An Empirical Assessment of COVID-19 Pandemic on Asset Market Responses in India

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ABSTRACT

The study investigates the financial market's response during the period of last nine months starting from the day when first COVID-19 case was confirmed in India. This paper attempts to gauge the impact of rise in COVID-19 confirmed number of cases on stock market as well as commodities market returns. A multi-model approach is used in the current research to assess the relationship between daily number of confirmed cases of COVID-19 and movement of asset returns from January 2020 to September 2020. The findings reveal that though financial markets exhibited asymmetric volatility clustering, it could not be traced to COVID-19 pandemic for the period under study in India.

Keywords: COVID-19, financial markets, commodities market, asset returns, volatility clustering

Introduction:

The world today is witnessing rapid spread of Covid-19 and adoption of stringent policy measures to contain the spread of virus and save human life. These policy measures have led to large negative economic shocks, not experienced before. The adverse economic effects of this pandemic at individual country level have been accentuated by inter country linkages that have been on the rise since the Bretton Woods era. Unlike a typical macroeconomic disturbance, this Covid-19 has resulted into a disaster which has unexpectedly changed the global economic environment which is now coupled with an uncertain future regarding the spread and cure of the disease.

Often crisis and disaster are used interchangeably, but in reality they indicate different connotations. The word crisis draws its origin from *krisis* which is the Latinized form of Greek word–which means decisive moment [1]. In non-medical terms it refers to vitally important or decisive state of things, point at which change must come, for better or worse [2]. As a noun it can be defined as an unstable or crucial time or state of affairs in which a decisive change is impending [3]. Thus crisis represent a situation which has reached a critical phase in social, economic, political or international affairs which can lead to a decisive change [4].

On the other hand, the term 'Disaster' originates from the 16th century Middle French word *désastre* and the Italian word *disastro.* It implies any unfortunate event or anything that befalls of ruinous or disastrous nature [5]. International Strategy for Disaster Reduction (ISDR) defines disaster as *"A serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources"* [6]. Centre for Research on Epidemiology of Disasters (CRED) defines a disaster as "A situation or event which overwhelms local capacity, necessitating a request to a national or international level for external assistance; an unforeseen and often sudden event that causes great damage, destruction and human suffering" [7]. The World Health Organisation (WHO) defines disaster as "An occurrence that disrupts the normal conditions of existence and causes a level of suffering that exceeds the capacity of adjustment of the affected community" [8].

Disasters can be classified as natural or manmade. Natural disasters are those which are considered as an Act of God and would include disasters like earthquakes, tsunamis, bushfires, volcanic eruptions, spread of diseases, floods or other natural calamities. Manmade crises have an element of human intent, negligence or error involving a failure of manmade system. These may be the result of erroneous planning, wars and attacks, coups, scams, financial anomalies, stock market crashes, economic downturns, recessions-all of these can be termed as manmade. Devastations caused by natural calamities can be overcome with human efforts and their spread is also contained to local geographies. On the other hand, manmade disasters span over large geographical areas and their effects cannot be contained easily. The effect of manmade disasters is spread far and wide and the aftermath is visible for a long period of time. The management of such disasters require a multipronged approach at national and international levels. For instance, economic recession of the 30's led to Second World War, which resulted in devastation of several economies. Post worldwar-II the worldwide rescue and relief operations aimed at rebuilding economies, develop the war affected nations and establish systems which would contain the happening of such events in future.

Officially declared as pandemic on 11th March 2020 by WHO, Covid-19 is the worst ever pandemic which has hit all countries since Spanish Flu of the early twentieth century [9]. This pandemic is also different from the recent epidemics like SARS, H1N1, MERS or the most recent one caused by Ebola virus. These epidemics were contained to limited geographies and were managed by the country governments with active participation from medical research and organizations. The situation today is different from the past

situations as this current pandemic has resulted into complete lockdown not only of commercial and industrial operations but complete closures of towns and countries for different time spans. This pandemic has severely affected the way in which normal activities-whether personal or commercial are carried out. The first human cases of Covid-19, the disease caused by the novel coronavirus causing Covid-19, subsequently named SARS-CoV-2 were first reported in early December 2019 [10]. Since then this, infection has spread across various national boundaries necessitating tough measures.

