Repercussions of COVID-19 on the Indian Stock Market: A Sectoral Analysis

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Abstract---The present paper determines the repercussions of the coronavirus on the Indian financial markets by taking the eight sectoral indices into account. By taking the sectoral indices into account, the study deduces the impact of virus outbreak on the various sectoral indices of the Indian stock market. Employing Welch's t-test and Non-parametric Mann-Whitney U test, we empirically analysed the daily returns of eight sectoral indices: Nifty Auto, Nifty FMCG, Nifty IT, Nifty Media, Nifty Metal, Nifty Oil and Gas, Nifty Pharma, and Nifty Bank. The results unveiled that pandemic had a negative impact on the automobile, FMCG, pharmaceuticals, and oil and gas sectors in the short run. In the long run, automobile, oil and gas, metals, and the banking sector have suffered enormously. The results further unveiled that no selected indices underperformed the domestic average, except NIFTY Auto.

Keywords---coronavirus, financial markets, lockdown, pandemic, stock market.

Introduction

COVID-19 was recognized in China in December 2019. The highly contagious virus continued to increase to the other provinces of China in January 2020 and

later on proliferated across the globe. World Health Organization (WHO) announced global emergency on January 30, 2020, and thereafter COVID-19 is turning out to be one of the consequential health crises in the world's history.

In case of India, first COVID-19 case was accounted for on January 30, 2020. In India's context, it has tackled diseases such as smallpox, polio, etc. in the past. However, India has not confronted any highly contagious disease outbreak in history. Undeniably, the healthcare sector in India is relatively weak. India's health sector suffers from inadequate investment in the public sector and unregulated medical technology and education commercialization. Besides, the lack of accountability of the public sector doctors and the rising treatment costs in the private sector ensure that healthcare services remain beyond the marginalized population (Baru et al., 2010). Therefore, in the battle against COVID-19, India needs to ramp up testing, contact-tracing and confirmed patients' isolation. It is also rudimentary to train the medical personnel, especially in rural areas. This pandemic iterates for collaboration between the public and private sectors; both the industries shall pool their assets through a Public-Private Participation (PPP) model (Kanca et al., 2020).

In response to COVID-19, India's government adopted a lockdown policy and imposed restrictions on international travel and internal mobility, the shutdown of institutions and public facilities (Rahayu et al., 2021). With social distancing norms being followed by public and stringent lockdown measures being taken up by the government, it is evident that it will have a detrimental impact on the economy. The construction and transportation activities have come to a halt due to the migrant workers' mass exodus. This causes a disbalance in the demand and supply chains, thereby affecting households' and firms' savings and investment behavior (Gupta et al., 2021). Therefore, it is proper to say that the health crisis is turning out to be an economic crisis not only for India but also for the world economy. According to the IMF, the Indian economy will experience shrinkage of 4.5 percent in the fiscal year 2020. Centre for Monitoring Indian Economy (CMIE), a Mumbai-based independent economic think tank that provides insights for the Indian economy by providing a database and forecasted 23.5% unemployment rate in May 2020. With such a high unemployment rate and contraction on GDP, it becomes difficult for the policymakers to pave a path for the economy's V-shaped recovery.

It is imperative to note here that India had notably experienced a slowdown even before the COVID-19 strike. This pandemic has done nothing but "added fuel to the fire." It appears that even after the announcement of the commercial package to ramp up the economic growth, it will take a long time for India to recoup, although lockdown has been lifted (Romdhani, 2020).

Stock markets are often seen as an economic barometer of a country; a continuous healthy condition tends to attract domestic and foreign investments (Kustina et al., 2019). These investments, in turn, increase the financial health of the country. In 2019, the Indian stock market was thriving. Both significant indices Sensex and Nifty 50, which are arguably the most accurate representatives of India's stock market in the world press, continued to have positive returns. In January, about 30 companies were close to filing Initial Public

Offers (IPOs). Ever since the COVID-19 hit, the stock markets plummeted and loomed under economic uncertainty.

