

Covid19 Impact On Twelve Sectors Of The Indian Economy

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Abstract

This study aims to investigate the reaction of COVID-19 cases (confirmed, deaths, recovered, & active) on twelve sectors of Indian economy by using sectoral indices of national stock exchange. Daily frequency of COVID-19 case categories was obtained from Worldometer from January 30, 2020 to June 30, 2020 and dataset of daily closing prices of twelve sectoral indices (auto, banks, financial services, fast moving consumer goods, information technology, media, metal, oil & gas, pharmaceutical, public sector banks, private banks, realty sector) was obtained from national stock exchange web portal for the same period as of COVID-19. In this study, the ordinary least square regression was used to study the significance of COVID-19 cases (confirmed, deaths, recovered, & active) on twelve sectoral indices. Empirical evidence suggested no significant impact of COVID-19 cases on daily returns of twelve major sectors represented by sectoral indices except in the case of pharmaceutical sector, where daily growth in number of deaths is impacting daily returns on pharmaceutical sectoral index in a positive way. The twelve sectoral indices went into a downward spiral at the beginning of COVID-19 pandemic, but as government and central bank introduced various policy measures, the impact of COVID-19 pandemic on sectoral indices faded away.

1. INTRODUCTION

Global Economic Prospects (GEP), a report by World Bank, with a presumption that 'everything goes right' and an opposing but acceptable level of tolerance, in January 2020 projected that the world economy is on edge for a modest rebound this year. The World Bank's semi-annual GEP forecasted a rather dichotomous global perspective of slowdown for advanced economies of 1.4% to 1.6% on account of weak yield of manufacturing sector, but on a brighter side, developing economies and emerging markets to witness an escalated growth rates of 4.1% when compared with 3.5% last year. International Monetary Fund (IMF), another international agency that promotes global monetary cooperation, through its World Economic Outlook Report in January 2020, projected that global growth would rise to an estimated rate of 3.3% in 2020 from 2.9% in 2019 while growth rate in the emerging market and developing economies will jump to 4.4% from 3.7% in 2020 and to 4.6% in 2021. The same report stated that countries like India and China will prove to be the biggest contributors to the growth rates of emerging markets and developing economies. The report further concluded that signs of stabilization are quite visible and thus entails a stronger multilateral cooperation across the world.

Fast forward to June 2020; the world is shocked by Covid-19 which the director General-WHO, on March 11, 2020, in his media briefing declared a pandemic¹ and considered it a

¹<https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>

highly contagious and deadly disease reported first in Wuhan, Hubei Province, China in December 2019. This infectious disease officially called SARS-CoV-2 and COVID-19 in common parlance is the third serious outbreak in less than 20 years preceded by SARS in 2002-03 and MERS in 2012 as reported by Yang et al., (2020). As per situation report by WHO (2020), until July 6, 2020, India had 6,48,35 total confirmed cases, 18,655 total death, and transmission classification is a cluster of cases, which means India is yet to enter in community transmission, (World Health Organization, 2020). India reported its first case (January 30, 2020) in Thrissur district in Kerala, and on March 15, 100 confirmed cases were reported from India. At the time of writing this paper, India reported the highest number as many as 24,015 new cases on July 4, 2020 (Worldometer, 2020). The data reflected 679,520, total confirmed cases and total deaths stood at 19,380 whilst a recovery rate of approximately 60 percent (recovered/total confirmed cases) was observed. The Prime Minister of India, metaphorically equating to Lakshman Rekha versed in Hindu epic, Ramayana, announced a lockdown on March 24, 2020 and compared the fight against COVID-19 to the battle of Mahabharata recounted in the Hindu epic by the same name.² Until now, four lockdowns with varying degrees of restrictions and time-periods were imposed which consequently impacted everyone from Mohalla provision store to local businesses, schools to universities, real estate to Railways and every other sector of the Indian economy. Amidst tight economic situation, Eco wrap (Ghosh, 2020), a research monthly report by SBI conferred that the nation-wide lockdown in the last few days of March 2020, dragged GDP growth rate to 40-quarters low to 3.1% in Q4 FY20 and the same is bound to impact stock markets. Kulkarni (2020) expected a 16-22 percent fall in nifty, the leading benchmark index of the National Stock Exchange (NSE) of India.