The first case of Covid-19 infection was reported in India on 30th January 2020 and since then the numbers have shown steep rise. To contain the spread of disease, the first countrywide lockdown was put in effect on 24th March 2020 for twenty one days which was termed as the biggest and the most severe action undertaken anywhere to stop the spread of coronavirus [11]. To stop the spread of this virus this first lockdown was extended till 3rd May and then further till 17th May which was further extended till 31st May [12]. The complete lockdowns were eased in a phased manner and reinforced whenever and wherever necessary. The following diagram shows the timeline of Covid-19 outbreak and the preventive measures taken to stop its spread in India.

Figure1: The timeline of Covid-19 outbreak and the preventive measures to control the spread of Covid-19 in India

- Jan 30 • First Covid-19 case reported
- Feb 3 • E Visa facility suspended for Chinese citizens
- Feb 26 • 14 day quarantine for travelers from Covid-19 affected countries and medical screening
- Mar 3 • Suspension for all visas for Italy, Iran, South Korea, Japan and China
- Mar 4 • Universal screening of all International flights
- Mar 16 • Physical distancing measures
- Mar 23 • Closure of flights, railways and immigration checkpost in India
- Mar 24 • National lockdown 1.0
- Apr 15 • National lockdown 2.0
- May 4 • National lockdown 3.0
- May 18 • National lockdown 4.0

Source: Authors' own representation of events

This pandemic has severely affected the way in which normal activities-whether personal or commercial are carried out. The spread of Covid-19 and the measures taken to contain the spread of this virus have not only affected the way in which commercial activities are carried but it has also affected the manner in which investments have taken place. The investment activities during these times of pandemic have effected not only the performance of stock market but also other investment markets. It becomes crucial to analyse the effect of spread of this pandemic on the investment environment. Capital markets are one of the most significant intermediaries for studying investment environments. World over the impact on commercial activities has significantly affected the asset returns in the last year. Post July 2020, India has experienced an unprecedented rise in number of confirmed Covid-19 cases. Hence it becomes important to assess the rise of Covid-19 cases on the financial markets of India. As such, this working paper in its current form aims to achieve the following:

1. To assess the impact of spread of pandemic in Indian financial markets
2. To identify abnormalities observed in different financial markets returns during the selected period
3. To identify any black swan effect of Covid-19 on NIFTY50index
4. To detect the effect of different market segments on NIFTY50 returns

Literature Review:
Researchers in the past have focused their attention on gauging the effect of various disasters on the economic and investment activities. While Haacker (2004) discussed the economic implications of the HIV/AIDS pandemic for government finance and public services [13], Santaeulalia-Llopis (2008) studied the consequences of the AIDS epidemic for economic development [14]. Lee & McKibbin (2004) provided an assessment of the global economic costs [15]. Apart from the global researches, there have been studies which have assessed the effects on the epidemics on specific geographies. Verikios, McCaw, & Harris (2010) estimated the macroeconomic effects of H1N1 epidemic on Australia [16], Brouwers, Camitz, Anders Tegnell, & Boman (2009) projected the costs to Swedish economy due to H1N1 influenza [17], Qui, Chu, Mao, & Wu (2018) discussed the impact of SARS in 2003 and H7N9 in 2013 in China [18].

Though this pandemic is a relatively new phenomenon yet there is rapidly growing literature focused on this. Various studies have been undertaken to study its impact on world [19], advanced as well as emerging markets [20], sub Saharan Africa [21], United States [22], China [23], India [24] to mention a few. The impact of this pandemic has not been limited to manufacturing and consumption but also the financial markets. While Erdem (2020) has analysed the relationship between freedom of countries and their stock market movements in response to Covid-19 outbreak in 75countries [25], Jhang, Hu, & Ji (2020) have explored the direct and spillover effects of Covid-19 on stock markets of eight countries [26], Gunay (2020) has examined the influence of Covid-19 on six different markets [27]. Apart from the studies involving multiple geographies, there have been country specific studies as well. Kartal, Depren, & Depren (2020) have examined the causes of the main stock exchange index changes in Turkey [28], Alawadhi, Al-Saifi, Al-Awadhi, & Alhammadi (2020) have investigated the effect on Chinese stock markets [29], Mazura, Dang, & Vega (2020) have studied the differential stock reactions for United States of America [30].

