) has also illustrated the relation between economy and stock markets. He stated that due to pandemic economies are worsening because of corrections in their fundamental values whereas stock markets after experiencing a downturn are witnessing upward trends. However, the question of stability is still pertinent. The argument concludes that it is not easy to beat stock markets for any investors and possibility of leveraging abnormal returns is very limited or zero. Therefore, markets seem to deceptively irrational rather than inefficient. The literature on the economic effects of COVID-19 is rapidly growing. Table 1 shows the empirical studies on COVID-19 and financial markets.

However, to the best of our knowledge, none of these studies have attempted to examine the effects of the number of confirmed COVID-19 cases and death cases on the daily returns of the Indian stock market. It is well known fact that India is an emerging investment destination because of easy availability of labour, raw material and policy reforms. As per IBEF (2020) Indian government has also taken various initiatives to strengthen the economy of the country and committed to make it one of the strongest economies in the world. Indian financial markets hold a very strong position in global markets. It has emerged as the best performing equity market in the recent three months after the sharpest sell-off in history during COVID-19 pandemic. In this context, it is very imperative and indispensable to study the Indian financial market.

Our empirical findings contribute to the literature by analysing the impact of COVID-19 on stock returns in many ways: (1) examining the relationship between daily market returns and confirmed COVID-19 cases by controlling firm specific factors, (2) investigating the sectoral impact on daily returns, (3) assessing the impact of the four phased lockdown on daily market returns and (4) the comparative analysis of the impact of COVID-19 during lockdown and post lockdown.

3. Research design

3.1. Panel data source

The present study works on the stocks of 50 large-cap firms of India that constitute an index called NIFTY-50. These firms are listed on the NSE of India. The index represents the 65 % float-adjusted market capitalization weights of the listed firms at NSE (Nifty 50, 2019). It embodies the most liquid stocks among Indian firms and therefore, it is also considered as the barometer of the Indian financial markets. The study is developed on the rationale that COVID-19 has shown a substantial impact on stock market trading and the Indian financial market has observed consistent volatility. An empirical association between the daily market returns and COVID-19 by controlling firm-specific factors has been investigated during time period from March 2020 to November 2020 because India went through the world’s largest lockdown by restricting 1.3 billion people of the country during this period in a phased manner. The time zone of this study is divided into two phases-smaller phase of three months (lockdown period) and longer phases of six months (post lockdown).

A panel data approach has been adopted to investigate the impact of COVID-19 on Indian financial markets, consisting the number of firms (50), time period (64 working days for three months), and the variables under study. Total 3200 firms’ observations have been recorded for each variable during the specified period. This forms the first part of the study that is exclusively characterised by lockdown enforced in India and this is followed by a period of post lockdown (131 working days for six months). It also shows the effectiveness of panel data study over a cross-sectional study. Panel data spreads the modelling possibilities and provides more variation and less collinearity among the variables under study (Elhorst, 2014). According to Hsiao (2005), panel data also lead to the presence of a greater degree of freedom and thereby upsurges model’s efficiency.

3.2. Panel data models

The study has adopted the balanced panel data regression technique. The present study applies pooled regression, fixed effect models, and random effect models to compare the applicability of the desired model by using the Hausman test (Jaba et al., 2016). In the fixed effect model influence of the predictor variable on the dependent variable is similar for all the firms under study. On the contrary, in the random effect model, firms effect direct unobservable personal features and they are uncorrelated with the dependent
variables (Jaba et al., 2017). The panel data regression equation applied in this study has been presented below:

$$DMR_{it} = \beta_0 + \beta_1 COVID_{19t} + \beta_2 LMCAP(-1)_{it} + \epsilon_{it}$$

(1)

Where DMR$_{it}$ represents daily market returns of firm $i$ at time $t$; COVID-$19_{it}$ presents the daily growth in total COVID-19 cases and daily growth in total death cases due to COVID-19 in time $t$ and remains constant for every firm $i$ and LMCAP(-1)$_{it}$ represents the lagged value of firm factors for which the log of the daily market capitalization of firm $i$ at time $t$ is being considered. Further, $i$ represents total no. of firms and $t$ is time period of study and $\epsilon_{it}$ is error term of firm $i$ at time $t$.

