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IMPACT OF COVID-19 PANDEMIC ON THE INDIAN STOCK MARKET: SECTORAL INDICES WISE ANALYSIS

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Abstract:
The pandemic, Covid-19, has impacted almost all arenas of the human life. It created enormous market volatility and turnover in the stock market as well. The various policy changes and sectoral reforms in relation to the pandemic would all have impacted the indices differently. However, by analyzing only the broad market index, Nifty 50, which represents all sectors, the overall impact could have got nullified, the prime impact of the pandemic might possibly not be captured. Hence, this study considers examining the impact of the pandemic individually on all the 14 sectoral indices of NSE. The impact of the pandemic has been observed using the non-parametric test, Wilcoxon matched pairs test, on each of the sectoral indices in 3 event windows of short-term, medium-term and long-term. Significant positive impact has been observed in Pharma, Health Care and FMCG sectors, while significant negative impact was observed in all other sectors.

Key words: Covid-19 pandemic, National Stock Exchange, Sectoral Indices, Stock Market, Stock Return, Volatility
JEL Classification: G11, G14, G41
Short title: Impact of Covid-19 on Indian Sectoral Indices

1. Introduction

The shrink in the global economy due to the impact of covid-19 pandemic has been observed to be the steepest, and more significant than the great depression of 1930s (Agarwal and Singh, 2020, Sahoo and Ashwani, 2020). The pandemic created notable economic deterioration in the financial markets of the world. The pandemic started in China in the month of December 2019 and later spread to the world nations. Global emergency was declared by the World Health Organization (WHO) on March 11, 2020 (WHO, 2020). Till date it soared more than two million people across the globe (Nayak et al., 2021). A major slump in the Indian domestic equity markets was noticed on March 12, 2020, when both the major indices of the country, Sensex and Nifty 50, crashed beyond 8 per cent as compared to the trends of the international equity

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markets (FICCI, 2020). Due to the pandemic, distress influence on the stock market performance (Chaudhary et al., 2020), negative influence on the stock prices (Liu et al., 2020; Al-Awadhi et al., 2020) and acute volatility in the Indian stock market indices (Sumesara, 2020) have been noticed which was expected to continue in the same manner when compared to the global indices.

The volatility spillovers were also observed to ascend to 69% during the pandemic (Guru and Das, 2021). Even the basic economic factors like demand, supply, international trade and the financial market are observed to be affected (Agarwal and Singh, 2020). During the pandemic, Nifty 50 dropped by 868 points, which was beyond 8 per cent as compared to the international equity markets' trend. As the numbers of cases of coronavirus increased, this fall in the market persisted due to the continuous selling of the stocks by investors (FICCI, 2020; Agarwal and Singh, 2020).

The social distancing and lockdown policies had a huge impact on the stock indices and economic policies. The decisions related to monetary policy, days of lockdown and international restrictions related to travel had all, critically hit the stock indices (Ozili and Arun, 2020). The volatility of the Indian stock market was greater during the pandemic (Chaudhary et al., 2020) although it had similar standard deviation as compared to the worldwide market, leading to FIIs selling more from the cash segment and many of the blue-chip companies to trade at multi-year lows (Thomas et al., 2020).

Due to the outbreak, the equity markets of the G-20 nations were observed to produce abnormal returns for both the developed and the emerging nations (Singh et al., 2020), the daily returns of the major stock market indices in the Gulf Cooperation Council (GCC) countries declined as the number of confirmed deaths increased (Bahrini and Filfilan, 2020), whereas the Asian nations experienced greater abnormal returns (Liu et al. 2020) and unexpected nosedives (Mishra and Mishra, 2020) when compared to the other nations. The returns on the Indian indices were greater during the pre-covid period than the post-covid period (Bora and Basistha, 2020), and large cap stocks raised in value than the mid cap and small cap stocks (Chaudhary et al. 2020) which suggested that the investors invested more in the big organizations due to the fear of the outbreak.

The empirical observations of the pharma sector specific study revealed that the indices moved in tandem with the primary index even during the pandemic period (Aravind and Manojkrishnan, 2020; Mittal and Sharma, 2021). Various suggestions were put forth for the pharmaceutical sector to be provided which include exemptions with respect to tax, more subsidies to be given for the development and promotion of the industry (Rani, 2020), private organizations should depend less on the Chinese suppliers (Jadhav et al., 2020), and the like. Although research has been conducted on the influence of the pandemic on the sector specific indices in the areas of automobiles (Rajamohan et al., 2020), tourism (Jaipuria et al., 2020), auto, bankex, capital goods, consumer durables, FMCG, health care, information technology, and realty (Chaudhary et al., 2020), Indian energy consumption (Aruga et al., 2020), suggesting business strategies for surviving

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the pandemic (Rakshit and Paul, 2020), scanty research has been found with respect to all sectoral indices on the National Stock Exchange (NSE).