Data and Methodology:
Numerous methods have been applied to study impact of Covid-19 on financial markets by various experts. Gurav & Kotrappa (2020) have designed Log Bilinear and Long Short term memory (LBL-LSTM) to analyse impact of the pandemic COVID-19 on stock market performance [31] whereas Jhang, Hu, & Ji (2020) have used the conventional *t*-tests and non- parametric Mann–Whitney tests to fulfil their research objectives [32]. Alawadhi, Al-Saifi, Al- Awadhi, & Alhammadi (2020) applied panel testing to examine the relative performances of stocks in relation to Covid-19, while controlling for firm-specific characteristics [33].

The period of the current study investigates daily movement in the selected variables from 30th January 2020 to 23rd September 2020. 30th January 2020 was the date when the first Covid- 19 confirmed case was registered in India. Consequently, the time frame for this study commences from 30th January with an intention to anticipate effect of rise in daily confirmed cases of Covid-19 on the movement in stock market. The study also considers that Covid-19 has not only affected the stock markets but also had influenced the commodities markets. Consequently, to assess the impact of pandemic on commodities, the study encompasses commodities market as well. There have been no studies which has established any movement in commodities market due to the ongoing pandemic. However, the authors are of the opinion, that commodities market in the current scenario play a pivotal role in overall investment environment in India. Investors generally hedge their positions across different markets basically with an intention to diversify and

safeguard their returns from unprecedented and unexpected shocks [34].

To achieve the aims of this study secondary data has been congregated. The stock market index chosen is NIFTY50 because it constitutes of fifty companies as compared Bombay Stock Exchange (BSE)'s SENSEX which is based on active trading of thirty companies. Also NIFTY has a broader coverage of twenty four sectors as compared to thirteen sectors of SENSEX [35].

In order to assess the impact of Covid-19 on sectorial indices, the study has incorporated NIFTY Midcap and Small cap indices. To assess the impact on other investment markets, MCDEX Composite index published by Multi Commodity Exchange of India has been used (COMEX). Number of confirmed cases of COVID-19 has been considered as a proxy of pandemic and have been collected from the WHO website. For meaningful achievement of the purpose of study, daily data of the above parameters have been collected for all working days from 30th January 2020 to 23rd September 2020. Data for Saturday, Sunday and other public holidays when trading was not functional have been emended from this dataset. The dispersion of data across chosen time series is shown in table 1.

Table 1: Summary Statistics

	Mean	Median	Minimum	Maximum
NIFTY50	10633	11048	7610.3	12362
Comex	9426.9	9577	7926.9	10839
Covid-19	9.03E+05	79987	0	5.73E+10
NMidcap	4221.5	4284.1	2905.1	5038
NSmallcap	2400.6	2379	1610.9	3087.2

	Std. Dev.	C.V.	Skewness	Ex. kurtosis
NIFTY50	1224.1	0.11513	-0.42831	-0.97337
Comex	805.33	0.085429	-0.18789	-1.3118
Covid-19	1.49E+06	1.6441	1.7581	1.9845
NMidcap	572.2	0.13554	-0.39131	-1.0258
NSmallcap	454.72	0.18942	-0.053634	-1.4328

The dynamics of time series data of the selected variables and its movement is represented in figure 2.

