The Pandemic Impact on The Indian Economy - An Application of Garch Model

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Abstract

The world pandemic has witnessed a great recession impact in the year 2020 due to the outbreak of the coronavirus. Many countries were affected badly because of the pandemic. India has the second most infected cases in the world and the financial performance of different sectors in the country as well as the overall economic performance of the country is badly affected by the pandemic. The objective of this project is to assess how the pandemic has affected the performance of India's key economic indicators, financial market performance, and the profitability of some of the important sectors in India. Our project makes use of macroeconomic indicators like GDP, GDP from different sectors, inflation rate, and daily infection data to analyze the impact of the pandemic on the Indian Economy. The macroeconomic variables are tested for stationarity using ADF tests and for heteroscedasticity using ARCH-LM tests and the GARCH model is applied to analyze the volatility of the indicators. The financial performance of most of the companies taken under study. Analysis shows that pandemic regulations have affected the volatility of GDP from most of the sectors and not affected the inflation rate and the stock market indices.

Keywords: India, GDP, Stock Market Indices, GARCH Model, industries

I. Introduction

The Evidence of Pandemic Outbreak

The world has witnessed a great impact in the year 2020 due to the outbreak of a pandemic called COVID-19. The Novel Coronavirus Disease (popularly called COVID-19), a respiratory disease, was first reported in Wuhan City of Hubei Province, China (WHO, 2020). The disease spread all over China, forcing the Chinese Government to put the entire city of Wuhan under Lockdown on 23rd January 2020 (Business Insider, 2020). The disease got attention all over the world in January 2020 due to its spread all over the world compared to the other kinds of viruses due to its nature of infection and incubation period. On March 7, 2020, the number of COVID-19 confirmed cases surpassed 100,000, and on March 8, 2020, over 100 countries reported COVID-19 cases (Ravelo & Jerving, 2020). Due to the increasing levels of spread and severity of the virus, and due to increased fatality, COVID-19 disease was declared a pandemic by the World Health Organization on March 11, 2020 (WHO, 2020).

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Due to the spread of the virus, international and domestic flights were banned in several countries to control the spread. On March 16, infections and deaths due to COVID-19 surpassed the cases within China (Ravelo & Jerving, 2020). Many countries showed a spike in the COVID-19 cases. Many Governments imposed lockdowns in their countries for several days. This put a stop to the economic activities and many other activities in those countries. Most of the industries across the globe were affected by the reduction in productivity, disruption in trade, and so on (Pak, 2020), thereby pushing the global economy into a phase of recession (The Indian Express, 2020). The pandemic and the efforts to contain it have caused a great collapse in the oil demand and a crash in the oil prices which have heavily impacted the world economy. The IMF has estimated about 4.4% shrunk in the global economy which is the worst since the Great Depression of the 1930s. IMF expects growth of about 5.5% in 2021 but for countries reliant on the service sector, growth was expected to be low (BBC, 2021).

COVID-19 Outbreak in India

India reported the first COVID-19 patient in the Thrissur district of Kerala on January 20, 2020, who was a student at Wuhan University (The Wire, 2020). Following the first case, cases started to increase during the month of March 2020, with Kerala and Maharastra being the most affected states in India. Many state governments ordered the closure of educational institutions, cinema halls, public parks, and so on. A 14-hour lockdown called 'Janata Curfew' was ordered on 22nd March (The Wire, 2020). Then the Government of India established a lockdown throughout the nation initially from March 25, for a period of 21 days. (The Wire, 2020). Due to the continuous increase in COVID-19 cases in India, the lockdown was extended continuously with little relaxations with each extension of lockdown.

As a result of the nationwide lockdown which was implemented by the Government, there was a decline in the economic activities all around India during the initial phase of the lockdown. Most of the industries were affected badly during this period, and there was a huge drop in the share prices of many companies during the months of February and March. Several people lost their jobs, and a lot of people were paid less than their actual salary. This in turn affected many macro-economical variables during this period.

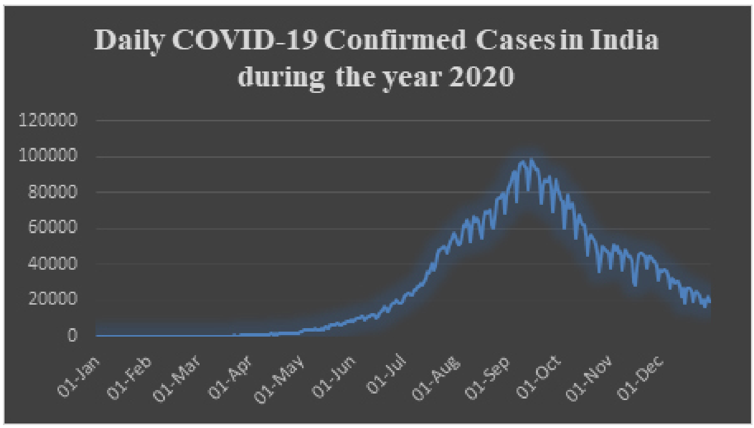

Figure Daily Confirmed Cases in India in the year 2020

This project is aimed at analyzing the impact created by the spread of COVID-19 cases on the GDP from different sectors of the Indian economy viz. Primary Sector, Secondary Sector, and Tertiary Sector and how COVID-19 has affected the macroeconomic variables GDP and inflation rate of the country, and how COVID-19 has affected the stock market indices of India and the financial performance of industries in India.