From the existing literature on the Indian markets, it is observed that they have considered only the broader market indices, i.e., Sensex and Nifty 50, as the indicators for examining the impact of the pandemic on the Indian stock market. Though the broader market indices reflect the Indian market, they consist of a particular number of stocks representing all sectors. After the declaration of the global emergency by WHO (2020), various policy changes including social distancing and lockdown policies had been implemented, because of which the impact of the pandemic on different sectors would be different. As different sectors have been impacted differently, the overall impact through the broad market index, Nifty 50, could have got nullified. Thus, the prime impact of the pandemic might not be possible to be captured through analysing Nifty 50 alone. Hence, it was felt that the study of individual sectoral indices might help to capture the complete impact of the pandemic. The current study proposes to examine the influence of the pandemic on all the sectors (14 sectoral indices) on NSE along with the prime index, Nifty 50. The purpose is to analyse the influence of the pandemic on all the indices, using three different windows i.e., short-term, medium-term and long-term, based on event analysis of both pre and post covid periods.

The rest of the paper is designed as follows: section two details with the data and methodology of the current study, followed by the discussion of the results in section three. Finally, in the last section, the conclusions are drawn and presented.

2. Data and Methodology

The objective of the current study is to determine the impact of Covid-19 pandemic on the select 14 Nifty sectoral indices along with the prime index, Nifty 50. The Null hypothesis has been formulated as "There is no impact of the covid-19 pandemic on the select NSE sectoral indices", against the Alternative Hypothesis "There is a significant impact of the covid-19 pandemic on the select NSE sectoral indices".

2.1 Data and Sample selection

14 sectoral indices available on NSE have been identified for the study, namely, Nifty Auto index, Nifty Bank index, Nifty Consumer Durables index, Nifty Financial Services index, Nifty FMCG index, Nifty Health Care index, Nifty IT index, Nifty Media index, Nifty Metal index, Nifty Oil & Gas index, Nifty Pharma index, Nifty Private Bank index, Nifty PSU Bank index, and Nifty Realty index. Along with these 14 sectoral indices, the prime index on NSE, Nifty 50 has also been considered for the study.

Secondary data has been compiled from NSE website (www.nseindia.com) for the select sectoral indices along with Nifty 50 index for the purpose of achieving the objective. The daily closing prices have been collected for a period of April 1st, 2019 to Feb 28th, 2021. The weekly average closing prices have been computed for this period

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for all the 14 sectoral indices and the Nifty 50 index. Considering the month of March, 2020 as the month of the event, the 4 weeks of March, 2020 have not been considered for the study. Before and after these 4 weeks, a 48 weeks duration has been selected for the pre-period and the post-period and paired. The data has been categorized into three windows that is short term (for 16 weeks), medium term (for 32 weeks) and long term (48 weeks) for the purpose of analysis. The list of all 15 indices is presented in Table 1.

Table 1 Here

2.2 Methodology

The regular parametric test statistics such as paired t-test, t-test for dependent samples and t-test for matched pairs cannot be employed in the current research as the data has been presumed to be not normally distributed. Hence, the nonparametric method i.e., Wilcoxon matched pairs test has been used to analyze the population means and for drawing the interpretations thereof.

For the purpose of analysis, the event period has been considered as March 2020, as that was the month when announcements relating to covid-19 pandemic were made and various measures to stop the spread of the virus in the country have been initiated, including the imposition of lock down across India. Thus, the 4 weeks of the month of the event are identified as March 8, March 15, March 22 and March 29, and have been eliminated for the study. A total of 48 weekly average closing prices have been considered for the pre-covid period (pre-event period), from April 7, 2019 to March 1, 2020, and equally a total of 48 weekly average closing prices were considered for the post-covid period (post-event period), from April 5, 2020 to February 28, 2021.

Each of these 48 weekly average closing prices have be paired taking the event month as the base. The average closing price of the weeks before and after the event have been paired, i.e., the first pair represents the average closing price of week 1 prior to the event month and the average closing price of week 1 after the event month, and second pair represents the average closing price of week 2 prior to the event month and the average closing price of week 2 after the event month, and so on till the 48th week on pre and post average closing prices to make the forty eighth pair.