The impact of COVID-19 has been studied on daily market returns by taking lockdown as a demarcating line between the two phases. The first phase analyzes the influence of pandemic by controlling firm specific factors in the following manner:

i. Examination of the relationship between DMR and COVID-19 variables

ii. Investigation of sectoral impact on DMR

iii. Assessment of the four phased lockdowns enforced in India on DMR

Whereas in the second phase, the post lockdown study, the comparative analysis of COVID-19 effects on DMR has been performed.

4. Data analysis

The study is primarily motivated by the efficient market theory that impounds that the market quickly responds to any publicly available information. According to Brooks et al. (2003), new and specifically unexpected information drives the market prices. It provides an immediate opportunity to investors for registering gain on the volatility observed in the market. This type of study has been pioneered by Fama et al. (1969). This year, the world had witnessed the intense wave of COVID-19 followed by severe market crash, therefore, it motivates researchers to document the effect of this unexpected event on the financial markets.

The study was primarily instigated by the COVID-19 and its impact can be observed in the form of the number of confirmed cases reported and the number of causalities caused due to this pandemic. Fig. 1 presents the daily growth in the total confirmed cases (DTGC) and recovered cases (DTRC) and the cases of mortality (DTDC) due to COVID-19 in India (shown in Fig. 2). As presented in Fig. 1, the confirmed cases of COVID-19 were identified from March 2nd 2020, and since then the number of infected cases have started increasing gradually. These two variables (DTGC and DTDC) serve as proxy for COVID-19 and also the predictor variables of this study. Fig. 3 presents the daily market returns (DMR) of the companies that comprise the NIFTY-50 index. This reflects a sharp volatility in the Indian stock market as a result of the fall in the global markets during this financial contagion. Moreover, in post lockdown period stock market price has been observed relatively stable. The present study hovers around daily market returns that are considered as criterion variable in the current analysis. It was also observed that there was a sharp decline in Foreign Institutional Investor (FII) investments as FIIs have withdrawn a record ₹61,000 crore from the equity segment of Indian markets in March as COVID-19 affected investor sentiment worldwide. Whereas, more inflow have been infused by FIIs in the equity segment from September onwards. Fig. 4 shows the FIIs’ net investments in the equity segment during COVID-19 and it might also be a probable reason for bearish trend observed in the market during lock down period. Therefore, these infographics gives the bird’s eye view of the present study.

Table 2 presents the descriptive statistics of the variables under study. The highest daily return observed during the observed period is 44.67 % and lowest is -27.91 %. It clearly shows the momentum of volatility experienced by the market. Further, the highest daily growth in the total number of cases (DTGC) has been noted at 366 % and the highest daily growth in the total number of death cases (DTDC) has been reported as 100 % during the period of study.

![Fig. 1. Daily Growth in Total Confirmed COVID-19 Cases.](image-url)
The association between dependent variable and independent variables has been depicted in Table 3. It clearly exhibits negative correlation between daily market returns and COVID-19 variables.

Table 4 presents the results of the panel data regression models. The COVID-19 variables have been statistically negatively related to daily market returns. The results visibly specify the inverse impact of growth in total COVID-19 cases and growth in total death cases on daily market returns in Indian financial market. The data has been examined through other panel data regression models too. The similar results have been reported with other models too that clearly indicates the robustness of the results. The regression models are also statistically significant as reported in the table. The Durbin-Watson statistics that indicates the absence of autocorrelation has also been found to be around 2.