In such a grim environment, the key objective in this study revolves around delving into how sectoral indices of national stock exchange responded to the Covid-19 pandemic. Presence of the extreme uncertainty of a quick-fix discovery of any vaccine against the virus in the near future, has aroused enough curiosity as observed by Wagner (2020) as to understand how the economy will shape up, how the behavior of people will change, and so on once the pandemic peaks in. Ramelli et al., (2020) through a recent research working paper, highlighted three phases of investor's behaviour; first, the incubation phase (cases of pneumonia detected in China) where well-informed investors started to anticipate. In the second phase (after January 2020 and WHO issued its first situation report), investors' attention grew as news channels and analysts began to talk more and more about the virus. The third and the last phase started on February 24, when Italy clamped lockdown, which led to the panic selling in the stock markets, Wagner, (2020).

The authors aim to examine the impact of growth in diurnal parameters of Covid-19 such as confirmed cases, fatalities, and recoveries onto the daily returns of fourteen major sectoral indices of NSE from January 30, 2020, to June 30, 2020. The study adds to the literature in at least two aspects: first, contribution towards the gamut of studies that concentrated how different catastrophes and crisis impacted the stock markets. Kowaleski and Spiewanowski (2020) analysed the stock markets' reaction to the disasters in potash mines and found a cumulative drop in the market value of affected mining firms by 1.15% in the first two days of the disaster. Gangopadhyay et al., (2010) found statistically significant negative reactions to insurer share prices to hurricane Katrina in 2005. We added to these studies by examining the response of sectoral indices of Indian stock markets to the Covid-19 pandemic. Second, we contribute to the recently emerging literature on the Covid-19 impact on emerging and developing economies' financial markets. Baker et al., (2020) concluded

²<https://timesofindia.indiatimes.com/india/mahabharata-battle-won-in-18-days-war-against-coronavirus-will-take-21-days-pm-modi/articleshow/74813107.cms>

that the Covid-19 pandemic had caused the highest market volatility in stock markets among all modern world infectious diseases by the textual analysis of news mentions. Corbet et al., (2020) indicated that Covid-19 has a strong and significant positive impact on both the Shanghai and Shenzhen Stock Exchanges. Zhang et al., (2020) examined the impact of Covid-19 pandemic on stock market risk and found that risks in the financial markets all around the globe have increased in response to the pandemic and reactions of the individual markets linked to the gravity of the epidemic in each country.

The COVID-19 outbreak and its severity prompted governments all around the world to impose restrictions on the movement of public, closing of public places, public and private offices with varying degree of restrictions. Countries went down for lockdown in phases to contain the spread of COVID-19 which mitigated the decline in prices of stocks. As the World economies suffered from the worst economic crisis since the Great Depression (Baldwin & di Mauro, (2020), Bénassy-Quéré et al., (2020), Coibon et al. (2020), the response of the stock markets elevates serious concerns. The stock prices seem to be running on a wilder side, since the pandemic broke out.

The rest of the paper is structured under the following broad constituents:

2. DATA

Authors constructed base dataset of the number of confirmed cases, deaths, recoveries from Covid-19 by direct downloading the data from the website of John Hopkins University (JHU) Coronavirus resource centre. The dataset consists of regularly updated daily frequencies of Covid-19 cases reported for more than 200 countries and regions from January 22, 2020 and June 30, 2020. At the same time to align the data, daily closing prices of thirteen sectoral indices were downloaded from the portal of the National Stock Exchange (www.nseindia.com) for the same period as of the Covid-19 dataset. To ensure completeness, comprehensiveness, and consistency in the dataset, returns of daily sectoral indices were appended with Covid-19 data. Certain filters were employed to process the data and consequently those sectoral indices where data for total turnover and the volume of shares was not available were dropped and number tallied to twelve sectoral indices. Further from the residual data, observations with missing values for stock market on account of holidays or weekends were omitted even when Covid-19 data was accessible for each day. As a result of this filter, dataset finally consists of 12 sectoral indices with 1308 observations throughout January 30, 2020, to June 30, 2020, Table 1 lists the sectoral indices along with the number of included stocks, and the number of observations.