Literature Review

A few studies evidenced the impact of selected indicators like Corporate Income Tax, Private income Tax, Public Debt, Goods and Service Tax Revenue, Annual Interest Rate of Government Bonds, Consumer Confidence Index, and balance of state budget on the GDP, to check whether they have the ability to face the Economic crisis with reference to the financial crisis of 2009. Tax revenues have a significant effect on GDP, which causes a decline in GDP (Oravsky, Toth & Banociova, 2020). Sreelakshmi. P & Jain (2018) examined the influence of factors like Gold, Crude oil prices, and USD on Annual GDP and inflation rate, and found that GDP was not influenced during the 1990s, but the GDP and inflation were influenced by the factors after the Iraq war, and also found that USD Exchange rate, Gold and oil prices influence each other. the impact of crude oil price, stock price, and macroeconomic variables on Indian GDP and concluded that the growth of GDP is significantly affected by the Stock price, Oil price, and Exchange rate (Bhunia, 2012; Desai. A & Bhatiain,2016). The early review of the impact of COVID-19 on the various sectors of the economy, Stock market, and Derivatives market using variables like GDP growth rate, Unemployment rate, and various policy changes in the segments of the economy. Saini (2020) says that it’s too early for determining the effect of Covid-19 and it depends on the severity of the virus and how long the virus will be there. Even It is found that there is significance in the variables that affect the GDP growth Rate in India using key macroeconomic Indicators using a Multiple variable regression model. They used variables such as Inflation, Crude Oil prices, and how they are affecting GDP growth after the deregulation of oil prices. Even though COVID-19 has insignificantly caused a decline in the macroeconomic variables due to the measures taken to control the spread of the virus. Farayibi. O & Asongu. A (2020) reviewed the macroeconomic impact of COVID-19 in Nigeria, by performing a trend analysis and Dynamic Ordinary Least Squares (DOLS) method on the macroeconomic variables like Crude Oil Prices, GDP Growth, inflation rate, unemployment rate, and exchange rate with respect to daily COVID-19 cases in Nigeria. Further recommends future research as it engages updated data to assess the impact of the virus on the economy and suggested that Industries should try to reduce the expenditures as much as possible to ensure their recovery. The economy is deteriorating and government should handle the matter carefully and rapidly to ensure minimum effects on the economy (Kumra, 2020; Islam & Muyeed 2020).

The Performance of Countries Stock Market has been analysed by using the daily data of COVID-19 positive cases, daily recoveries, daily deaths, and the closing prices of PSX 100 index during the 2020, and found significant relationship between the COVID-19 recoveries and the stock market performance and insignificant relationship between daily cases and deaths and stock market (Ahmed 2020; . Czech, Wielechowski, Kotyza, Benesova & Laputkova 2020; Verma & Sinha 2020; Thomas,

T. C., Sankararaman, G., & Suresh, S. 2020); Alam, M. N., Alam, M. S., & Chavali, K. (2020))) Chia, Liew & Rowland (2020) examined the relation between the returns of the Malaysian stock market and the daily COVID-19 cases by using the closing prices of the main indices of the Malaysian Stock Market and found that daily COVID-19 cases and fatalities have a negative insignificant impact on the stock market and the Movement Control Order has caused a positive significant impact on the Stock market returns whereas oversea financial risks had negative impact on the returns. The study adds that future research could be done to understand how COVID-19 has affected individual firms or specific economic sectors.

The Indian economy in the pre-reform and Post reform periods of time and finds differences between the models in the Post and Pre-reform periods using the Regression model considering economic and Non-economic factors (Gupta; 2014). Bora. D & Basistha. D (2019); made a comparative analysis of the closing prices of the indices - NIFTY and SENSEX in the pre-COVID time and during COVID time by using the GARCH model to analyze the volatility and found that the markets were highly volatile in the pre-COVID time than during the COVID time.

Machmuddah, Z, et al. (2020) analyzed the stock prices of consumer goods companies in Indonesia at 3 intervals - before COVID-19 emergence, during COVID-19 emergence, and 3 months after the emergence and found significant differences in the stock prices and the volume of stocks traded before and after COVID-19, with the findings strengthening the efficient market hypothesis. Ashraf, B. N. (2020) examined the stock markets' response to the COVID-19 pandemic by analyzing the behaviour of stock markets with respect to the daily COVID-19 over 64 countries and found that the stock market returns declined with respect to the daily confirmed cases, the markets reacted more proactively with respect to daily confirmed cases than daily deaths.

Kotishwar A. (2020) investigated the impact of COVID-19 on the share markets on six countries - USA, Spain, France and Italy, India and China by applying the VCEM model and CAAR model and found that the share markets in these countries reacted positively in the post - COVID period than in the pre - COVID period the reasons for the Stock Market Crash of 2020 that the reasons for the stock market crash is due to the fear and uncertainty of the pandemic made the investors pull back their investments which resulted in larger supply than the demand, leading to the collapse of the stock prices, and also stated that the stock market crash is also due to the compression in oil prices due to the oil-price war between Saudi Arabia and Russia (Angel Broking 2020; Liu, H. et al.2020) Inflation insignificant relationship between the GDP and Unemployment and there is negative correlation between them Nurudeen, 2009; Yue et al., 2020; Ho & Iyke 2017; Omuroyi, Izekor, & Osaretin,2015; Singh, 2018; Gurloveleen. K & Bhatia. BS 2015; Pal, 2013; Sehrawat & Giri. A. K, 2019) Turegun, 2019). Mani & Mishra (2014) analyzed the impact of inflation on the Indian Economy by looking at the Performance of agricultural growth, industrial growth, and service growth in India. The study found that there is less impact of inflation rate on the agricultural, industry, and service growth and there is a low significant and low positive relation between GDP and inflation rate.

In addition, there is an impact on business such as Banking and Finance and Business related to banking and it can also be analyzed by controlling Cash flows, Firm size, and Credit Ratings. Before the pandemic FDI and savings rate had a positive effect on GDP and the other variables had no or negative effects on the GDP growth (Ullah & Rauf, 2013; Ultana et al.,2019; Tamilselvan M & Manikandan, 2015). The pandemic has affected the key industries and the work of supply and transportation networks by analyzing various social, economic, and environmental indicators and found that post-COVID-19 period, it is difficult to make forecasts about the level of trade (Vasiev, Bi, Denisov & Bocharnikov,2020; Turegun, 2019). Roy (2020) found that various sectors have been affected due to Covid-19. India's economic growth is by the services industry. It also recommends that both India and China are strong in-Service sectors and they should try to bring more Foreign direct investment to the Manufacturing and Agricultural sectors (Hada & Suri (2019); Solo. N & Angami (2012; Hussin & Yik (2012; Sivasubramaniyan. K (2017; Kotishwar. A (2018).

Industries can be only recovered by following the government norms and collaboration efforts from the government, Healthcare professionals, and common people (Agarwal & Singh, 2020; Ozili &Arun (2020).