Three windows have been identified as short-term window, medium-term window and long-term window. For the short-term window the first 16 paired observations will be considered, for the medium-term window the first 32 paired observations will be considered and for the long-term window all the 48 paired observations will be considered. Under each event window, the absolute differences for each pair were calculated using the formula ($|D| = |X_i-Y_i|$) where X_i represent the post-covid average closing price, Y_i represents the pre-covid average closing price, and 'i' takes values from 1 to 16/32/48 respectively, representing the week number of the pair. Apart from the absolute differences, the sign function is also identified separately.

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For each event window, ranks have been assigned for the absolute differences in ascending order, after which the identified sign function has been assigned to the respective ranks. Sum of all ranks having positive (∑+) differences and the sum of all ranks having negative (∑-) differences were obtained. The sample mean has been identified as the max value i.e, $\mathrm{Max}\{(\sum +):(\sum -)\}$ of the two sums computed.

The population mean has been computed for each event window, as E(X) = {n (n+1)} / 4], where 'n' represents the number of observations (16/32/48). The standard deviation $\boldsymbol{\sigma}_x = \sqrt{\frac{n(n+1)(2n+1)}{24}}$ and variance $(\boldsymbol{\sigma}_x)^2$ have been computed and the test statistic, $|Z| = \frac{E(X) - \mathrm{Max}\{(\sum +):(\sum -)\}}{\sigma x}$ has been identified.

For each event window, the decision rule is based on comparing the calculated test statistic (Z_{cal}) with the critical value (Z_α) at 5 per cent level of significance. The critical values at 5 per cent level of significance for two-tailed test are identified as 2.26 for short term; 2.09 for medium term; and 1.96 for long term.

3. Analysis and Results

The non-parametric test, Wilcoxon matched pairs test, has been used to analyze the population means of 14 sectoral indices on NSE along with the prime index, Nifty 50. Three event windows have been considered for the study, the short-term window, the medium-term window and the long-term window. The results after applying Wilcoxon matched pairs test are identified for Nifty 50 and the 14 sectoral indices and presented in Tables 2 to 4. For each of the indexes, 3 calculations were made for the 3 event window periods. The impact of the pandemic is interpreted as positive when the sum of ranks with positive sign is greater than the sum of ranks with negative sign. Similarly, the impact of the pandemic is interpreted as negative when the sum of ranks with negative sign is greater than the sum of ranks with positive sign.

The results after applying Wilcoxon matched pairs test for the short-term period on all sectoral indices and on Nifty 50 index are presented in Table 2. From Table 2, it can be observed that in the short-term all the 14 sectoral indices are found to be significantly influenced by the pandemic. However, Nifty Pharma index and Nifty Health Care Index have been positively influenced and the rest indices have been negatively influenced by the pandemic. The prime index, Nifty 50 index, has shown an overall negative and significant influence by the pandemic after the nullifying effect.

Table 2 Here

The results after applying Wilcoxon matched pairs test for the medium-term period on all sectoral indices and on Nifty 50 index are presented in Table 3. From Table 3, it can be observed that in the medium-term, out of the 14 sectoral indices, only 13 indices are found to be significantly influenced by the pandemic. Nifty FMCG index had a negative influence of the pandemic but the impact was not significant. However, along with Nifty

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Pharma index and Nifty Health Care Index which had positive and significant influence in the short-term, Nifty IT index also turned positive and significant due to the pandemic during the medium-term. The rest of the indices have still remained significantly and negatively influenced by the pandemic even during the medium-term. The prime index, Nifty 50 index, still shows an overall negative and significant influence by the pandemic after the nullifying effect.

Table 3 Here

The results after applying Wilcoxon matched pairs test for the long-term period on all sectoral indices and on Nifty 50 index are presented in Table 4. From Table 4, it can be observed that in the long-term, out of the 14 sectoral indices, only 10 indices are found to be significantly influenced by the pandemic. The influence of the pandemic on Nifty Auto index had turned positive and insignificant in the long-term. However, Nifty Consumer Durables index and Nifty Metal index continued with the negative influence of the pandemic, but the impact lost its significance during the long-term. Interestingly, the influence of the pandemic on Nifty FMCG index had turned positive and significant for the long-term. The rest of the indices still remain significantly and negatively influenced by the pandemic even during the long-term. It is specifically observer that the prime index, Nifty 50 index, has turned to an overall positive influence by the pandemic after the nullifying effect, which remained insignificant.