Table 1. Sectoral Index Composition

	Sectoral Index	Total Stocks	Brief Description of the Sectoral Index
1	Nifty Auto	15	Reflect the behavior and performance of the Automobiles sector which includes manufacturers of cars & motorcycles, heavy vehicles, auto ancillaries, tyres, etc.
2	Nifty Bank	12	Comprised of the most liquid and large capitalised Indian Banking stocks.
3	Nifty Fin Service	20	Reflect the behaviour and performance of the Indian financial market which includes banks, financial institutions, housing finance, insurance companies and other financial services companies.
4	Nifty FMCG	15	FMCGs (Fast Moving Consumer Goods) are those goods and products, which are non-durable, mass consumption products and available off the shelf.

5	NIFTY IT	10	Companies in this index are those that have more than 50% of their turnover from IT related activities like IT Infrastructure, IT Education and Software Training, Telecommunication Services and Networking Infrastructure, Software Development, Hardware Manufacturer's, Vending, Support and Maintenance.
6	NIFTY Media	10	Reflect the behavior and performance of the Media & Entertainment sector including printing and publishing.
7	Nifty Metal	15	Reflect the behavior and performance of the Metals sector including mining.
8	Nifty Oil & Gas	15	Reflect the performance of the stocks belonging to Oil, Gas and Petroleum industry.
9	Nifty Pharma	10	Pharmaceuticals sector is one of the key sectors where Indian companies have created a global brand for themselves besides software.
10	Nifty PSU Bank	12	NSE Indices has developed Nifty PSU Bank Index to capture the performance of the PSU banks.
11	Nifty PVT Bank	10	The Nifty Private Bank Index is designed to reflect the performance of the banks from private sector.
12	Nifty Realty	12	Recent listings of real estate companies resulting into prominent growth in public funds and private equity.

3. METHODOLOGY

To study the impact of change in Covid-19 confirmed cases and deaths on sectoral indices' returns, researchers used ordinary least square regression more commonly known as multiple linear regression model for each sectoral index separately. COVID-19 pandemic attracted a lot of attention from the research fraternity and a wide variety of statistical tools used by various authors. Liu et al., (2020), Bonaccorsi et al., (2020), and Farzanegan et al., (2020) used OLS method in their studies as a linear relationship between the independent variables and the dependent variable. The relationship for OLS method can be understood by the following discourse.

Daily return of an index, as a convention and practice across the world, is the growth rate calculated on a continuously compounded basis for the day.

If $R_{s,t}$ is the daily return of an index 's' on any day 't', then

$index_{s,t} = index_{s,t-1} \times e^{R_{s,t}}$ which gives

$$e^{R_{s,t}} = \frac{index_{s,t}}{index_{s,t-1}} \quad \text{or} \quad R_{s,t} = \ln\left(\frac{index_{s,t}}{index_{s,t-1}}\right)$$

It is noted that regarding COVID-19, it has been extensively reported that coronavirus is spreading exponentially, i.e. the doubling rate follows a plummeting trend. Now in absence of any standard treatment or cure for COVID-19, the rates of confirmed cases, deaths, recovery, and active cases are also assumed to move exponentially. In the same vein, rates of confirmed cases (GCC), deaths (GD), recovered cases (GR) and active cases (GAC) are computed as below:

$$confirmed\ cases_t = confirmed\ cases_{t-1} e^{GCC} \quad \text{where} \quad e^{GCC} = \frac{confirmed\ cases_t}{confirmed\ cases_{t-1}}$$

and

$$deaths_t = deaths_{t-1} e^{GD} \quad \text{where} \quad e^{GD} = \frac{deaths_t}{deaths_{t-1}}$$

and

$$recovered_t = recovered_{t-1} e^{GR} \text{ where } e^{GR} = \frac{recovered_t}{recovered_{t-1}}$$

and

$$active\ cases_t = active\ cases_{t-1} e^{GAC} \text{ where } e^{GAC} = \frac{activecases_t}{activecases_{t-1}}$$