However, the Hausman test conducted for the fixed and random effect models selects the random effect model, thus the panel regression equation for random effect models takes the following form:

![Fig. 2. Daily Growth in Total Deceased COVID-19 Cases.](image1)

![Fig. 3. Daily Returns of NIFTY-50 (March to November 2020).](image2)

![Fig. 4. FII Net Investment in Equity (March to November 2020).](image3)
DMR_t = 0.083 – 0.063DTDC_t – 0.004DTGC_t – 0.003 LMCAP(-1)_t

Where i indicates number of firms ranges from 1 to 50 and t stands for time period under observation (from 2nd March 2020 to 30th May 2020) and, the empirical test revealed that COVID-19 has negatively affected the daily market returns in the Indian stock market. It also implies the profound effect of increased number of total cases and deaths due to COVID-19 on investors in India. The results are in cognizance with the findings of Capelle-Blancard and Desroziers (2020).

Table 2
Descriptive Statistics of Variables.

|                | DMR  | DTDC | DTGC  | LMCAP(-1) |
|----------------|------|------|-------|-----------|
| Mean           | -0.002|   0.112 |  0.166 |  27.459   |
| Median         |  0.000|   0.060 |  0.081 |  27.397   |
| Maximum        |  0.446|   1.000 |  3.666 |  29.933   |
| Minimum        | -0.279|    0.000 |  0.033 |  25.463   |
| Std. Dev.      |   0.048|   0.160 |  0.446 |   0.881   |
| Skewness       |    0.023|   3.363 |   7.533 |   0.397   |
| Kurtosis       |    7.776|  16.754 |  59.135 |   2.752   |

Notes: DMR = Daily Market Returns; DTDC = Ratio of Daily Growth in total death cases; DTGC = Ratio of Daily Growth in Total cases; LMCAP(-1) = natural logarithm of daily Market Capitalization of firms.

Table 3
Correlation Matrix.

|        | DMR | DTDC | DTGC | MCAP |
|--------|-----|------|------|------|
| DMR    | 1.000   | 0.207*** | 0.025* | 0.001   |
| DTDC   | 0.207*** | 1.000   | -0.042*** | -0.033* |
| DTGC   | 0.025*   | -0.042*** | 1.000   | 0.001   |
| LMCAP(-1) | 0.001   | -0.033*   | 0.001   | 1.000   |

Notes: DMR = Daily Market Returns; DTDC = Ratio of Daily Growth in total death cases; DTGC = Ratio of Daily Growth in Total cases; LMCAP(-1) = natural logarithm of daily Market Capitalization of firms; ***,* presents significance level at 1% and 10 % respectively.

Table 4
Panel Data Regression Models.

| Variables/Panel data Regression Models | Pooled | Fixed | Random |
|---------------------------------------|--------|-------|--------|
| DTDC                                  | -0.063*** (-11.723) | -0.073*** (-13.987) | -0.063*** (-12.178) |
| DTGC                                  | -0.004** (-1.957) | 0.002 (1.256) | -0.004** (2.017) |
| LMCAP(-1)                             | -0.003*** (-2.897) | -0.106*** (-16.548) | -0.003** (-3.006) |
| C                                     | 0.083*** (3.112) | 2.920*** (16.581) | 0.083*** (3.233) |
| R-square                              | 0.045   | 0.128  | 0.045  |
| F-statistic                           | 48.962*** | 8.780*** | 48.962*** |
| Durbin-Watson                         | 1.916   | 1.912  | 1.916  |

Notes: DMR_{it} = Daily market Returns of firm i at time t; DTDC_{it} = Ratio of Daily Growth in total death cases at time t for all i firms; DTGC_{it} = Ratio of Daily Growth in Total cases at time t for all i firms; LMCAP(-1)_{it} = natural logarithm of daily Market Capitalization of i firm at time t; ***,*,* presents significance level at 1%,5% and 10 % respectively; figures in parentheses present t-statistic.

$$DMR_{it} = 0.083 - 0.063DTDC_{it} - 0.004DTGC_{it} - 0.003 LMCAP(-1)_{it} \tag{2}$$

Where i indicates number of firms’ ranges from 1 to 50 and t stands for time period under observation (from 2nd March 2020 to 30th May 2020) and, the empirical test revealed that COVID-19 has negatively affected the daily market returns in the Indian stock market. It also implies the profound effect of increased number of total cases and deaths due to COVID-19 on investors in India. The results are in cognizance with the findings of Capelle-Blancard and Desroziers (2020).