Literature review

Analysing the impact of an event on the stock markets to assess the economic repercussions is not a new research interest of scholars (Chen & Siems, 2004 and Abadie & Gardeazabal, 2003). Historically, various studies have conducted to examine the macroeconomic impact of past pandemics in terms of lost output and growth, however it is still difficult to conclude long term impact (Bell & Lewis, 2005). The scholars and academicians have restricted their scope of the study of past pandemics to short term economic repercussions through assessing stock market, trade, tourism, fertility rate, etc. (Jonung & Roeger, 2006).

The most notable event that had a catastrophic impact on the global stock market is perhaps crisis of 2008. The question about the origin of the crisis is a hotly debated question because of the plethora of articles tracing the origin of this event (Ramskogler, 2015). The vast literature available on the financial crisis of 2008 has been summarised in Table 1.

So far, the SARS epidemic is investigated the most by the thinkers and researchers. A vast literature is available on the ramifications of the SARS. Smith (2006), judged the role of cognizance of risk, enacted in propelling the SARS outbreak's economic consequences. By considering the public health response, media, and communication role, he commented that the exponential proliferation of infectious disease does not necessarily significantly impact the economy; however, an outbreak can have considerable influence. Nippani & Washer (2004), attempted to scrutinize the SARS outbreak's outcome on the leading stock indices of sternly affected nations by comparing the post-SARS period's daily stock returns with the previous period. They found out that the outbreak didn't entail a malignant effect on the stock indices, except China and Vietnam. Chen et al. (2007), focused upon the reaction of Taiwanese hotel stock prices to the epidemic and documented a severe deep and lasting effect on the hotel industry. Lee & McKibbin (2004), attempted to gauge the global economic desolation caused by the SARS epidemic by employing the G-Cubed Model (Asia-Pacific). Their empirical estimates revealed that the SARS outbreak's effect is massive in China and Hong Kong. Further attempts were made by Hai et al. (2004), to inspect SARS's economic impact. Their investigation indicates that China's travel and tourism sector suffered the most and estimated that foreigners' tourism revenue will decline by 50 to 60 percent compared to income in 2002. They concluded this would result in a loss equivalent to US dollar 25.3 billion to the Chinese economy.

Table 1
Relevant literature on the financial crisis of 2008

Authors	Focus of the Study	Findings/Conclusion	Place
Reinhart & Rogoff (2009)	Aftermath of Financial Crises	Financial crises have documented severe deep and lasting effects	United States

		on asset prices, output, and employment.	
Kumar (2009)	Policy Response and Impact of Financial Crisis on India	Three transmission routes that affected India were the financial sector, exports and exchange rates.	India
Bentolila et al. (2018)	Banks bailed out by the Spanish government	24% of job losses at firms attached to weak banks	Spain
Stiglitz (2010)	Origins of the financial crisis	Placed the onus of responsibility for the failures on the financial system	
Bezemer (2011)	Scrutinized the work of twelve economists who warned of the crisis	If economics is relevant to reality, then it should turn away from an individualistic view and toward a systemic view of the economy.	
Bagliano and Morana (2012)	Channels of transmission of macroeconomic and financial shocks	Documented stronger evidence of an asset prices channel over liquidity channel.	United States and the rest of the world
Mian and Sufi (2010)	Lessons to be learnt from great recession and understanding the link between household finance and the real economy	Emphasized that microlevel data is now widely available and is updated at quarterly frequency or higher, making them highly useful for policy work.	United States
Jagannathan et al ., (2013)	Root cause of the financial crisis	Fundamental cause of the crisis is the huge labor supply shock the world has experienced	United States and the developing countires
Nachane and Shashidul Islam (2012)	Effect of financial crisis on South Asia	Effect south Asia via declining trade volumes, asset deflation and exchange rate pressure.	South Asia