To study the impact of COVID-19 on sectoral indices in India, we hypothesize a relationship between them i.e., we say return of sectoral indices is a function of COVID-19 case categories as mentioned below.

Return of Sectoral Indices = f(confirmedcases, deaths, recovered, active cases, some unknown variable)

Here it has been already shown that both the dependent variable (return of a sectoral index) and independent variables (growth rates of various categories of COVID-19 related variables) are exponentially varying, then it can be safely assumed that

$$\left(\frac{index_{s,t}}{index_{s,t-1}}\right)^{k_1} = \left\{ \left(\frac{confirmedcases_t}{confirmedcases_{t-1}}\right)^{k_2}, \left(\frac{deaths_t}{deaths_{t-1}}\right)^{k_3}, \left(\frac{recovered_t}{recovered_{t-1}}\right)^{k_4}, \left(\frac{activecases_t}{activecases_{t-1}}\right)^{k_5}, k_6 \right\}$$

Where k_i for $i = 1$ to 6 are constants.

Exponential form may further give a relation like

$$\left(\frac{index_{s,t}}{index_{s,t-1}}\right)^{k_1} = k_6 * \left(\frac{confirmedcases_t}{confirmedcases_{t-1}}\right)^{k_2} * \left(\frac{deaths_t}{deaths_{t-1}}\right)^{k_3} * \left(\frac{recovered_t}{recovered_{t-1}}\right)^{k_4} * \left(\frac{activecases_t}{activecases_{t-1}}\right)^{k_5}$$

Taking natural logarithm on the both sides

$$k_1 \ln\left(\frac{index_{s,t}}{index_{s,t-1}}\right) = \ln k_6 + k_2 \ln\left(\frac{confirmedcases_t}{confirmedcases_{t-1}}\right) + k_3 \ln\left(\frac{deaths_t}{deaths_{t-1}}\right) + k_4 \ln\left(\frac{recovered_t}{recovered_{t-1}}\right) + k_5 \ln\left(\frac{activecases_t}{activecases_{t-1}}\right)$$

On substituting the various rates computed above,

$$k_1 R_{s,t} = \ln k_6 + k_2 GCC_t + k_3 GD_t + k_4 GR_t + k_5 GAC_t$$

$$R_{s,t} = \frac{\ln k_6}{k_1} + \left(\frac{k_2}{k_1}\right) GCC_t + \left(\frac{k_3}{k_1}\right) GD_t + \left(\frac{k_4}{k_1}\right) GR_t + \left(\frac{k_5}{k_1}\right) GAC_t$$

On simplification, relationship takes the following final shape.

$$R_{s,t} = b_0 + b_1 GCC_t + b_2 GD_t + b_3 GR_t + b_4 GAC_t + \varepsilon$$

Where b_i for $i = 0$ to 4 are constants and ε represents an error term for the data.

A critical look at the above relationship clearly suggests that under the assumptions considered above, a multiple linear regression (MLR) model or ordinary least square (OLS) regression is but a natural choice to study the impact of COVID-19 on sectoral indices.

4. RESULTS

Table 2. Summary Statistics

This table reports the summary statistics of variables under consideration. Sectoral Index market returns is measured as the daily change in sectoral index based on closing price. Growth in confirmed cases is measured as the daily growth in COVID-19 confirmed cases. Growth in deaths is measured as the daily growth in the number of COVID-19 patients died. Growth in recovered cases is measured as the daily growth in COVID-19 recovered cases. Growth in active cases is measured as the daily growth in COVID-19 active cases.