Table 5
Mean Difference Among Sectoral and Market Returns.

| No. | Sectors | SMR  | AMR  | Mean Difference | t-stats |
|-----|---------|------|------|----------------|---------|
| 1   | Automobile | 0.015 | -0.014 | 0.003         | 1.124   |
| 2   | Banking  | -0.008 | -0.014 | -0.007        | -2.018**|
| 3   | FMCG     | 0.001  | -0.014 | 0.002         | 0.670   |
| 4   | Financial Services | -0.009 | -0.014 | -0.007        | -1.960**|
| 5   | Pharma   | 0.008  | -0.014 | 0.009         | 3.476***|
| 6   | IT       | -0.001 | -0.014 | 0.000         | -0.210  |
| 7   | Telecom  | 0.001  | -0.014 | 0.004         | 0.781   |
| 8   | Metal    | -0.001 | -0.014 | 0.000         | -0.050  |
| 9   | Power    | -0.001 | -0.014 | 0.001         | 0.333   |
| 10  | Conglomerate | -0.001 | -0.014 | 0.001         | 0.220   |

Notes: SMR = Sector Mean Return; AMR = Average Market Return; **,**,**,* refers to significance level at 5% and 1% respectively.
The results reported in Table 7 reveals that Pharma FMCG and telecom have shown a significantly positive impact on daily market returns, whereas the financial services and banking sector has shown a statistically negative relationship with the daily returns of the NIFTY-50 index. Although the Entertainment, Oil and Power, Auto and Metal sectors have also exhibited negative relationships but the results were not statistically significant.

### 4.2. The impact of lockdowns

This part of the study scrutinizes the lockdown enforced in India over four phases starting from March 25th 2020 that partially ended on May 31st 2020. Therefore, the study has adopted two techniques to examine the financial markets during the lockdown. The first technique applied here is the event study methodology where the daily returns of the stocks enlisted in the NIFTY-50 have been examined separately for Lockdown 1.0 to Lockdown 4.0. Fig. 5 represents the event window and the respective dates of the four lockdowns experienced by India. According to Bromiley et al. (1988), “event study estimates the impact of event on the stock market’s expectation of the future economic performance of the corporation”. The basic aim of the event study is to understand the behavior of stock around specific events (Binder, 1998).

This technique differentiates between the expected returns and abnormal returns received due to the occurrence of an event. The present study utilizes mean adjusted returns to compute the abnormal returns (Brown and Warner, 1985) and then the cumulative abnormal return (CAR) for the specific periods of Lockdown 1, 2, 3, and 4. The event study charts(see Fig. 6) depicts the behavior of stock market returns during these different periods. 0 day in each chart indicates the start point of every lockdown.

Clearly visible in the chart is that the market returns are ostensibly negative at the onset of every lockdown and returns shows upward trends whenever the lockdown was about to finish. During Lockdown 3.0 (May 4th to May 17th), India’s government announced a financial stimulus package and the positive peak is evidently visible in the returns during that period. The event study also highlights the possibility of having good returns even when the economy is witnessing a downturn.

The study has also examined the impact of the lockdown on daily market returns with the help of the panel regression model. It has taken four dummy variables to indicate Lockdown 1, 2, 3, and 4 along with COVID-19 variables and by controlling for firm specific factors.

Table 8 exhibits the panel regression model w.r.t lockdowns as enforced over four phases. The variables corresponding to firm specific factors (LMCAP) and COVID-19 have been found to be negatively related to daily market returns in all regression models. The results suggest that Lockdown 1.0 has been witnessed significantly more positive effects than the other lockdown phases. The positive effects have been reduced significantly in Lockdown 2.0 and the third lockdown has experienced significant negative returns as compared to the others. The results reveal the statistically significant impact of the lockdown on financial markets.
Table 7: Impact of Different Sectors on Daily Market Returns.