Figure 2: Time Series Plot of Variables
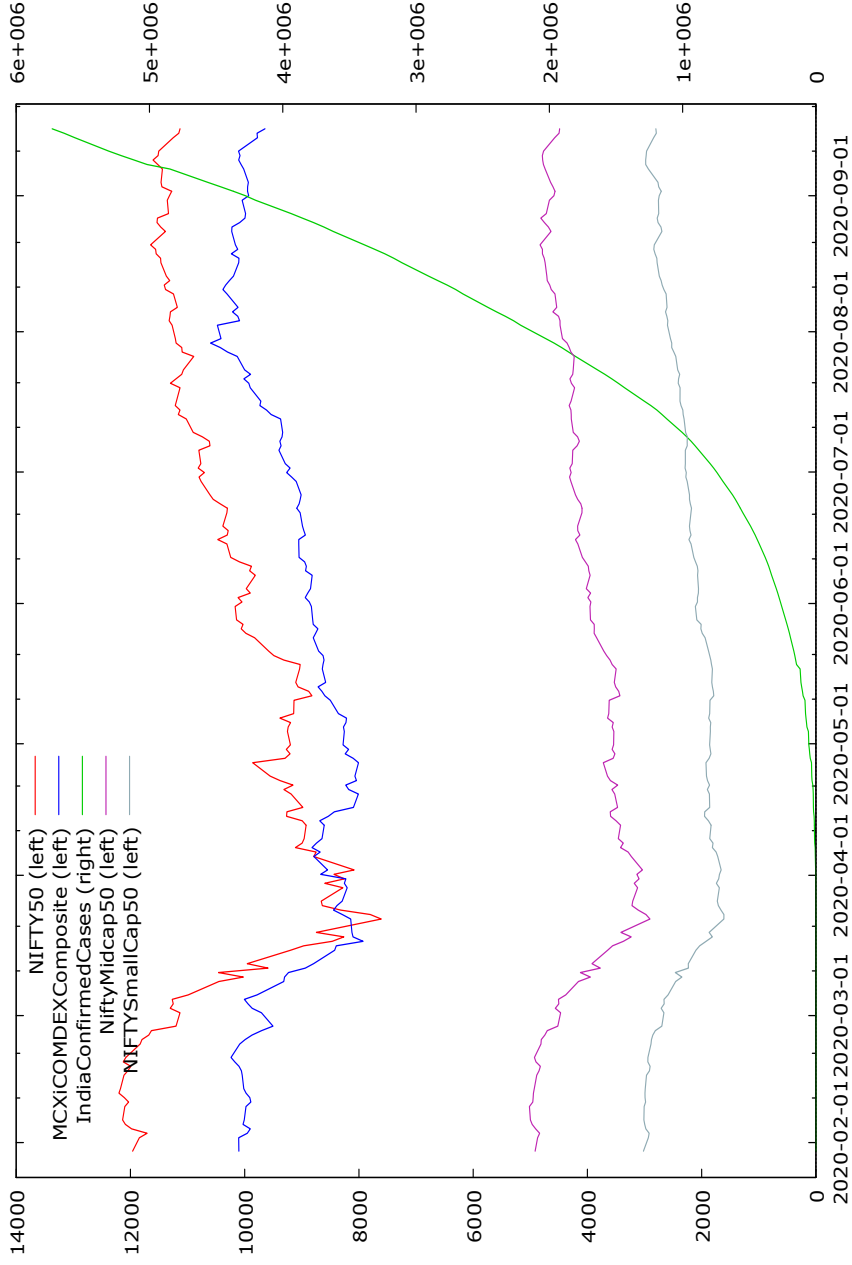
Stock returns data covers three indices, viz NIFTY50, NIFTY Midcap and NIFTY Smallcap. All selected indices data is taken from the NIFTY indices website. To quantify aggregate stock returns for all the three selected indices, first difference of the natural log of the daily closing value of NIFTY50 index $\{DNIFTY50^{agg} = 100 * (lnNIFTY50_t - lnNIFTY50_{t-1})\}$ has been calculated. In this same manner aggregate stock returns on Midcap and Smallcap indices have been calculated. Thus, the stock returns on NIFTY Midcap and NIFTY Smallcap indices are represented as follows-

$DNMidcap^{agg} = 100 * (lnNIFTYMidcap_t - lnNIFTYMidcap_{t-1})$ $DNSmallcap^{agg} = 100 * (lnNIFTYSmallcap_t - lnNIFTYSmallcap_{t-1})$ $DComex^{agg}$
$= 100 * (lnComex_t - lnComex_{t-1})$