Variable	Mean	Maximum	Minimum	Std. Dev.
AUTO	-0.002	0.099	-0.149	0.033
BANKNIFTY	-0.004	0.100	-0.183	0.039
FINSERV	-0.003	0.089	-0.174	0.038
FMCG	0.000	0.080	-0.112	0.024
IT	-0.001	0.086	-0.101	0.028

MEDIA	-0.003	0.064	-0.109	0.031
METAL	-0.003	0.076	-0.123	0.035
OILGAS	0.000	0.087	-0.124	0.030
PHARMA	0.002	0.099	-0.094	0.025
PSUBANK	-0.005	0.102	-0.141	0.035
PVTBANK	-0.004	0.105	-0.197	0.040
REALTY	-0.005	0.062	-0.121	0.032

Table 3. Summary Statistics

This table reports the summary statistics of variables under consideration. Growth in confirmed cases is measured as the daily growth in COVID-19 confirmed cases. Growth in deaths is measured as the daily growth in the number of COVID-19 patients died. Growth in recovered cases is measured as the daily growth in COVID-19 recovered cases. Growth in active cases is measured as the daily growth in COVID-19 active cases.

Variable	Mean	Maximum	Minimum	Std. Dev.
Growth in active cases	0.126	2.526	-0.044	0.293
Growth in confirmed cases	0.132	1.723	0.000	0.233
Growth in deaths	0.097	0.734	0.000	0.1555
Growth in recovered	0.116	1.179	0.000	0.175

Table 4. Correlation Matrix

This table reports the pairwise Pearson correlations between sectoral indices and Covid-19 pandemic cases.

Variable	Growth in confirmed cases	Growth in number of deaths	Growth in number of recovered cases	Growth in active cases
AUTO	-0.1321	-0.0466	-0.0837	-0.1126
BANKNIFTY	-0.1870**	-0.0758	-0.1428	-0.1581
FINSERV	-0.1919**	-0.0898	-0.1689**	-0.1628
FMCG	-0.0986	0.0263	-0.0232	-0.0875
IT	-0.1101	-0.0458	-0.0535	-0.0938
MEDIA	-0.1853**	-0.1552	-0.0501	-0.1428
METAL	-0.1239	0.0284	-0.926	-0.0978
OILGAS	-0.1157	0.2588*	-0.0194	-0.149
PHARMA	0.043	0.2371*	0.1581	0.0498
PSUBANK	-0.2247*	-0.013	-0.0914	-0.1670**
PVTBANK	-0.1797**	-0.0766	-0.1429	-0.1542
REALTY	-0.1506	-0.0608	-0.1950**	-0.1289

*significant at 5% level, **significant at 10% level

Table 5. OLS regression results

Impact of Covid-19 on sectoral indices returns. This table reports the results of OLS regression regarding the impact of Covid-19 cases and its categories on daily returns of

twelve major sectoral indices of national stock exchange. Growth in confirmed cases is calculated as the daily growth in Covid-19 confirmed cases in India. Growth in deaths is calculated as the daily growth in the number of Covid-19 patients died. Growth in number of recovered cases is calculated as the daily growth in number of recovered patients. Growth in active cases is measured as the daily growth in number of active patients in India.

Variable (Sectoral Index)	R-squared	Constant	Growth in confirmed cases	Growth in number of deaths	Growth in number of recovered cases	Growth in active cases
Auto	0.021	0.001	-0.037	0.004	-0.008	0.016
BANKNIFTY	0.046	0.002	-0.057	0.006	-0.019	0.024
FINSERV	0.052	0.003	-0.049	0.004	-0.024	0.019
FMCG	0.015	0.001	-0.025	0.012	0.000	0.010
IT	0.015	0.001	-0.030	0.000	-0.002	0.014
MEDIA	0.058	0.002	-0.078	-0.021	0.016	0.046
METAL	0.033	0.000	-0.057	0.027	-0.015	0.030
OILGAS	0.130	-0.002	0.019	0.068	-0.023	-0.036
PHARMA	0.076	-0.002	-0.046	0.0372*	0.017	0.032
PSUBANK	0.088	0.000	-0.132	0.025	0.000	0.077
PVTBANK	0.043	0.002	-0.050	0.005	-0.021	0.019
REALTY	0.048	0.000	-0.020	0.011	-0.033	0.004