COVID-19 has impacted the Economy of several countries across the world. India has also faced a decline in Economic Activities due to the spread of COVID-19 and the lockdown imposed on the government. The decline in economic activities has resulted in a fall in the Gross Domestic Product of our country. Most of the sectors of the Indian Economy have also faced a fall in their contribution to GDP.

Objectives of the study

Based on the literature reviews collected, and based on the problem statement and need for the study, the following objectives are framed.

1. To analyze the impact of COVID-19 on the primary, secondary, and tertiary sectors of the Gross Domestic Product of India.
2. To analyze the impact of COVID-19 on the Gross Domestic Product of India and the Inflation Rate.
3. To examine how COVID-19 spread has affected the Financial Markets and its impact on GDP.
4. To examine how COVID-19 has affected the profitability of selected firms from various industries.

Research Methodology

Analysis of the Impact of Covid-19 on GDP, Inflation, and Stock Market Returns:

Analysis of the Impact of COVID-19 on GDP, Inflation, and Stock Market Returns is done by GARCH model built by using an external regressor. Daily COVID-19 cases are used as the external regressor. The GARCH (1,1) makes use of a conditional mean equation and a conditional variance equation. The equations are given below.

Conditional Mean Equation: $Rt = \mu t + mxreg1 * d(cases) + et$

Conditional Variance Equation: $\sigma 2t = \omega + \alpha * e2t\text{-}1 + \beta * \sigma 2t\text{-}1 + vxreg1 * d(cases)$

Where mxreg1 and vxreg1 are the coefficients for the external regressor (COVID-19 cases), et is the error term, e2t-1 refers to the squared residuals, σ2t-1 refers to the previous day volatility, and μt and ω are the intercepts of the conditional mean and variance equation respectively.

The steps performed to create a GARCH model are as follows

1. **Test for Stationarity -** Augmented Dickey-Fuller Test (ADF Test) is used to test the stationarity of the variables. If the variable is not stationary, they are converted into a stationary series by finding the difference.

2. **Test of heteroscedasticity -** The ARCH-LM test is done on the variables to examine the arch effect on the heteroscedasticity property of the time series. Only if the data has an arch effect, GARCH model is employed.

3. **GARCH test -** The GARCH test is then employed to analyze the volatility of the selected variable. Daily COVID-19 cases are considered as the external regressor while developing the model.

Analysis of The Impact Of Covid-19 on The Financial Performance of Companies

This analysis is done by doing a trend analysis of the variables chosen for the study. The chosen variables (Total Income, Total Expenses, Net Profit, and Earnings per share) are visualized using the software Tableau, and the trend is analyzed. Automobile, Airlines, FMCG, IT, and Pharmaceuticals are the industries chosen.

Variables used:

GDP from Different Sectors:

Based on the Nature of Activity, India's Economic Sector is classified into the following sectors(Drishti IAS, 2019):

Primary Sector

a)Agriculture, Fishing, Forestry, Dairy
b)Mining and Quarrying

Secondary Sector

a)Manufacturing
b)Construction,
c)Electricity, Gas and Other Utilities

Tertiary Sector

a)Trade, Hotels, Transportation
b)Financial, Real Estate and Professional Services
c)Public Administration, Defence, and other Services

Stock Market Variables used:

NIFTY 50, SENSEX, INDIAVIX

Companies chosen from Industries:

For analyzing the impact of COVID-19 on the Financial Performance of Industries, five industries are chosen - the Airline Industry, the Automobile Industry, the FMCG Industry, the IT Industry, Pharmaceutical Industry. The companies considered for analysis under each industry are as follows:

Aviation Industry:

1. Interglobe Aviation Limited
2. Spicejet Limited
3. Global Vectra

Automobile Industry:

1. Bajaj Auto Limited
2. Eicher Motors Limited
3. Mahindra & Mahindra
4. Maruti Suzuki
5. Tata Motors Limited

FMCG Industry

1. Hindustan Unilever Limited
2. ITC Limited
3.Britannia Industries
4. Nestle India
5. Marico Limited
6. Colgate Palmolive

IT Industry

1. Tata Consultancy Services Limited
2. Infosys Limited
3. Tech Mahindra Limited
4. Wipro Limited
5. HCL Technologies

Pharmaceutical Industry:

1. Dr. Reddy's Laboratories
2. Dr. Divi's Laboratories
3. CIPLA Limited
4. Glenmark Pharmaceuticals
5. Sun Pharmaceuticals

Data Collection

The project uses mainly secondary data for analysis. The data for daily cases of COVID-19 is collected from the website https://www.covid19india.org/. The closing prices for NIFTY 50 and INDIAVIX are collected from the NSE website and the closing prices for S&P BSE SENSEX are collected from the BSE website. The stock market data are collected for a period of 6 years from Jan 1, 2015 to Dec 31, 2020. Data regarding the macroeconomic variables are collected from databases like IndiaStat and the RBI website for a period of 6 years from 2015 to 2020. Data regarding the financial performance of the companies are taken from the CMIE-PROWESS database. Quarterly data are taken for the financial performance of the company for the period of 5 years from 2016 to 2020. The following data are collected:

1. GDP (from different sectors and as a whole)
2. Inflation rate
3. Closing values of NIFTY 50, SENSEX, INDIAVIX
4. Total Income, Total Expenses, Net Profit, and Earnings per share of companies

Statistical Tools Used

The analysis of the impact of GDP from different sectors, GDP and inflation, and on the stock market indices is done in R-Studio. The analysis of the impact of COVID-19 on the financial performance of Industries is done by trend analysis using Tableau.

Analysis and Findings

Analysis of Impact of GDP from Primary, Secondary and Tertiary Sectors

The analysis of GDP from different sectors is done by implementing the GARCH model with daily COVID-19 as the external regressor and analyzing whether the COVID-19 cases have affected the volatility of the indicators.

Test for stationarity:

ADF tests were conducted to check the stationarity of the time series. It was found that GDP from the primary sector was stationary without any differencing, whereas GDP from the secondary and tertiary sectors and the daily COVID-19 cases were stationary at the first difference.

Test for heteroscedasticity:

ARCH-LM tests were conducted to test the time series whether there is an ARCH effect or heteroscedasticity on the given time series. It was found that there is an ARCH effect on all sectors of GDP. Hence GARCH model is applied to analyze the heteroscedasticity of the time series.