Figure 3: Asset Returns and Rate of COVID-19 cases
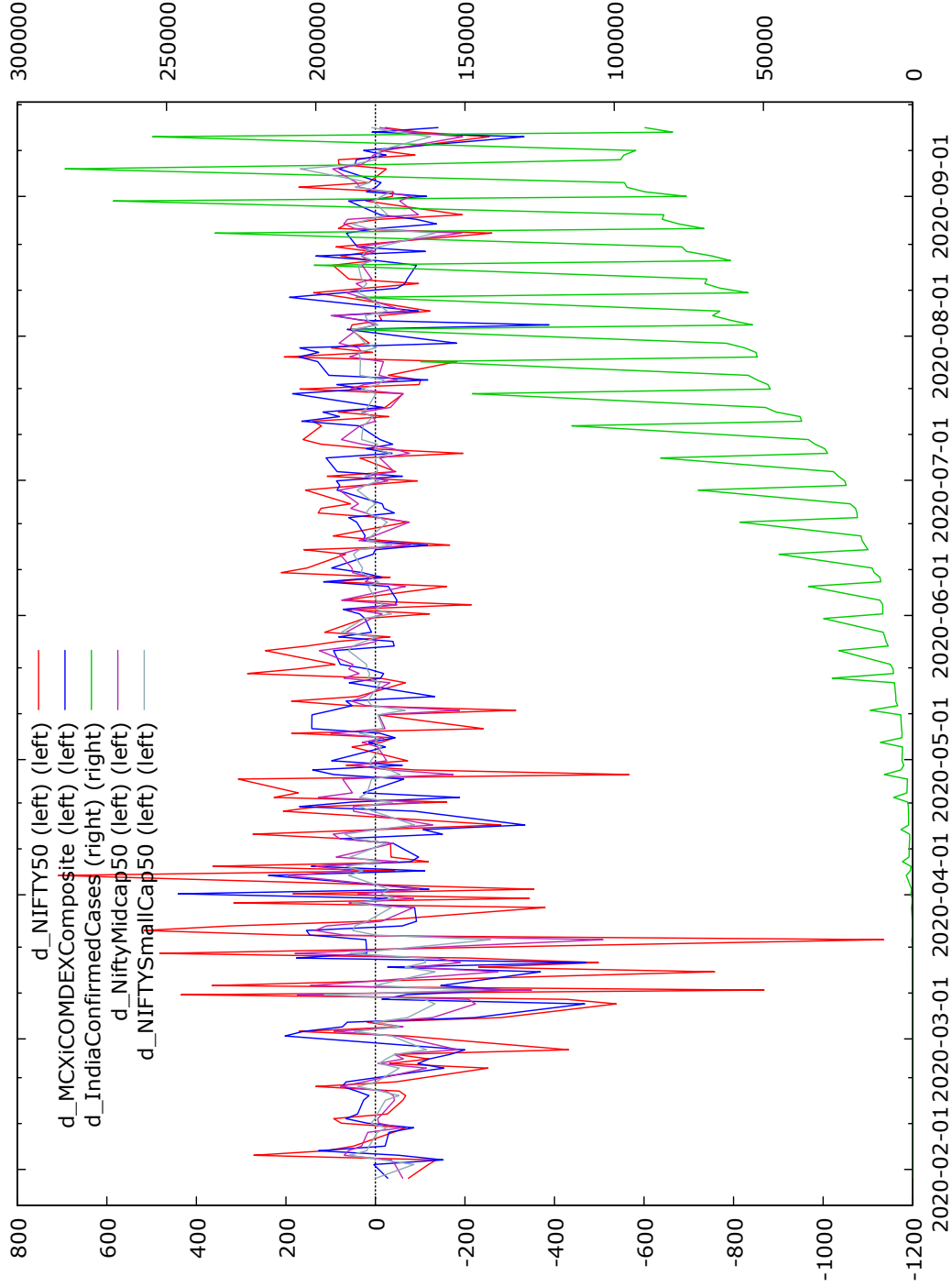
In order to assess the Covid-19 shocks on stock market, daily data of confirmed cases reported by WHO for India have been considered. In literature many experts have taken number of confirmed cases and death rate both as a proxy for Covid-19. However, for the purpose of this study, only the confirmed cases for COVID-19 have been

utilized [36]. The study measures the expected change in COVID-19 ($\Delta \check{C}_t$) by using the following process:

$$\Delta \check{C}_t = 100 * (lnC_t - lnC_{t-1})$$

Methodology
The empirical investigation is conducted by running a regression model on NIFTY50 returns through three different models, viz.

Model I: $DNIFTY50_t = \alpha + \beta_1 \Delta \check{C}_t + \beta_2 DComex_t + \varepsilon_t$

Model II: $DNIFTY50_t = \alpha + \beta_3 \Delta \check{C}_t + \beta_4 DNMidcap_t + \beta_5 DNSmallcap_t + \epsilon_t$

Model III: $DNIFTY50_t = \alpha + \beta_6 \Delta \check{C}_t + \beta_7 DComex_t + \beta_8 DNMidcap_t + \beta_9 DNSmallcap_t + \theta_t$

In all the three models NIFTY50 returns are taken as a dependent variable and Covid-19, Midcap index, Small Cap index and Comex index are considered as independent variables. The three error terms ε_t, ϵ_t *and* θ_t represent those factors which are not a part of the current model framework and comprise of other factors. The OLS results derived from the estimation are shown in the following Table 2.