| Variables/Models | M1 | M2 | M3 | M4 | M5 | M6 | M7 | M8 | M9 | M10 |
|------------------|----|----|----|----|----|----|----|----|----|------|
| C                | 0.065** (2.379) | 0.055** (1.987) | 0.036* (1.632) | 0.067** (2.395) | 0.071*** (2.609) | 0.071*** (2.611) | 0.063*** (2.379) | 0.072*** (2.640) | 0.079*** (2.757) | 0.084*** (2.925) |
| LMCAP(-1)        | -0.003** (-2.467) | -0.002* (-1.523) | -0.002* (-1.679) | -0.003** (-2.475) | -0.003** (-2.675) | -0.003*** (-2.677) | -0.002* (-1.563) | -0.003*** (-2.716) | -0.003*** (-2.821) | -0.003*** (-2.992) |
| Pharma           | 0.009** (2.348) | -0.008*** (-3.167) | 0.969*** (40.418) | -0.002 (0.484) | 0.001 (0.999) | -0.001 (-0.086) | -0.006 (-1.562) | 0.006* (1.685) | -0.003 (-0.886) | 0.005 (1.391) |
| Bank             | 0.009** (2.348) | -0.008*** (-3.167) | 0.969*** (40.418) | -0.002 (0.484) | 0.001 (0.999) | -0.001 (-0.086) | -0.006 (-1.562) | 0.006* (1.685) | -0.003 (-0.886) | 0.005 (1.391) |
| FMCG             | 0.009** (2.348) | -0.008*** (-3.167) | 0.969*** (40.418) | -0.002 (0.484) | 0.001 (0.999) | -0.001 (-0.086) | -0.006 (-1.562) | 0.006* (1.685) | -0.003 (-0.886) | 0.005 (1.391) |
| Auto             | 0.009** (2.348) | -0.008*** (-3.167) | 0.969*** (40.418) | -0.002 (0.484) | 0.001 (0.999) | -0.001 (-0.086) | -0.006 (-1.562) | 0.006* (1.685) | -0.003 (-0.886) | 0.005 (1.391) |
| Information      | 0.009** (2.348) | -0.008*** (-3.167) | 0.969*** (40.418) | -0.002 (0.484) | 0.001 (0.999) | -0.001 (-0.086) | -0.006 (-1.562) | 0.006* (1.685) | -0.003 (-0.886) | 0.005 (1.391) |
| Technology       | 0.009** (2.348) | -0.008*** (-3.167) | 0.969*** (40.418) | -0.002 (0.484) | 0.001 (0.999) | -0.001 (-0.086) | -0.006 (-1.562) | 0.006* (1.685) | -0.003 (-0.886) | 0.005 (1.391) |
| Power            | 0.009** (2.348) | -0.008*** (-3.167) | 0.969*** (40.418) | -0.002 (0.484) | 0.001 (0.999) | -0.001 (-0.086) | -0.006 (-1.562) | 0.006* (1.685) | -0.003 (-0.886) | 0.005 (1.391) |
| Financial Services | 0.009** (2.348) | -0.008*** (-3.167) | 0.969*** (40.418) | -0.002 (0.484) | 0.001 (0.999) | -0.001 (-0.086) | -0.006 (-1.562) | 0.006* (1.685) | -0.003 (-0.886) | 0.005 (1.391) |
| Telecom          | 0.009** (2.348) | -0.008*** (-3.167) | 0.969*** (40.418) | -0.002 (0.484) | 0.001 (0.999) | -0.001 (-0.086) | -0.006 (-1.562) | 0.006* (1.685) | -0.003 (-0.886) | 0.005 (1.391) |
| Metal            | 0.009** (2.348) | -0.008*** (-3.167) | 0.969*** (40.418) | -0.002 (0.484) | 0.001 (0.999) | -0.001 (-0.086) | -0.006 (-1.562) | 0.006* (1.685) | -0.003 (-0.886) | 0.005 (1.391) |
| Conglomerate     | 0.009** (2.348) | -0.008*** (-3.167) | 0.969*** (40.418) | -0.002 (0.484) | 0.001 (0.999) | -0.001 (-0.086) | -0.006 (-1.562) | 0.006* (1.685) | -0.003 (-0.886) | 0.005 (1.391) |
| R square         | 0.004 | 0.005 | 0.343 | 0.002 | 0.002 | 0.002 | 0.002 | 0.003 | 0.003 | 0.002 | 0.003 |
| F Stats          | 6.328*** | 8.614*** | 822.257*** | 3.8324** | 3.5827** | 3.5494** | 4.2680** | 4.553*** | 3.980** | 4.558** |
| Durbin Watson    | 1.997 | 1.997 | 1.997 | 1.978 | 1.978 | 1.978 | 1.978 | 1.979 | 1.979 | 1.979 | 1.979 |