The literature on the SARS epidemic is wide. It is vital to understand the previous outbreaks that the world has suffered from to assess the corona pandemic. Taking past experiences into account to assist in determining the present facilitates a comprehensive overview. As pointed out by Hassan et al. (2020), the economic repercussions of corona pandemic can be examined by drawing up similarities between the SARS and the COVID-19 pandemic. However, many thinkers have contradicted this opinion. It is so because of the uncertainty about the COVID-19 and the lack of enough data. Furthermore, the mortality rate of COVID-19 stands at 2 to 4 percent, which is significantly lower than SARS (around 10%). Despite the similarities from the medical perspective, both the outbreaks' economic impact will tend to be different (Fernandes, 2020).

Many researchers have attempted to ascertain the pandemic's economic ramifications. Sumner et al. (2020), tried to gauge the effect of COVID-19 on poverty across the globe through shrinkage in per-capita household income. They remarked that the coronavirus outbreak poses a threat to one of the UN's ambitious goals to end poverty by 2030. Fernandes (2020), has stated that a global recession is inescapable, and service-based economies will severely be impaired. McKibbin & Fernando (2021), used the G-cubed model proposed by Lee & McKibbin (2004), and developed different scenarios to check the economic consequences. These scenarios were based on how the disease might evolve. The results demonstrated that even if the virus continues to spread in a restrained manner, it will have a sizable malignant impact on the world economy quickly. Ozili & Arun (2020), have projected a negative impact of lockdown, international travel restrictions, and lockdown days on economic activities and the stock market. Interestingly, confirmed COVID-19 cases tend to have an insignificant effect on the economy but a positive impact on the stock market.

From an Indian perspective, Dev & Sengupta (2020), have commented that the financial markets' sluggish performance in the pre-COVID period and high dependence of the economy on the labour from the informal sector and the social distancing measures and lockdown make the recovery path difficult (Zhang et al., 2020). Ray & Subramanian (2020) aimed at assessing not only the economic cost, i.e., reduction of the production of GDP, but also psychological and physiological prices (extreme stress, violence, and starvation) that are invisible, but the conjunction of the costs makes the propulsion of Indian economy harder. Kumar (2020), commented that the Indian tourism sector faces unprecedented challenges; being a foreign exchange source, the Indian economy will be adversely impacted.

Studies investigating the consequences of the Corona pandemic on the stock markets are limited, and most of the studies are conducted on developed nations. He et al. (2020), endeavoured to gauge coronavirus direct effects and spillovers on eight sternly affected nations' stock markets by comparing their daily returns after COVID-19 with the pre-COVID period. The findings revealed COVID-19 hurts the stock markets in the short run. However, they did not find any proof that stock markets underperformed in the long term. Liu et al. (2020), by using event study methodology to gauge 21 stock market indices of countries that are gravely affected by the COVID-19 pandemic, assessed the short-term economic

repercussions. Results indicated a sharp downfall of the states' stock market after the virus outbreak, and Asia observed higher negative abnormal returns compared to other countries. Ramelli & Wagner (2020) explained how, initially internationally oriented firms, mainly involved in trading with China, underperformed. As the virus unfurl rapidly to the USA and Europe, corporate loans and cash holdings emerged as the critical value drivers. In case of India, Ashri & Sahoo (2021), have pointed out that the nationwide lockdown proved to be detrimental to the Indian stock market. However, Alam et al. (2020), have provided empirical results that market reacted positively during the period of February to April 2020. In an attempt to measure the extent of the effect of COVID-19 on stock market returns, Khanthavit (2021), found COVID-19 induced returns to be highly volatile. Herwany et al (2021), confirms severe impact of the pandemic on the Indonesian Stock Exchange resulting negative market returns. Zainuri et al. (2021), argues that good news has a dominant influence on advancing composite stock price index (IHSG) movements in Indonesia, but bad news can also damage the confidence of the investors.