Table 4 Here

4. Findings and Conclusions

By using Wilcoxon matched pairs test, the population means of the 14 sectoral indices and the prime index, Nifty 50, were analyzed to test the influence of the Covid-19 pandemic, on the Indian stock market under three event windows. The results of all these indices, for all the three event windows, have been summarized in Table 5.

Table 5 Here

According to Table 5, out of the total 45 observations, 40 observations (89 per cent) are found to be significant at 5 per cent level of significance, rejecting the null hypothesis. This indicates that there is a significant influence of the pandemic on the sectoral indices of the Indian stock market. Out of the 40 significant observations, 9 observations (22 per cent) show a positive impact and 31 observations (78 per cent) show negative impact. This indicates that most of the indices were influenced in the negative way.

Of the 31 observations that show negative impact, 13 observations are identified in the short-term, 11 observations are identified in the medium-term, and 7 observations in the long-term. This implies that the maximum impact of the pandemic on the sectoral indices of the Indian stock market observed during the short-term window has slowly started to reduce down and reached 7 observations in the long-term window.

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Interestingly, the pandemic had an almost 95 per cent significant and negative impact on the short-term window which slowly started reducing in the medium-term and the long-term windows. All the 14 sectoral indices selected for the study had the maximum significant impact from the pandemic. Four indices, Nifty Pharma index, Nifty Health Care index, Nifty IT index and Nifty FMCG index had the most positive impact, and all the other indices had the most negative impact of the pandemic. But overall, moving from the short-term event window through long-term event window, the impact seemed to reduce.

Volatility on exchanges were very high and stock market started to respond to covid related announcements with knee jerk reactions (Thomas et al., 2020). However, from the observations of this study, it can be concluded that the Indian stock market has recovered and has been fairly efficient in the long-term event window resulting in the reduced impact. This may be due to the various measures taken by the government for the control of spread of the coronavirus, the stimulus packages announced by various state governments, and the better understanding by the investors during the euphoric hype and anxiety during the lockdown periods, by tapping the event related return opportunities as the markets drew to normalcy and deriving maximum gains during long term. Emphasizing the importance for the health of the general public in the society, this study concludes that the pandemic had a maximum impact on the select indices during the short term, which started to slowly reduce as time passed.

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Table 1: List of all indices considered for the study

Sl. No.	Index	Period	Total observations
1	Nifty Auto	2019-2021	48
2	Nifty Bank	2019-2021	48
3	Nifty Consumer durables	2019-2021	48
4	Nifty Financial Services	2019-2021	48
5	Nifty FMCG	2019-2021	48
6	Nifty Health care	2019-2021	48
7	Nifty IT	2019-2021	48
8	Nifty Media	2019-2021	48
9	Nifty Metal	2019-2021	48
10	Nifty Oil & Gas	2019-2021	48
11	Nifty Pharma	2019-2021	48
12	Nifty Private Bank	2019-2021	48
13	Nifty PSU	2019-2021	48
14	Nifty Realty	2019-2021	48
15	Nifty 50	2019-2021	48

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Table 2: Short-term impact of Covid-19 pandemic on NSE's Nifty 50 and all sectoral indices

Index	Short term			Impact
	Σ +	Σ -	Z	
Nifty Pharma Index	136	0	-3.52*	Positive & Significant
Nifty Health Care Index	128	-8	-3.10*	Positive & Significant
Nifty FMCG Index	18	-118	-2.59*	Negative & Significant
Nifty IT Index	18	-118	-2.59*	Negative & Significant
Nifty Auto Index	0	-136	-3.52*	Negative & Significant
Nifty Bank Index	0	-136	-3.52*	Negative & Significant
Nifty Consumer Durables Index	0	-136	-3.52*	Negative & Significant
Nifty Financial Services Index	0	-136	-3.52*	Negative & Significant
Nifty Media Index	0	-136	-3.52*	Negative & Significant
Nifty Metal Index	0	-136	-3.52*	Negative & Significant
Nifty Oil & Gas Index	0	-136	-3.52*	Negative & Significant
Nifty Private Bank Index	0	-136	-3.52*	Negative & Significant
Nifty PSU Bank Index	0	-136	-3.52*	Negative & Significant
Nifty Realty Index	0	-136	-3.52*	Negative & Significant
Nifty 50 Index	0	-136	-3.52*	Negative & Significant