Table 2: OLS estimation, Dependent Variable: DNIFTY50 returns

Variable	Model I	Model II	Model III
Const	0.1125 (0.1682)	0.0045 (0.0650)	0.01185 (0.0646)
DCovid	−0.0096 (0.0111)	0.00061 (0.0016)	0.0001 (0.001)
DComex	0.6393*** (0.1695)		0.1288** (0.0553)
DNMidcap		0.9652*** (0.1004)	0.9502*** (0.0921)
DNSmallcap		−0.05835 (0.09321)	−0.0690 (0.0901)
Diagnostics			
Adujsted R Square	0.139966	0.862274	0.866425
Hetro	8.28E-21***	0.02308***	0.0507***
Norm	5.21E-18	0.0295731	0.040343
LM	0.017059	0.165777	0.296867

Note: Table 2 represents OLS estimation of Model 1, 2 and 3 over the period from 30thJanuary 2020 to 23rd September 2020 with 165 days of observations.

Figures in the brackets represent standard errors of coefficients.

Hetro is Breusch-Pagan test for heteroskedasticity (p-value) with H0: heteroskedasticity not present.

Norm is Test for normality of residual (p-value) with H0: error is normally distributed.

LM is the LM test for autocorrelation (p-value) with H0: no autocorrelation.

***Indicates statistical significance at the 1% level

**Indicates statistical significance at the 5%level

*Indicates statistical significance at the 10%level

The above table for OLS estimation of all the three models reveals that estimated stock market response to Covid-19 confirmed cases rise is very less and statistically insignificant. Similar results are derived with all the three models for the given sample. However the same cannot be inferred with respect to other variables in the study. In model I, the commodity market index has influenced the NIFTY50 returns considerably and the impact is statistically significant. With regard to Model II and III, it is observed that the Midcap index has played a dominant role in affecting the movement of NIFTY50 returns. Majority of the change in NIFTY50 is explained by the movement in Midcap index. Though Smallcap index had been volatile, yet its impact on NIFTY50 is low and insignificant.

To improve the goodness of fit of the current estimation, when sectoral variables of stock market have been included, the adjusted R square increases from 13% in Model I to 86% to Model III. The test of heteroskedasticity at 5% level of significance, reveals that the null hypothesis of absence of hetroskedasticity in the model is rejected and hence hetroskedasticity is assumed in the model specification. Still this will lead to unbiased coefficient however, efficiency will be challenged. For normality of residuals, the p-value derived from the test is less than 5% level of significance, hence, the null hypothesis is rejected and it can be inferred that residuals are not normally distributed. The overall findings derived in the Table 1 are structurally unable to explain the stock market response to Covid-19. During March 2020 the market witnessed volatility clustering however, due to lack of statistical significance this clustering cannot be associated with the rise in confirmed cases of Covid-19. Consequently, to investigate further for any possible structural relationship between market returns and Covid-19 during the months of volatility clustering, the study divides the total time period into three quarters. The detail of these three quarters formation is given in Table3.

Table 3: Quarter formation

Quarters	Start and end date	No. of days
First Quarter	30th January 2020 to 31st March 2020	44
Second Quarter	1st April 2020 to 30th June 2020	60
Third Quarter	1st July 2020 to 23rd September 2020	61

All the three models of the study have been estimated with respect to each of the quarter formed as mentioned in Table 3. During the first quarter the estimation results for the three defined models viz Model I, Model II and Model III are exhibited in Table 4.