After searching the extensive literature available, limited studies are carried out to check the pandemic's economic repercussions on India's financial markets. Therefore, we plan to inspect Coronavirus's effect on the Indian stock market by looking at the sectoral indices through this review (Lima et al., 2020; Ali et al., 2020).

Objective of the study

In a developing nation like India, it takes more time to bounce back to normal operations and stabilize the situation. On the one hand, some industries, such as tourism, hotels, and airlines, will take a longer time to rebound. On the other hand, initiatives such as FMCG, pharmaceuticals, etc. are less affected and recover faster. Considering that there are limited studies available, to the best of our knowledge, which endeavour to deduce the effect of COVID-19 specifically on the sectors of Indian economy, we aim to determine the effect of the corona pandemic on the sectoral indices of the Indian stock market.

Methodology

To ascertain the coronavirus outbreak's impact on India's financial markets, eight sectoral indices are chosen: Nifty Auto, Nifty FMCG, Nifty IT, Nifty Media, Nifty Metal, Nifty Oil and Gas, Nifty Pharma, and Nifty Bank. In the present paper, the data for stock indices' daily returns are retrieved from the web portal of investing.com.

To derive the precise chronology of the occurrence and the eventual spread of COVID-19 in India, the web portal wikipedia.com is examined. On January 30, 2020, the first COVID-19 case was detected, and after that, the number of confirmed cases started increasing exponentially. Early death from COVID-19 was reported on March 12, and in the same week, the confirmed cases reached a mark of 100. This compelled government to resort to a lockdown policy, and lockdown was imposed on March 24, 2020. This led to public institutions, offices, universities, and international and domestic travel restrictions. On April 14, the

lockdown was extended, with conditional relaxation after April 20 in the regions where the coronavirus spread was minimal. On May 30, lockdown restrictions were lifted, but the lockdown was extended till June 30 in the range's areas severely affected. From June 8, lockdown restrictions have been lifted nation-wide, and services are resuming in a phased manner.

For gauging the impact of COVID-19, the entire period is divided into three sub-periods, and essential events about COVID-19 in India identify main time points. From May 31, 2019, to January 29, 2020, is the first sub-period is used as a comparison period in the study (Albulescu, 2021). The second sub-period is defined from January 30, 2020, to February 29, 2020, as a "short-term window." The third sub-period is defined from March 1, 2020, to May 31, 2020, as a "long-term window." Empirical analysis has been divided into three sub sections in the present paper.

The first sub-section consists of graphical analysis as a part of preliminary analysis.

Second sub-section compares the daily returns of the selected indices in short term and long-term window with the comparison period. The hypothesis tested in this section is as follows:

Null Hypothesis (H0): There is no significant impact of the COVID-19 pandemic on selected indices' daily returns.

Alternate Hypothesis (H1): COVID-19 had a significant negative impact on selected indices' daily returns.

The hypothesis has been tested in both short-term windows as well as the long-term window in the second sub-section of empirical analysis. To test the hypothesis mentioned above, Welch's t-test and non-parametric Mann-Whitney U test has been employed. Usage of both of these tests to assess the impact of health/economic crisis on financial markets can be traced back to the work of Nippani & Washer (2004) and He et al. (2020). The advantages of employing the above-mentioned tests are well explained by Ruxton (2006) and Mcknight & Najab (2010). Furthermore, the suitability of the t-test for larger samples have been explained by Barrett & Goldsmith (1976).

In the third sub-section the returns of selected sectoral indices are compared to the domestic index NIFTY 50 in the short term and long-term window. To compare the returns of the selected indices with the domestic average Welch's t-test and Mann-Whitney U test is being employed.

Empirical Results

The empirical results of the study have been presented under three sub-sections. The first sub-section illustrates the daily returns of the stock indices via a graphical representation. The second sub-section test the hypothesis formed for the purpose of the study. The third sub-section deals with comparing the daily returns with the domestic average.