5. EMPIRICAL ANALYSIS

Table reports summary statistics of the variables under consideration. The mean value of daily returns for all sectoral indices are in negative zone which shows that on an average sample sectoral indices experience zero percent returns except pharma sector whose average returns are in positive zone with a value of 0.0019 (0.19%), as Indian pharma sector projected to advance from global health care requirements in the wake of the Covid-19 pandemic. The private bank sectoral index witnessed the highest range and the difference between maximum and minimum return is 30.19 percent, whereas realty sectoral index range is the lowest one at 18.25percent. Likewise, the average growth rate of confirmed cases is at 13.15 percent with a wide standard deviation of 23.26 percent. Table presents Pearson correlations between sectoral indices and Covid-19 cases. Sectoral index of banknifty, financial services, media, psubank, pvtbank have negative correlation with growth in confirmed cases, whereas only oilgas and pharma have positive correlations with number of deaths. Financial services and realty have negative correlations with growth in number of recovered cases. Psu bank has a negative correlation with growth in active cases.

Table 3 represents OLS regression results. Authors applied OLS for each sectoral index considering it as a predictor variable, and four categories of Covid-19 cases as predictands. The coefficients of growth in confirmed cases indicated a negative impact on all sectoral indices, although non-significant which suggest growth in number of confirmed cases has not so strong impact on the daily returns of sectoral indices. The growth in daily deaths loses significance for the daily returns of sectoral indices except for pharmaceutical sector. This is not beyond expectation. Since a rise in number of deaths leads to a fear among the people

which in turn increases the demand for health and hygiene related products and impacts the cash flows of pharma manufacturers in a positive way. Our OLS regression results indicate that Covid-19 cases do not significantly impact the daily returns of sectoral indices, with only exception being the growth in number of deaths which impacts significantly. To support the results, authors plotted the daily closing prices of every sectoral indices against Covid-19 cases as depicted in Figure 1. The graphical representations show that there are two phases, the first one lasted for 19 days from March 4, 2020 to March 23, 2020 during which all sectoral indices had a downward slope, and this can be explained as the markets reacted to the outbreak with a strong negative reaction in early phase; second phase from March 24, 2020 (the day lockdown 1.0 started), sectoral indices started to show signs of recovery as markets started to discount the worst situation after application of proper containment measures and regulations. All the twelve major sectoral indices went to their pre-Covid-19 levels on closing basis.