GARCH Test:

GARCH model is applied to the time series to analyze the volatility of the GDP from different sectors. COVID-19 cases are used as an external regressor to analyze the effect of COVID-19 cases on the volatility of GDP. GARCH (1,1) model is applied and the results are as follows:

Table : GARCH(1,1) results for GDP from different sectors

	GDP FROM PRIMARY SECTOR		**GDP FROM SECONDARY SECTOR**			**GDP FROM TERTIARY SECTOR**		
	GDP from Agri cultural, Forestry and Fishing	GDP from Mining and Quarrying	GDP from Manufac-turing	GDP from Electricity, Gas, Water Supply	GDP from Const-ruction	GDP from Trade, Hotels, Trans-port, Communi-cation and Services Related to Broadcasting	GDP from Financial, Real Estate and Professional Services	GDP from Public Administ-ration, Defence and Other Services
Variable	**Estimate / P value**	**Estimate / P value**	**Estimate / P value**	**Estimate / P value**	**Estimate / P value**	**Estimate / P value**	**Estimate / P value**	**Estimate / P value**
μ	4713.4 / 0.0000	884.5329 / 0.0000	0.61034 / 0.0000	-0.10054 / 0.0000	0.7963 / 0.00000	0.550841 / 0.0000	16.85125 / 0.0000	1.604527 / 0.0000
mxreg1	0.000528 0.77512	-.000293 0.70183	0.00007 0.0000	-0.00002 0.0175	-0.0000 0.0169	0.000185 0.0000	-0.000013 0.53851	-0.000031 0.24832
ω	248.43 0.26514	11.0328 000538	0.03502 0.0000	0.00007 0.0000	0.0000 0.3884	0.001678 0.1335	0.027356 0.00082	0.004666 0.00843
α	0.9999 0.0000	0.99993 0.0000	1.00000 0.0000	0.84135 0.0000	0.0.8654 0.0000	0.956847 0.0000	0.999991 0.0000	1.000000 0.0000
β	0.000 1.0000	0.000 1.0000	0.00000 0.9999	0.09417 0.0000	0.1735 0.0000	0.084503 0.0001	0.000001 0.99999	0.00000 0.99999
vxreg1	0.000 1.0000	0.000 1.0000	0.00026 0.0000	0.0000 0.8893	0.0002 0.0000	0.00006 0.0021	0.0000 0.99998	0.000038 0.09441

From the results, we can see that the COVID-19 cases have not affected the volatility of the GDP from the primary sector. The volatility of the GDP is caused mainly due to the squared residuals (alpha term). GDP from Agriculture had always been at the peak during the final quarter of each financial year and constantly decreasing in the other quarters. GDP from Mining and Quarrying had been increasing in the last 2 quarters and decreasing in the first 2 quarters of each financial year. As the same trend is followed in 2020, we can conclude that COVID-19 has not affected the volatility of the GDP from the primary sector.

The daily COVID-19 cases have significantly affected the volatility of the GDP from Manufacturing and GDP from Construction. GDP from mining is unaffected by the previous day's volatility and affected by the squared residuals, whereas GDP from Construction is affected by both squared residuals and the previous day's volatility. The lockdown imposed by the Government made the Manufacturing and Construction Industries pause their operations which resulted in a drop in GDP from these sectors. GDP from Electricity, Gas, and Water Supply, on the other hand, is not affected by the COVID-19 cases as the cases have not affected the volatility of the GDP. The volatility of the GDP from this sector is affected only due to the squared residuals and the previous day's volatility. Electricity, Gas, and Water Supply are resources that are consumed by the public even in case of Lockdown as it was one of their essential needs.

The Volatility of the GDP from Trade, Hotels, Transport, etc., is affected by the daily COVID-19 cases. The volatility is also affected by its squared residuals and the previous day's volatility. During the Lockdown, Trade, Transport, and Hotels were badly affected. Hence the GDP from this sector had a drop in the first quarter. The daily COVID-19 cases did not affect the volatility of the GDP from the Financial and Professional Services and the volatility is affected by the squared residuals alone. This is due to the fact that most of the Financial and Professional Services were moved to Online mode and most of the operations continued during the Lockdown. The COVID cases had a small significant effect on the volatility of GDP from Public Administration, Defense, and Other Services. The volatility is affected only by its squared residuals.

Analyzing the Impact of Covid-19 on GDP and Inflation

Test for Stationarity:

The ADF test was conducted on GDP and Inflation and it was found that the Gross Domestic Product and Daily COVID-19 cases are stationary at the first difference and Inflation is stationary at level 0.

ARCH Test:

ARCH-LM test was done on GDP and Inflation to check the presence of ARCH effect or heteroscedasticity and the test results showed the presence of ARCH effect on both variables. Hence, GARCH model is used to analyze the mean and the volatility.

GARCH model:

GARCH (1,1) model is applied for GDP (first difference) and Inflation with the difference of daily COVID-19 cases as external regressors for both models. The test results are summarized as follows.

Table: GARCH model results for GDP and inflation

	Gross Domestic Product		**Inflation**	
Variable	**Estimate**	**P value**	**Estimate**	**P value**
μ	11.78186	0.00000	0.16340	0.00000
mxreg1	-0.000567	0.04619	0.00000	0.78905
ω	0.125985	0.01258	0.00000	0.89355
α	1.000000	0.00000	0.78757	0.00000
β	0.000000	0.99999	0.21992	0.00000
vxreg1	0.008257	0.00056	0.00000	1.00000

From the above table, we can see that the COVID-19 cases have an effect on the value of GDP as well as the volatility of GDP with mxreg1 and vxreg1 significant at 5 percent. The volatility of GDP is affected by the squared residual and the daily cases. On the other hand, the COVID-19 cases have neither affected the mean value of the inflation rate nor the volatility of the inflation rate. The volatility of the inflation rate is affected only by the squared residuals and the historical volatility. Hence, we can conclude that COVID-19 cases have no effect on the inflation rate and have an effect on the Gross Domestic Product of the Country.