Graphical analysis

Figure 1 illustrates the performance of selected eight stock indices over the period from May 31, 2019 to May 31, 2020.
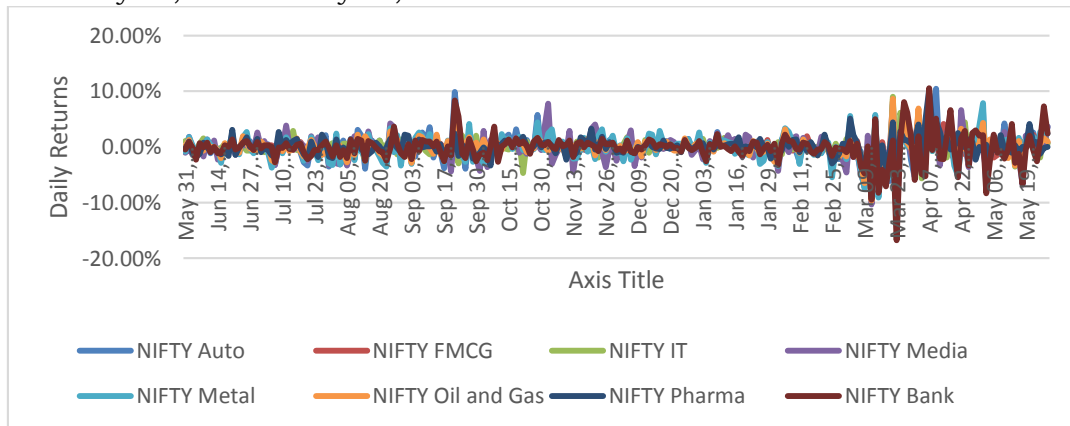

Figure 1. Daily returns of selected indices

Each point of the stock market graph is represented by daily returns. It has been observed that stock indices have witnessed fluctuations in the daily returns after February 29, 2020. This can be explained by the fact that COVID-19 outbreak intensified in the month of March and nationwide lockdown imposed by the government only added fuel to the fire (Ibarra-Vega, 2020; Ghosh et al., 2020). This created a pessimistic atmosphere for the investors, and thus causing such upward and downward swings in the daily returns. In the pre-pandemic period, the daily returns of the indices have been fairly stable expect during the month of September 2019 due to concerns over slowing of Indian economy.

Comparison of the daily returns of the selected indices to the comparison period

The results of Welch's t-test have been reported in Table 2. It is important to note here, Chen & Siems (2004), have argued that t-statistics essentially test the significance of the economic impact of an event on the capital market as measured by the deviation of index returns from their average. If the event had no consequence, one would expect an insignificant return deviation. Panel A shows the mean returns of the selected indices in the comparison period (from May 31, 2020 to January 29, 2020). Panel B compares the mean daily return in the short-term window with the comparison period. The results have revealed that only Nifty Auto have been adversely affected due to the spread of coronavirus. Surprisingly, none of the other sectoral indices have underperformed their comparison period.

In the long-term window, Panel C of Table 2 compares the mean daily returns in the long-term window with the comparison period. The results have revealed that automobile, oil and gas and pharma sector have witnessed a significant negative impact due to COVID-19 pandemic. It appears that other indices have yielded a negative (though insignificant) mean return, except Nifty FMCG.