6. CONCLUSION

The paper examined the returns of twelve major sectoral indices in response to the Covid-19 pandemic in the context of India. Using daily Covid-19 confirmed cases, deaths, recovered and active cases and stock market returns data for twelve sectoral indices, the study found that stock markets responded negatively for the initial few days. As the cases increased, returns decline in the first phase, but later as the markets started to discount the worst situation, the indices did recover to pre-COVID 19 levels. Authors further found from OLS regression, the growth in confirmed cases, deaths, recovered, and active cases do not impact daily returns on sectoral indices significantly with only exception being the growth in deaths impacting pharma sectoral index. Overall, the analysis suggests that sectoral indices were quite resilient and quickly responded to Covid-19 pandemic and almost undeterred continued their path on a recovery mode in the later phase. Figure 1 and 2, shows the weekly price movement of broader indices Nifty-50 and Sensex before the Covid-19 pandemic broke out in a full blown crisis in India, since March 23, 2020 to the end of June, 2020, both the benchmark indices gained nearly 40 percent from their lows of March, 2020 despite weak sentiments of retail investors and people holding on cash for use in emergency measures. This rise spread out to even midcap and small cap indices giving 39 percent and 44 percent gains, respectively. Reserve bank of India reduced the key policy rates by 115 bps since the first lockdown and injected approximately 8 lakh crores worth of liquidity in the financial system. Industries and household sector did not opt for the loans with enthusiasm and somehow that liquidity found its way into the equity market, pumping up the prices. Foreign portfolio investors and Domestic institutional investors kept on purchasing equities after March 2020 as seen in Figure 3 & 4. Are markets ignoring or discounted the worst-case scenario of detached itself from the fundamentals. To conclude, whether stock markets incorporate all available information? We can see it as a glass half-full, half-empty. The reaction of stock markets during the outbreak of Covid-19 pandemics is not completely accidental, as different sectoral indices reacted with varying degree of reaction at the beginning of pandemic. On the other hand, variations in the daily returns of sectoral indices can be explained partly be fundamentals. The reaction of these sectoral indices was on a strong note at the start of pandemic, and as central bank, government started to intervene, investors, shareholders no longer seems anxious by the news bulletins of Covid-19 cases, and prices bounce back to pre-Covid-19 levels. Paul Krugman (2020) in New York Times column, said out loud what many people were thinking: *“Whenever you consider the economic implications of stock prices, you want to remember three rules. First, the stock market is not the economy. Second, the stock market is not the economy. Third, the stock market is not the economy (...). The relationship between stock performance – largely driven*

by the oscillation between greed and fear – and real economic growth has always been somewhere between loose and non-existent”.



Figure 1. Sensex Weekly Closing



Figure 2. Nifty Weekly Closing

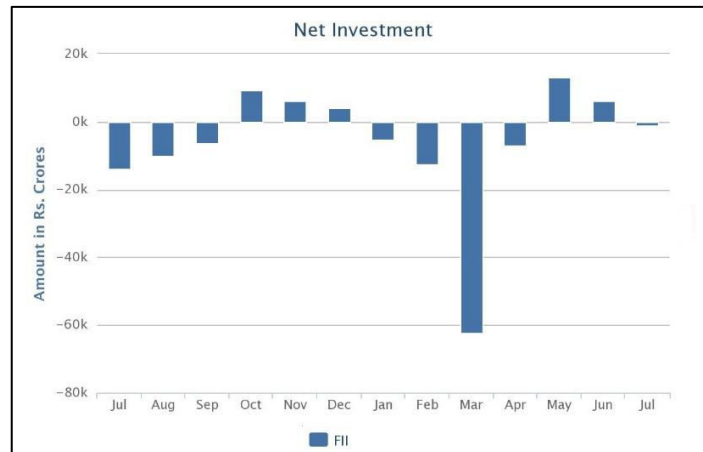


Figure 3. FII Net Investment

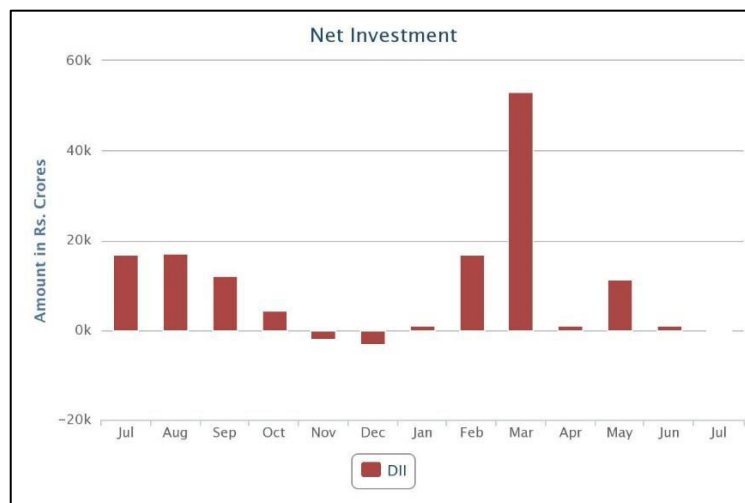


Figure 4. DII net investment

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