Notes: DMR$_{it}$ = Daily market Returns of i firm at time t; LMCAP(-1)$_{it}$ = natural logarithm of daily Market Capitalization of i firm at time t; M1 to M10 represents Panel regression models w.r.t different sectors; ***,***, * presents significance level at 1%, 5% and 10% respectively; figures in parentheses present t stats.
The results also disclose that central government interventions (in the form of countrywide lockdowns), social distancing measures, and stimulus packages for supporting industrial infrastructure have also restricted the downside movement of stock prices to an extent.

4.3. Impact of COVID-19 on daily market returns post lockdown phase

Since 1st, June 2020, Indian had started resuming its economic activity in gradual manner and by now, economic operations in all sectors across the country have been fully functional. Therefore, it gives another opportunity to researchers, to seek the comparative differences in market returns during lockdown and post lockdown phase and thereby exploring a scope of providing evidence about the fact that markets are primarily driven by economic activities in long term and impact of unexpected events and shocks stays till the preparations to combat and probable solutions pertaining to that event becomes evident. Hence the present study incorporates another period of six months from 1st June to 30th November 2020 into the analysis. This characterizes the post lockdown phase as the lockdown during this phase has been lifted in a gradual manner by the government of India.

Table 9 presents the descriptive statistics of the variables under study post lockdown. The highest daily return observed during post lockdown has shown an 8% increase (56.46 % post lockdown and 44.67 % during lockdown) and lowest is -50.54 % as compared to -27.91 % during lockdown phase of Indian economy. It clearly shows the incremental momentum in the daily average returns. Further, the highest daily growth in the total number of cases (DTGC) has been reported as 12.63 % and therefore presents a sharp declining difference when compared with 366 % during lockdown period and the highest daily growth in the total number of death cases (DTDC) has also been decreased to 20.21 % wrt 100 % registered during economic shutdown in India.

Table 10 depicts the empirical evidence regarding the impact of COVID-19 on DMR after lockdown through panel data regression models. The results obtained have shown striking difference from the regression results of lockdown (see Table 4). However, the
COVID-19 variables have been negatively related to daily market returns but the coefficients are not statistically significant. It clearly restores the importance of economic activity and thereby fading the sway of COVID-19 on market returns that was short and spontaneous in response to sudden outbreak of pandemic in India. Further, the market capitalization exhibits a positive association with DMR, contradictory to the results obtained during lockdown. The data has been examined through other panel data regression models too. However, the regression models show statistical significance but unable to capture the explained variance in the model (low R square) as reported in the table. Therefore, it has been documented that unexpected events bring volatility in the market but long term movements in markets are certainly supported by the continued economic activity in the country Fig. 6.

However, the Hausman test conducted for the fixed and random effect models selects the fixed effect model. The panel regression equation for fixed effect model has been presented below:

### Table 8
Impact of Lockdown on Daily Market Returns.

| Variables/Panel Regression Models for Lockdown | PRLC1 | PRLC2 | PRLC3 | PRLC4 |
|-----------------------------------------------|-------|-------|-------|-------|
| DTDC                                         | -0.084*** | -0.059*** | -0.066*** | -0.061*** |
|                                              | (-15.415) | (-10.903) | (-12.234) | (-11.171) |
| DTGC                                         | -0.004*** | -0.003 | -0.005** | -0.003* |
|                                              | (-2.134) | (-1.337) | (-2.366) | (-1.726) |
| D1                                           | 0.0264*** |       |       |       |
|                                              | (13.124) |       |       |       |
| D2                                           |       | 0.0109*** |       |       |
|                                              |       | (5.096) |       |       |
| D3                                           |       |       | -0.009*** |       |
|                                              |       |       | (-3.894) |       |
| D4                                           |       |       |       | 0.004* |
|                                              |       |       |       | (1.649) |
| LMCP(-1)                                     |       |       |       |       |
|                                              |       |       |       |       |
| Notes: DMR<sub>i</sub> = Daily market Returns of firm i at time t; DTDC<sub>t</sub> = Ratio of Daily Growth in total death cases at time t for all i firms; DTGC<sub>t</sub> = Ratio of Daily Growth in total cases at time t for all i firms; LMCP<sub>i</sub>(-1) = natural logarithm of daily Market Capitalization of i firm at time t; D1 = Dummy Variable for Lockdown 1.0; D2 = Dummy Variable for Lockdown 2.0; D3 = Dummy Variable for Lockdown 3.0; D4 = Dummy Variable for Lockdown 4.0; *, **, *** presents significance level at 10%, 5% and 10% respectively; figures in parentheses present t statistics. |

### Table 9
Descriptive Statistics of Variables Post Lockdown.

|                | DMR | DTDC | DTGC | LMCP |
|----------------|-----|------|------|------|
| Mean           | 0.003 | 0.025 | 0.030 | 27.655 |
| Median         | 0.001 | 0.018 | 0.024 | 27.488 |
| Maximum        | 0.564 | 0.202 | 0.126 | 30.321 |
| Minimum        | -0.505 | 0.003 | 0.004 | 25.588 |
| Std. Dev.      | 0.024 | 0.026 | 0.027 | 0.846 |
| Skewness       | 0.888 | 3.282 | 1.761 | 0.633 |
| Kurtosis       | 77.367 | 18.731 | 6.088 | 3.394 |

Notes: DMR = Daily Market Returns; DTDC = Ratio of Daily Growth in total death cases; DTGC = Ratio of Daily Growth in Total cases; LMCP = natural logarithm of daily Market Capitalization of firms; total no of observations for all four variables = 6550.

COVID-19 variables have been negatively related to daily market returns but the coefficients are not statistically significant. It clearly restores the importance of economic activity and thereby fading the sway of COVID-19 on market returns that was short and spontaneous in response to sudden outbreak of pandemic in India. Further, the market capitalization exhibits positive association with DMR contrary to the results obtained during lockdown. The data has been examined through other panel data regression models too. However, the regression models show statistical significance but unable to capture the explained variance in the model (low R square) as reported in the table. Therefore, it has been documented that unexpected events bring volatility in the market but long term movements in markets are certainly supported by the continued economic activity in the country Fig. 6.

However, the Hausman test conducted for the fixed and random effect models selects the fixed effect model. The panel regression equation for fixed effect model has been presented below:

### Table 10
Panel Data Regression Models Post Lockdown.

| Variables/Panel data Regression Models | Pooled | Fixed | Random |
|---------------------------------------|--------|-------|--------|
| DTDC                                  | -0.013 (-0.699) | -0.008 (0.474) | -0.013 (-0.699) |
| DTGC                                  | -0.021 (-1.135) | -0.005 (0.267) | -0.021 (-1.135) |
| LMCP                                  | 0.003 (0.641) | 0.024*** (8.434) | 0.003 (0.641) |
| C                                     | -0.002 (-0.281) | -0.667*** (-8.437) | -0.002 (-0.282) |
| R-square                              | 0.001 | 0.019 | 0.001 |
| F-statistic                           | 2.789* | 2.458*** | 2.789* |
| Durbin-Watson                          | 1.916 | 1.925 | 1.916 |