Table 2
Difference in mean returns

Index	Mean	Variance	T-statistic
Panel A: Comparison Period (163 trading days)			
Nifty Auto	0.01%	0.03%	-
Nifty FMCG	0.03%	0.01%	-
Nifty IT	0.02%	0.01%	-
Nifty Media	-0.09%	0.03%	-
Nifty Metal	-0.04%	0.03%	-
Nifty Oil and Gas	-0.03%	0.01%	-
Nifty Pharma	0%	0.01%	-
Nifty Bank	0%	0.02%	-
Panel B: Short-term Window (22 trading days)			
Nifty Auto	-0.78%	0.02%	-2.42**
Nifty FMCG	-0.31%	0.01%	-1.45
Nifty IT	-0.35%	0.02%	-1.16
Nifty Media	-0.49%	0.04%	-0.92
Nifty Metal	-0.75%	0.06%	-1.31
Nifty Oil and Gas	-0.55%	0.02%	-1.49
Nifty Pharma	-0.46%	0.02%	-1.34
Nifty Bank	-0.25%	0.02%	-0.82
Panel C: Long-term Window (58 trading days)			
Nifty Auto	-0.1%	0.17%	-2.19**
Nifty FMCG	0.05%	0.09%	0.03
Nifty IT	-0.08%	0.12%	-0.22
Nifty Media	-0.54%	0.13%	-0.91
Nifty Metal	-0.22%	0.17%	-0.33
Nifty Oil and Gas	-0.02%	0.12%	1.04**
Nifty Pharma	-0.46%	0.02%	-0.34
Nifty Bank	-0.6%	0.22%	-1.01**

Note: *, ** represents statistical significance at 1% and 5% respectively

The results of non-parametric Mann-Whitney U test have been reported in Table 3. Nachar (2008), stated that the null hypothesis for Mann-Whitney U test stipulates that the two groups provided are homogenous, in other words they came from the same distribution. However, in case of one-tailed test the null hypothesis remains unchanged, but the alternate hypothesis stipulates the direction of change, negative or positive.

The results of Mann-Whitney U test are partly consistent with the results of Welch's t-test. Panel A of Table 3 suggests that automobile, media, oil and gas, and metal sector was already suffering in the pre-pandemic period. Panel B compares the median daily returns of the selected indices with the median daily returns of the comparison period. It appears that Nifty Auto has underperformed with their comparison period at 1% level of significance. Furthermore, Nifty FMCG, Nifty Metal and Nifty Pharma have experienced a significant (significant at 5%) negative impact due to the spread of contagious virus. However, median daily returns of the other indices are not statistically different than the median daily return of the comparison period. Panel C of Table 3 unveils that Nifty Pharma (at

5% level of significance) have outperformed their comparison period. It is tough to argue that the virus played a role of catalyst to turn these indices upward. However, the results indicate Nifty Auto, Nifty Oil and Gas, Nifty Metal and Nifty Bank have witnessed significant (at 1% level) negative daily returns.

Table 3
Differences in Median returns

Index	Median	Variance	U-statistic
Panel A: Comparison Period (163 trading days)			
Nifty Auto	-0.19%	0.03%	
Nifty FMCG	0.02%	0.01%	
Nifty IT	0.03%	0.01%	
Nifty Media	-0.11%	0.03%	
Nifty Metal	-0.12%	0.03%	
Nifty Oil and Gas	-0.05%	0.01%	
Nifty Pharma	0%	0.01%	
Nifty Bank	0.01%	0.02%	
Panel B: Short-term Window (22 trading days)			
Nifty Auto	-0.57%	0.02%	1812.5*
Nifty FMCG	-0.4%	0.01%	1218.5**
Nifty IT	-0.08%	0.02%	1581
Nifty Media	-0.54%	0.04%	1634.5
Nifty Metal	-0.72%	0.06%	1538
Nifty Oil and Gas	-0.66%	0.02%	1287.5**
Nifty Pharma	-0.38%	0.02%	1349**
Nifty Bank	-0.36%	0.02%	1708.5
Panel C: Long-term Window (58 trading days)			
Nifty Auto	-0.28%	0.17%	2428*
Nifty FMCG	0.09%	0.09%	2254.5
Nifty IT	0.54%	0.12%	2942
Nifty Media	-0.01%	0.13%	2886.5
Nifty Metal	-0.33%	0.17%	2931*
Nifty Oil and Gas	-0.17%	0.12%	2897*
Nifty Pharma	0.2%	0.02%	3348.5**
Nifty Bank	-0.54%	0.22%	1565*