Analyzing the Effect of Covid-19 cases on Nifty, Sensex returns and on Indiavix

ADF Test for Stationarity:

ADF test is performed on NIFTY50, SENSEX, INDIAVIX, and daily confirmed cases to test the stationarity and the results are tabulated given below. From the table, it is found that the closing prices of NIFTY, SENSEX, and INDIAVIX values and the daily confirmed cases were stationary at the first difference.

ARCH-LM test:

The ARCH-LM test is done on the stock market indices to test the presence of ARCH effect on the data. The ARCH test results showed the presence of ARCH effect on the variables. Hence GARCH model is applied to analyze the volatility.

GARCH Model:

GARCH (1,1) model is applied for the stock market indices separately with the difference of daily COVID-19 cases as an external regressor for each model. The test results are summarized as follows.

Table : GARCH model results for stock market indices

	NIFTY 50		SENSEX		INDIAVIX	
Variable	**Estimate**	**P value**	**Estimate**	**P value**	**Estimate**	**P value**
μ	0.070414	0.00078	0.076315	0.00025	15.29528	0.00000
mxreg1	0.000001	0.32545	- 0.000003	0.04282	-0.000004	0.00000
ω	0.026531	0.00000	0.023802	0.00000	0.417458	0.00000
α	0.100632	0.00000	0.100710	0.00000	1.00000	0.00000
β	0.874154	0.00000	0.877043	0.00000	0.007474	0.13413
vxreg1	0.000001	0.00000	0.000005	0.00000	0.000085	0.00000

From the above table, we can find that the COVID-19 cases have affected the returns as well as the volatility of the share market indices. The COVID cases haven't significantly affected the NIFTY 50 returns but it has affected the volatility of the index. The volatility of the index is also affected by its squared residuals and the previous day's volatility. COVID cases have significantly affected both the returns and the volatility of SENSEX as well as INDIAVIX. The volatility of SENSEX is also affected by its squared residuals and its previous-day volatility. The volatility of INDIAVIX is significantly affected by its squared residuals and not by its previous-day volatility. Hence, we can conclude that COVID-19 cases have affected the returns as well as the volatility of the stock market indices. The reason for the volatility of the stock market indices is due to the stock market crash in which fear and uncertainty caused investors to pull back their investments thereby resulting in higher supply than demand causing a collapse in stock prices (Angel Broking, 2020).

Analyzing the Impact of Covid-19 on the Performance of the Industries

The quarterly financial statements of the companies from various industries are taken and the financial performance such as Total Income, Total Expenses, Net Profit, and Earnings per share are analyzed for the companies.

Airline Sector:

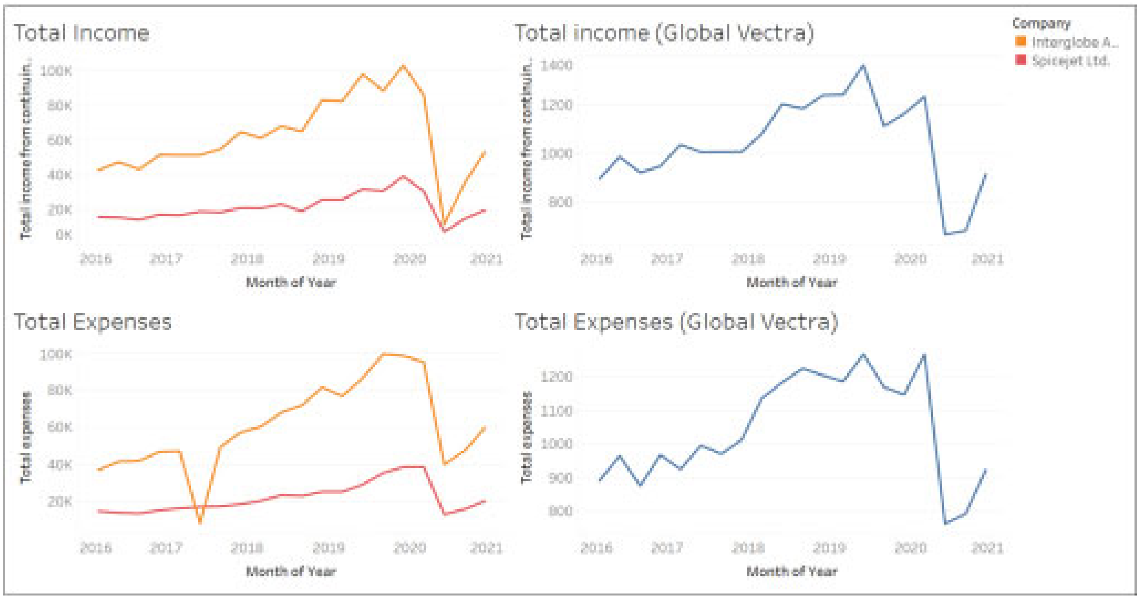

Figure 5.1 Airline Sector Performance -1

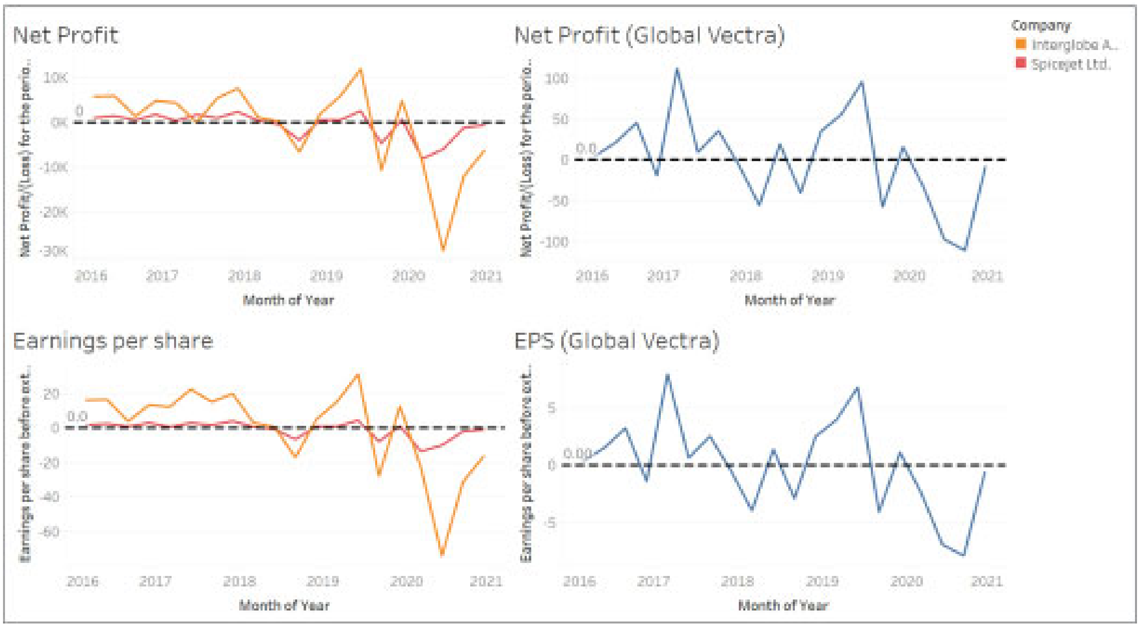

Figure 5.2 Airline Sector Performance - 2

The airline industry was the first industry to get affected as flight operations were stopped in many countries. The airline Industry, which was growing steadily in its income through the years, saw a sudden drop in its income in the year 2020 in the first six months. After the approval of the government to operate domestic flights after months, flight operations resumed and there was a considerable increase in its income in the last six months. This behaviour of income and expenses has impacted the profitability of the industry as the industry suffered big losses in the first six months. This loss is also reflected in the Earnings per share of each company. The companies in this industry are still facing losses even after the flight operations in the last six months due to the regulations laid by the government to allow only 50% of the passengers.

Automobile Sector:

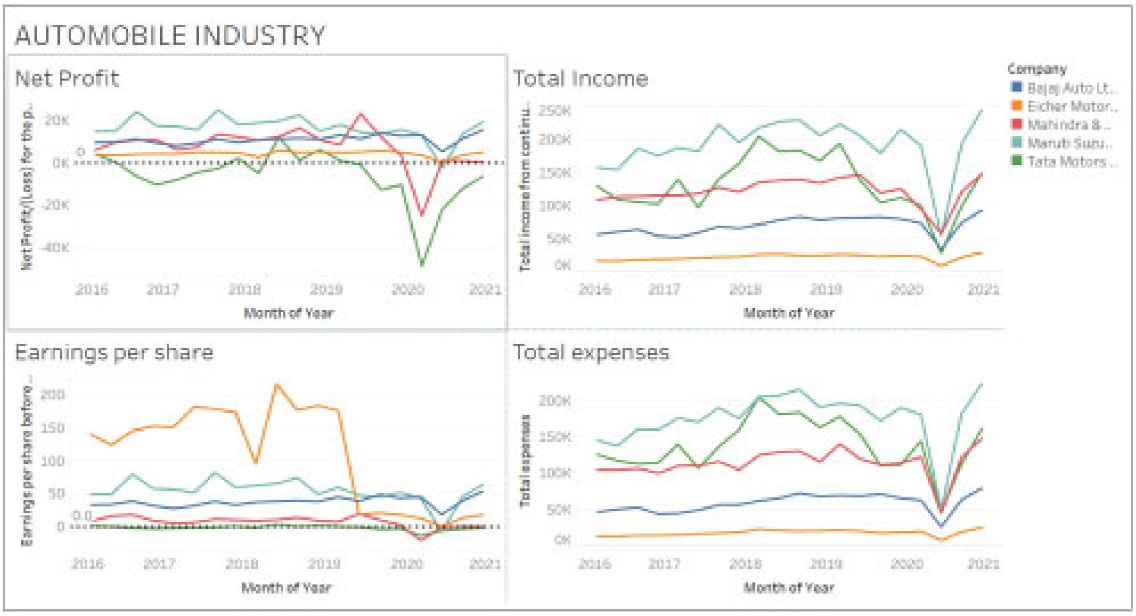

Figure 5.3 Automobile Sector Performance

The automobile sector which did not have stable growth in the past years also has seen a massive drop in its income and expenses in the first six months of the year 2020 due to lack of operations and sales. Most of the industries were allowed to resume operations in the last 6 months with a certain amount of restrictions. Hence the automobile industry was able to recover from the situation during the last 6 months. Due to the drop-in income during the first six months, the companies saw a drop in the net profit, which is also reflected in the Earnings per share of the companies. While Bajaj Auto survived without making losses and companies like Eicher Motors and Maruti Suzuki suffered minor losses, companies like Mahindra & Mahindra and Tata Motors suffered high losses, which is seen in the graph. While Mahindra & Mahindra was able to get minor profits during the last 6 months, Tata Motors is still making losses.

FMCG Sector:

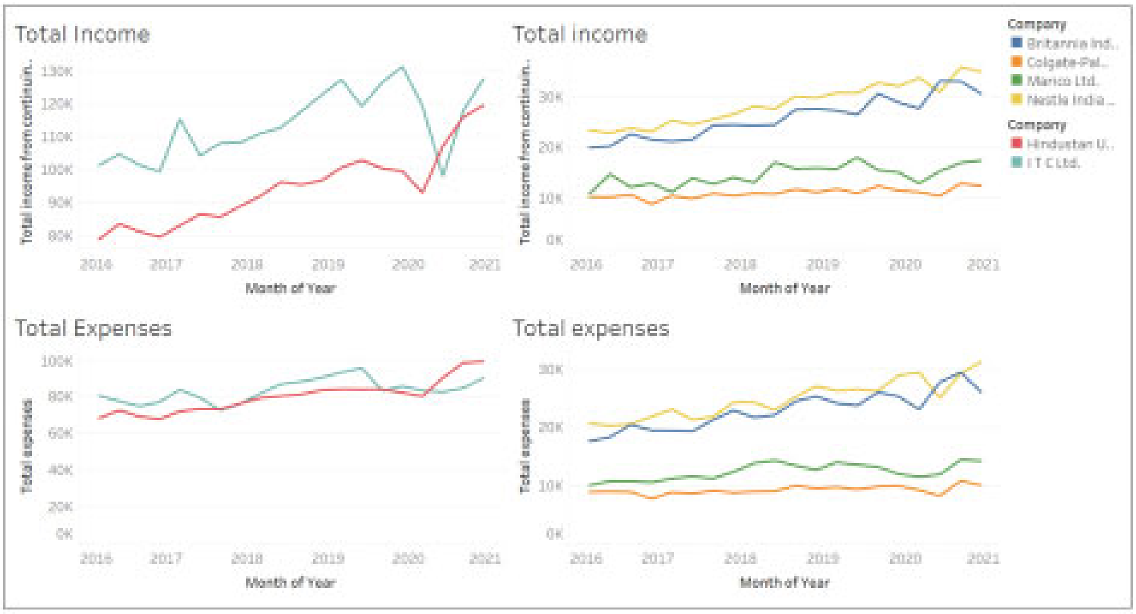

Figure 5.4 FMCG Sector Performance - 1

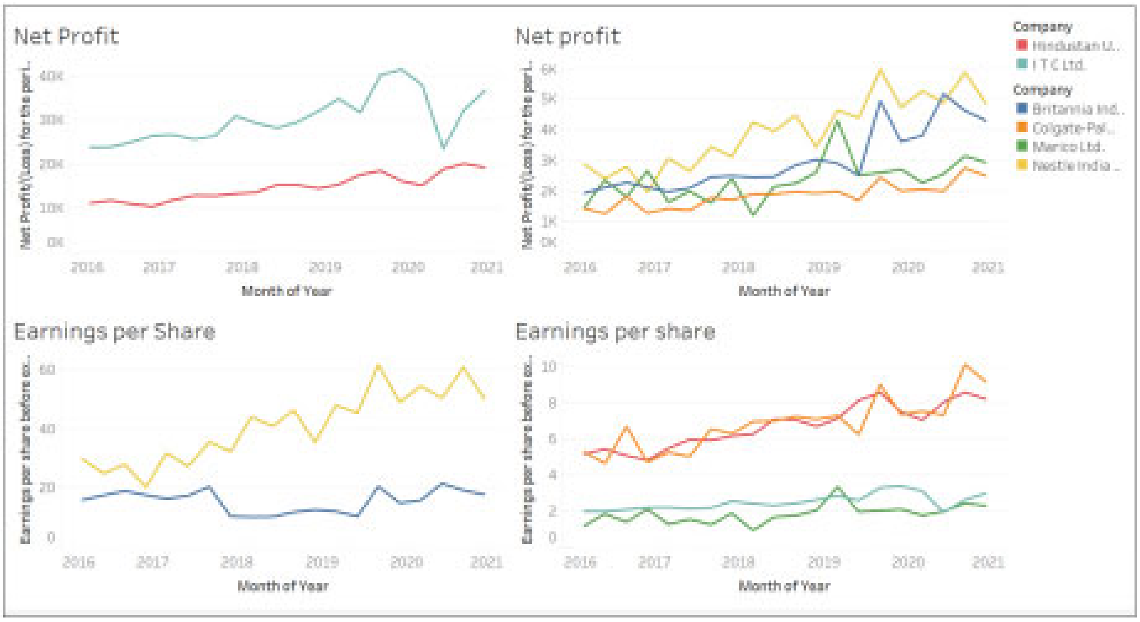

Figure 5.5 FMCG Sector Performance – 2

The FMCG sector is one of the sectors that is least affected by COVID-19. Because the industry produces goods that are essential for day-to-day activities. From the graphs, we can see that the companies faced a slight drop in their income. ITC Ltd had a huge drop in their income during the first six months. As a result, the profit of the company had also decreased. Hindustan Unilever Ltd and ITC Ltd had a sharp rise in their income during the last six months, while the other companies had a small significant increase in their income. The companies other than ITC did not face a much drop in their profits. ITC, in spite of facing a drop-in profit, had a steady increase in their profit while the other companies did not face an increase and a further decrease in the last six months. This has also impacted the Earnings per share of the companies as ITC had increasing EPS after the fall whereas he other companies faced fluctuations in the EPS value.

IT Sector:

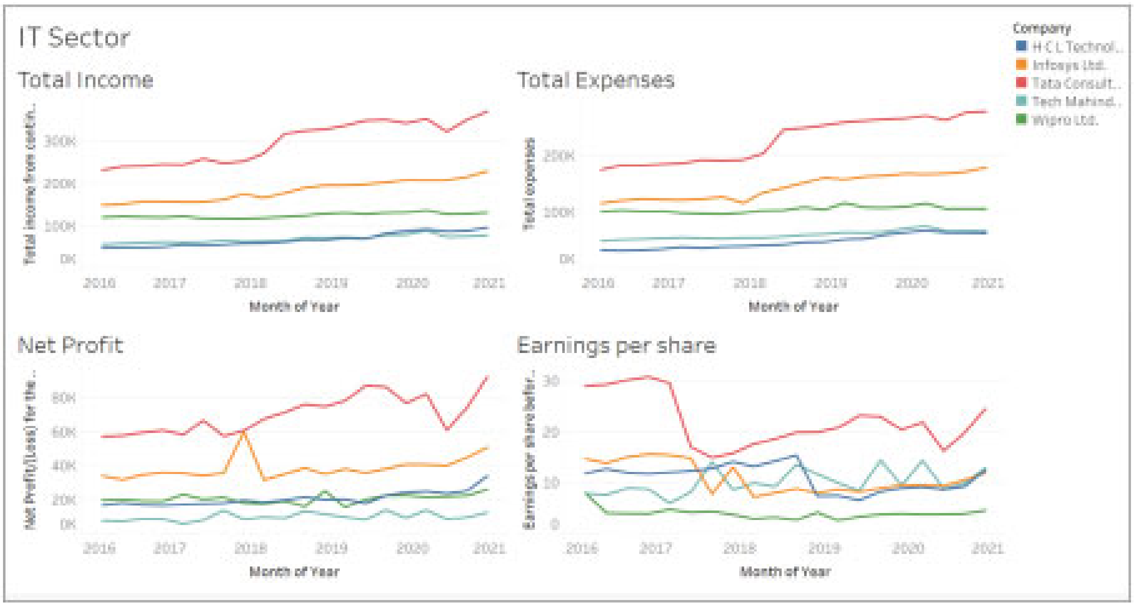

Figure 5.6 IT Sector Performance

The Information Technology Sector also comes under the sectors that are least affected by COVID-19. Most of the companies did not face a fall in their income during COVID-19. Companies like Tata Consulting Services and Tech Mahindra had a slight drop in their income during the first six months. In the last six months, they had a steady increase in their income. The reason for the no drop / slight drop in income is due to the availability of a work-from-home facility. IT industry effectively utilized the facility of work-from-home and continued its operations in spite of the COVID-19 cases and the lockdown. Hence, the income had a steady increase except for TCS and Tech Mahindra. TCS and Tech Mahindra had a drop in their net profits due to the drop-in income whereas the other companies did not face a drop in income. The behaviour of the net profits is also reflected in the Earnings per share.