Notes: DMR<sub>i</sub> = Daily market Returns of firm i at time t; DTDC<sub>t</sub> = Ratio of Daily Growth in total death cases at time t for all i firms; DTGC<sub>t</sub> = Ratio of Daily Growth in Total cases at time t for all i firms; LMCP<sub>i</sub>(-1) = natural logarithm of daily Market Capitalization of i firm at time t; *, **, *** presents significance level at 1%, 5%, and 10% respectively; figures in parentheses present t statistics.
DMR_{it} = -0.667 - 0.008DTDC_{it} - 0.005DTGC_{it} + 0.024LMCAP_{it} (3)

Where \( i \) represents number of firms (50 firms indexed in NIFTY 50) and \( t \) is time period under examination (1st June 2020 to 30th November 2020). Fig. 7 illustrates 20 days CAR post lockdown registered by the market. The commencement of economic activity has provided a major thrust that is evidently visible through the upward trend line shown.

However, the initially days have seen much volatility in the returns, but afterwards markets have booked gains and thereby fading away the short run impact of pandemic on equity market returns.

5. Discussion

The present study illustrates the contagion effect of COVID-19 on the financial markets in India. It reveals a negative impact of COVID-19 on the daily market returns and also highlights the sectoral impact on daily market returns. It is observed that the FMCG and Pharma sectors have shown better performance as compared to the other stocks that indicates that health and staple products related to daily needs are an imperative strategic reserve for any country during a crisis period and therefore the government must work on building sustainable health and safety infrastructure for its citizens. The banking sector has been affected severely with this crisis as further lending and EMIs (equated monthly instalments) have been put to a halt with the shutdown of economic activities for a substantial period. The study also highlights the abnormal returns during the period of study. This implies that investors and fund managers could have gained through the inconsistency in the trends and due to some positive peaks that had been witnessed during this period. This also signals the buying of potential stocks in sunrise industries. Further, the study extended to post lockdown period, thereby showcasing the wiping out effect of COVID-19 on DMR due to commencement of economic activity in the country. The study provides mixed evidence of EMH, due to pandemic market has shown downward movement, which indicates that market has reacted as per the information availability. Further, event study, conducted during the period of lockdown also provide evidence for existence of abnormal returns, it implies that market can be outperformed if investors are engaged in actively managed investment vehicles. Moving ahead, market has exhibited positive trend post lockdown and thereby emphasizes the significance of organic activity started in different industrial sectors after lockdown has been lifted in the country.

The study also indicates toward the existence of recency effect in the stock markets albeit implicitly. According to Rudiawarni et al. (2020) investors’ decisions are highly governed by the recency bias. Further, the study conducted by Gandré (2020) for US stock markets also supports the recency bias among investors.

This study enriches the extant literature of stock market by incorporating the impact of COVID-19 outbreak and by providing methodological rigor for examining the influence of pandmeic through different dimensions. This study is among very few that have been conducted on an emerging and promising investment destination to foreign investors among South Asian economies. The study also highlights the fact that sudden break applied on economic activities by government of India has shaken the financial markets initially, further with the gradual commencement of economic activities and restoration of supply chains across different sectors has pulled the market returns (Impact of COVID 19 on the Indian Stock Markets, 2020). Indian post lockdown period also witnessed the festive season that has also lightened the market, furthermore, with some positive announcements in vaccine development and projected rebound of GDP to around 8% in FY 2021–22 mainly due to base effects and restoration of investor confidence (OECD, 2020).

6. Conclusion

The present study covers a short period of nine months for assessing the impact of pandemic on financial markets. However, the empirical evidence uncovered has been found to be consistent with other studies performed during this period in different countries such as China (Al-Awadhi et al., 2020) Further, as the lifting of restrictions on economic activity has commenced in India, COVID-19 cases are also increasing exponentially, it is difficult to arrive at conclusions about the exact damage done by this contagious pandemic. Since, the markets are exhibiting progressive trends but the wounds given by pandemic to economic framework are deep and will be healed with long term sustainable measures. The study can be performed for a longer period and further results can be compared with

![Fig. 7. Cumulative Abnormal Return Post Lockdown Phase.](image-url)
Declaration of Competing Interest

We have no conflict of interest to declare.

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