Note: *, ** represents statistical significance at 1% and 5% respectively

Comparison of the daily returns of the selected indices to NIFTY 50

The returns of selected sectoral indices are compared to the domestic index NIFTY 50 in the short term and long-term window and the results are reported in the table 4. Table 4 compares the short term and long-term window of selected eight indices to the domestic average by employing Welch's t-test and Mann-Whitney U test. Looking at the results there is no strong evidence that sectoral indices differ from the domestic average significantly. Only statistically significant negative mean return over two windows was NIFTY Auto over the short-term window and long-term window. This can be explained by the fact that automobile industry in India was already suffering in the South-Asia region due to slackening of demand

and COVID-19 only added to the misery of the industry. Therefore, it suffered a comparatively stronger negative impact compared to the domestic average.

Table 4
Returns Relative to Domestic Index

Index	Mean	T-statistic	Mean	T-statistic
NIFTY 50	-0.37%	-	-0.22%	-
NIFTY Auto	-0.78%	-1.0032**	-0.10%	0.1732
NIFTY FMCG	-0.31%	0.1665	0.05%	0.4255
NIFTY IT	-0.35%	0.04368	-0.08%	0.2113
NIFTY Media	-0.49%	-0.2394	-0.54%	-0.4659
NIFTY Metal	-0.75%	-0.6356	-0.22%	-0.0018
NIFTY Oil and Gas	-0.55%	-0.4119	-0.02%	0.3084
NIFTY Pharma	-0.46%	-0.2127	0.48%	1.1282
NIFTY Bank	-0.25%	0.29769	-0.60%	-0.4783
Index	Median	U-statistic	Median	U-statistic
NIFTY 50	-0.39%	-	-0.05%	-
NIFTY Auto	-0.57%	217*	0.28%	1524.50
NIFTY FMCG	-0.46%	239	0.09%	1370.5
NIFTY IT	-0.08%	227	0.54%	1643
NIFTY Media	-0.54%	163	-0.01%	1535
NIFTY Metal	-0.72%	111	0.33%	1460.5
NIFTY Oil and Gas	-0.66%	168	0.17%	1581
NIFTY Pharma	-0.38%	172	0.20%	1413.5
NIFTY Bank	-0.36%	215	-0.54%	1324.5

Note: *, ** represents statistical significance at 1% and 5% respectively

Conclusion

This paper attempted to ascertain the aftermath of COVID-19 on the various sectors of the Indian economy by drawing pieces of evidences from the following sectoral indices. The study employed Welch's t-test and Mann-Whitney U test to compare the daily returns of the sectoral indices, both in the short-term and long-term window, with the daily returns pre-COVID period. These stock indices are arguably the most accurate representatives of various sectors of Indian economy.

The study revealed a malignant effect of COVID-19 pandemic on the automobile, FMCG, oil and gas, and pharmaceuticals sector in the short run. This is because of the Indian government's lockdown policy, which led to supply chain disruption. Since the onset of COVID-19 in India, consumer confidence has plummeted, and the households and private sector's consumption and investment patterns have changed. Furthermore, it has been observed that automobile industry has suffered more strongly from the pandemic and reported returns below domestic average.

However, FMCG and pharmaceuticals sector rebounded quickly and yielded positive mean daily returns. In the long-term window, the global demand for oil, gas, and metals slowed down due to the industries' closure. This led to a fall in the global prices of oil, causing a catastrophic impact on the oil and gas sector

and the metals sector in India. Due to the spread of coronavirus, the risk of a precipitous fall in loan growth, and the fear of a rise in NPAs as COVID continues to hit the businesses is getting stronger.

These findings contribute to the literature by exploring the ramifications of COVID-19 on the Indian economy's various sectors. However, one of the constraints of this study is the limitation is the short period of analysis. Also, there might be spill overs to other sectors as the virus spread exponentially in the future. Further studies need to be carried out on more extended periods to capture the effect of COVID-19.

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