Table 4: First Quarter OLS estimation, Dependent Variable: DNIFTY50 returns

Variable	Model I	Model II	Model III
Const	0.0661 (0.401908)	0.250 (0.117)	0.321 (0.0140)
DCovid	−0.0118 (0.012)	−0.00035(0.0009)	−0.0010(0.1753)
DComex	1.051*** (0.187)		0.185*** (0.0008)
DNMidcap		0.9432*** (0.0799)	0.891*** (2.09e-034)
DNSmallcap		0.033 (0.097)	0.0496 (0.5656)
Diagnostics			
Adujsted R Square	0.23156	0.956	0.9616
Hetro	2.52E-03	0.8053	0.2965
Norm	7.63729e-005	0.0345	0.0293
LM	7.27E-04	0.0345	0.0293

Note: Table 4 represents OLS estimation of Model I, II and III over the period from 30th January 2020 to 31st March 2020 with 44 days of observations.
Figures in the brackets represent standard errors of coefficients.
Hetro is Breusch-Pagan test for heteroskedasticity (p-value) with H0: heteroskedasticity not present.
Norm is Test for normality of residual (p-value) with H0: error is normally distributed.
LM is the LM test for autocorrelation (p- value) with H0: no autocorrelation.
***Indicates statistical significance at the 1% level
**Indicates statistical significance at the 5% level
*Indicates statistical significance at the 10% level

The first quarter was the quarter when the stock market witnessed major volatility clustering especially towards the end of the quarter. The results derived are similar to the overall trend shown in the entire period sample selected earlier for the study. The rise of Covid-19 confirmed cases did have a negative impact on the NIFTY50 returns however, this impact was not statistically significant. On the contrary, returns from commodities index was much volatile and had positive impact on the NIFTY50 returns. The change in commodities index was not only in line with the movement in NIFTY50 but also the impact was statistically significant. Model II for first quarter continued to show negative impact of Covid-19 cases on NIFTY50 returns, this time the coefficient value was extremely low. However, Midcapindex returns dominated the impact on the NIFTY50 returns majorly and this impact was statistically significant with 94% of movement in NIFTY50 returns explained by the change in Midcap index. Combining all the explanatory variables into Model III, it was observed that rise in Covid-19 cases had negligible impact on NIFTY50 returns. However, the NIFTY50 returns were predominantly affected by two variables viz commodities returns and Midcap returns. Model III with more explanatory variables has shown improvement in goodness of fit as the value of adjusted R square strengthened from 23% in Model I to 96% in Model III. While considering all four explanatory variables it was observed that the p-value is less than 5%. This proves that there is no reason to accept the null hypothesis of no autocorrelation among the variables. Consequently, it can be said that for the first quarter autocorrelation was present among all the four variables.

Table 5: Second Quarter OLS estimation, Dependent Variable: DNIFTY50 returns

Variable	Model I	Model II	Model III
Const	−0.0818 (0.4053)	−0.2112 (0.1859)	−0.2027 (0.1820)
DCovid	0.0309 (0.0336)	0.01106 (0.0119)	0.0085 (0.0106)
DComex	0.3107 (0.2280)		0.1439 (0.1014)
DNMidcap		1.0031*** (0.1536)	0.9850*** (0.1478)
DNSmallcap		−0.0868 (0.1450)	−0.0768 (0.1464)
Diagnostics			
Adujsted R Square	0.060975	0.78006	0.783538
Hetro	6.42E-05	0.284249	0.551412
Norm	5.99E-02	0.459593	0.621016
LM	0.418146	0.224809	0.359423

Note: Table 5 represents OLS estimation of Model I, II and III over the period from 1st April 2020 to 30th June 2020 with 60 days of observations.

Figures in the brackets represent standard errors of coefficients.
Hetro is Breusch-Pagan test for heteroskedasticity (p-value) with H0: heteroskedasticity not present.
Norm is Test for normality of residual (p-value) with H0: error is normally distributed.
LM is the LM test for autocorrelation (p- value) with H0: no autocorrelation.
***Indicates statistical significance at the 1% level
**Indicates statistical significance at the 5% level
*Indicates statistical significance at the 10% level

Table 5 gives the estimation result for three models for the period starting from 1st April 2020 to 30th June 2020. The impact of Covid-19 on NIFTY50 returns is difficult to establish in the second quarter as the value of coefficient was low and not statistically significant. In case of Model I the commodities index movement had some impact on NIFTY50 returns however, this movement was not statistically significant. Moreover, the goodness of fit was extremely low with errors not normally distributed as the p-value from test of normality was lower than 5% level of significance. Model II showed similar trend as in first quarter where Midcap index exhibited statistically significant impact on NIFTY50 returns. It was also observed that the movement in Nifty Midcap returns during the second quarter was more than the movement in the NIFTY50. This influence of Midcapon NIFTY50 returns continued in the Model III where all explanatory variables were clubbed together. Of the selected variables in Model III, Midcap volatility had significant impact on the NIFTY50 returns. The adjusted R square value suggests that three explanatory variables explain approximately 80% variations in the NIFTY50 returns. The robustness of Model III indicate absence of heteroskedasticity, normally distributed residuals and no autocorrelations among the explanatory variables for the quarter two.