Where, Σ+ stands for the sum of all ranks with positive sign, Σ- stands for the sum of all ranks with negative sign, Z represents the calculated test statistic, and * represents significant at 5% level

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Table 3: Medium-term impact of Covid-19 pandemic on NSE's Nifty 50 and all sectoral indices

Index	Medium-term			Impact
	Σ +	Σ -	Z	
Nifty Pharma Index	528	0	-4.94*	Positive & Significant
Nifty Health Care Index	520	-8	-4.79*	Positive & Significant
Nifty IT Index	385	-143	-2.26*	Positive & Significant
Nifty FMCG Index	199	-329	-1.22	Negative but Insignificant
Nifty Auto Index	124	-404	-2.62*	Negative & Significant
Nifty 50 Index	102	-426	-3.03*	Negative & Significant
Nifty Metal Index	56	-472	-3.89*	Negative & Significant
Nifty Consumer Durables Index	50	-478	-4.00*	Negative & Significant
Nifty Financial Services Index	7	-521	-4.81*	Negative & Significant
Nifty Oil & Gas Index	5	-523	-4.84*	Negative & Significant
Nifty Bank Index	1	-527	-4.92*	Negative & Significant
Nifty Private Bank Index	1	-527	-4.92*	Negative & Significant
Nifty Media Index	0	-528	-4.94*	Negative & Significant
Nifty PSU Bank Index	0	-528	-4.94*	Negative & Significant
Nifty Realty Index	0	-528	-4.94*	Negative & Significant

Where, Σ+ stands for the sum of all ranks with positive sign, Σ- stands for the sum of all ranks with negative sign, Z represents the calculated test statistic, and * represents significant at 5% level

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Table 4: Long-term impact of Covid-19 pandemic on NSE's Nifty 50 and all sectoral indices

Index	Long term			Impact
	Σ +	Σ -	Z	
Nifty Pharma Index	1176	0	-6.03*	Positive & Significant
Nifty Health Care Index	1168	-8	-5.95*	Positive & Significant
Nifty IT Index	1033	-143	-4.56*	Positive & Significant
Nifty FMCG Index	823	-353	-2.41*	Positive & Significant
Nifty Auto Index	658	-518	-0.72	Positive but Insignificant
Nifty 50 Index	651	-525	-0.65	Positive but Insignificant
Nifty Consumer Durables Index	568	-608	-0.21	Negative but Insignificant
Nifty Metal Index	459	-717	-1.32	Negative but Insignificant
Nifty Financial Services Index	347	-829	-2.47*	Negative & Significant
Nifty Realty Index	286	-890	-3.10*	Negative & Significant
Nifty Bank Index	160	-1016	-4.39*	Negative & Significant
Nifty Private Bank Index	125	-1051	-4.75*	Negative & Significant
Nifty Oil & Gas Index	35	-1141	-5.67*	Negative & Significant
Nifty Media Index	0	-1176	-6.03*	Negative & Significant
Nifty PSU Bank Index	0	-1176	-6.03*	Negative & Significant

Where, Σ+ stands for the sum of all ranks with positive sign, Σ- stands for the sum of all ranks with negative sign, Z represents the calculated test statistic, and * represents significant at 5% level

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Table 5: Summary of impact of Covid-19 pandemic on NSE's Nifty 50 and all sectoral indices

Index	Significant Impact						No Impact						Total
	Positive			Negative			Positive			Negative			
	S	M	L	S	M	L	S	M	L	S	M	L	
Nifty Auto Index				1	1				1				3
Nifty Bank Index				1	1	1							3
Nifty Consumer Durables Index				1	1							1	3
Nifty Financial Services Index				1	1	1							3
Nifty FMCG Index			1	1							1		3
Nifty Health Care Index	1	1	1										3
Nifty IT Index		1	1	1									3
Nifty Media Index				1	1	1							3
Nifty Metal Index				1	1							1	3
Nifty Oil & Gas Index				1	1	1							3
Nifty Pharma Index	1	1	1										3
Nifty Private Bank Index				1	1	1							3
Nifty PSU Bank Index				1	1	1							3
Nifty Realty Index				1	1	1							3
Nifty 50 Index				1	1				1				3
Total	**2**	**3**	**4**	**13**	**11**	**7**	**0**	**0**	**2**	**0**	**1**	**2**	**45**

S stands for the Short-term window, M stands for the Medium-term window and L stands for the Long-term window