Finally, estimation for the models for the third quarter is carried out and the result are represented in table 6. Model I re-establishes the negative impact of Covid-19 on NIFTY50 returns and positive impact of commodity index on the NIFTY50 returns as observed for full time period and quarter I. However, in quarter 3 neither Covid-19 nor commodity index had any statistically significant impact on the NIFTY50 returns. With respect to the results obtained from Model II, Covid-19 had negligible impact however, Midcap continued to significantly impact the NIFTY50 returns. The impact of Midcap movement had been statistically significant on NIFTY50 returns, even during the third quarter. The value of Midcap coefficient reduced and now approximately 52% variation in NIFTY50 returns is explained by the Midcap movement. This impact of Midcap on NIFTY50 has reduced progressively. Comprehensive Model III shows that Midcap variations have not only been large but have also been statistically significant to influence the NIFTY50 returns while other variables like Covid-19, commodities index and Smallcap had small but negligible statistically significant impact.

Table 6: Third Quarter OLS estimation, Dependent Variable: DNIFTY50 returns

Variable	Model I	Model II	Model III
const	0.2232 (0.2014)	−0.0065 (0.1202)	0.01104 (0.1265)
DCovid	−0.0285 (0.0568)	0.01451 (0.0258)	0.0096(0.0278)
DComex	0.1887 (0.1247)		0.036182 (0.0683)

DNMidcap		0.5618*** (0.1277)	0.5589*** (0.1269)
DNSmallcap		−0.0176 (0.1305)	−0.0220 (0.1328)
Diagnostics			
Adjusted R Square	0.0106	0.5237	0.5168
Hetro	1.55E-01	0.1277	0.2395
Norm	1.81E-01	0.1548	0.1250
LM	0.9528	0.7975	0.7079

Note: Table 6 represents OLS estimation of ModelI, II and III over the period from1ˢᵗJuly 2020 to 23ʳᵈ September 2020 with 61 days of observations.
Figures in the brackets represent standard errors of coefficients.
Hetro is Breusch-Pagan test for heteroskedasticity (p-value) with H0: heteroskedasticity not present.
Norm is Test for normality of residual (p-value) with H0: error is normally distributed.
LM is the LM test for autocorrelation (p- value) with H0: no autocorrelation.
***Indicates statistical significance at the 1% level
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*Indicates statistical significance at the 10% level

Conclusion

Covid-19 has not only impacted the human health but also economic health of nations. The economic health of a country can be measured by the movement of its financial markets. In order to assess the impact of Covid-19 on the Indian financial markets, this study was undertaken. Variables like the rise in number of Covid-19 cases, movements in Midcap, Smallcap and commodity index were incorporated to assess their impact on NIFTY50 returns. The rise in number of Covid-19 cases started post June 2020, however, major volatility in Indian financial markets was observed during the month of March 2020. Consequently, to find the root cause of such volatility clustering, the time series was staggered into three quarters. Classification of time period showed the volatility clustering was predominantly observed during the first quarter which subsequently eased during the second and third quarter.

Using a multi model approach, it was discovered that during the entire period of study, rise in Covid-19 cases in India did not affect the NIFTY50 returns. This analysis showed that Midcap index movement and commodity movement were dominant variables in affecting the NIFTY50 returns. Thus, the outcome suggests that the spread of Covid-19 cases in India did not demonstrate any black swan effect for financial markets in the country. However, the result does not trace the causality of volatility clustering to Midcap and Comex movement only as volatility was observed in Midcap and Comex movements as well. Nevertheless, the volatility may have been caused due to other factors. It is supposed that this volatility could be traced to rapid spread of pandemic in foreign countries which forced Indian market to correct and discount before the pandemic could hit the subcontinent.

The study proposes future research could provide more answers to these pertinent questions and trace the causality to other factors cited in contemporary literature. It can also be researched whether the findings are similarly observed in other countries as well. The current research can be extended further to different set ups to observe the replication of the results gained in this study.

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