Pharmaceutical Sector:

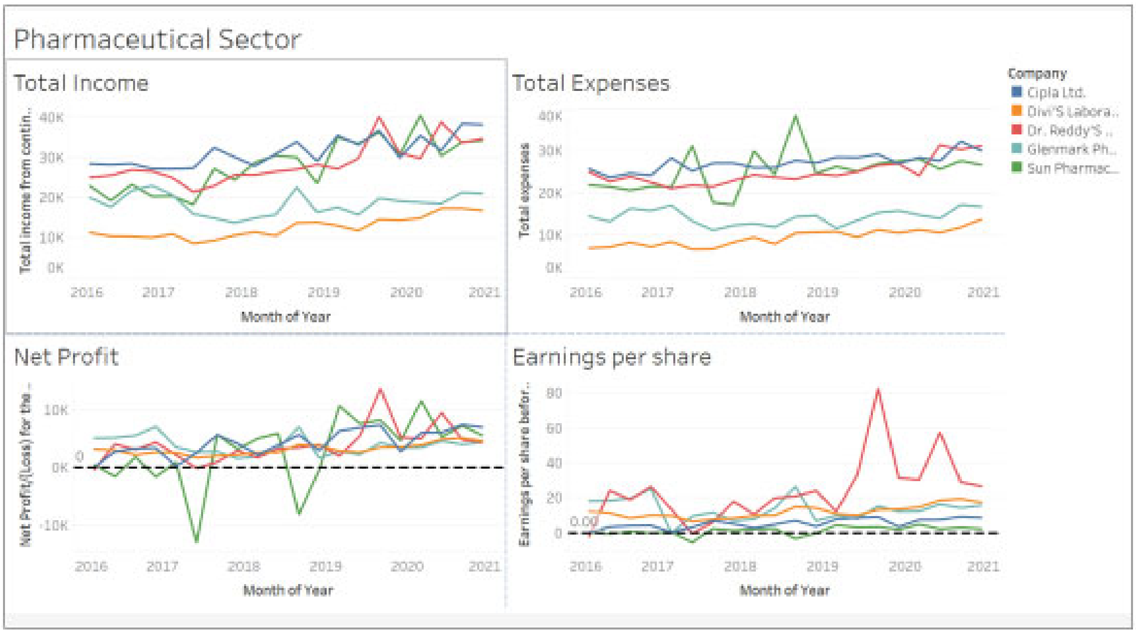

Figure 5.7 Pharmaceutical Sector Performance

The pharmaceutical sector also comes under the industries which was least affected by COVID-19. Most of the companies in this sector faced a slight drop in their income compared to the companies in other sectors except for Divi's Laboratories. The companies after the drop-in income had an increase in income. Most of the companies started focusing on the production of antibiotics and vaccines against COVID-19. The companies did not make losses in the year 2020.

Conclusion

The project has studied the impact of COVID-19 on the Indian Economy by analyzing the effect of COVID-19 on the Gross Domestic Product (GDP), Inflation, sectoral GDP, Stock market indices, and the performance of some of the sectors. The analysis was based on the trend analysis of the financial performance of the companies from selected industries and the creation of a GARCH model to analyze the volatility of the variables due to COVID-19. The analysis shows that COVID-19 has affected the volatility of indicators like GDP, GDP from the Services Sector, and stock market indices like NIFTY 50, SENSEX, and INDIAVIX. All the variables and indicators saw a steep fall due to the spread of the virus and the suspension of operations and economic activities due to the lockdown imposed by the government.

From the graphs, we are able to notice that the economy started to return to its original state after the fall due to COVID-19. This is due to the reason that the Government of India focused on economic growth amidst the pandemic and allowed business operations and economic activities to resume with restrictions as COVID-19 was still spreading.

From the industry analysis, we can see that most of the companies were facing a steep fall in their income and profits, with some companies facing losses due to it, with the Airline Industry and Automobile Industry being severely affected as they faced huge losses. Most of the companies ecovered from the losses by making profits in the last six months, whereas the Airline Industry still continued to make losses.

In conclusion, COVID-19 had a greater impact on the Economy of the Country, the Stock market indices, and the Financial performance of companies. As the Indian Government was able to take measures and keep the spread of COVID-19 under control, Economic activities and business operations were able to resume and thus able to return to their original state. The project has considered the samples for a period from 2015 to 2020 and has taken only one country. Future studies can be done by comparing the economic performance of two countries or analyzing the economic performance of countries where there was a second wave of COVID-19 to analyze how the economy responded during the first wave and the second wave.

References

Journals :

1. Agarwal & Singh (2020), "Covid-19 and Its Impact on Indian Economy", International Journal of Trade & Commerce-IIARTC, Volume 9, No. 1 pp. 72-79, doi:10.46333/ijtc/9/1/9.

2. Alam, M. N., Alam, M. S., & Chavali, K. (2020). Stock market response during COVID-19 lockdown period in India: An event study. Journal of Asian Finance, Economics and Business, 7(7), 131–137. https://doi.org/10.13106/jafeb.2020.vol7.no7.131

3. Ashraf, B. N. (2020). Stock Markets' Reaction to Covid-19. SSRN Electronic Journal, January. https://doi.org/10.2139/ssrn.3585789

4. Bhunia (2012), "The Shock of the Shock of Crude Price, Stock Price and Selected Macro-economic Variables on the Growth of Indian Economy", SUMEDHA Journal of Management, Vol . 1, No 2 April-June, 2012.

5. Bora, D., & Basistha, D. (2021). "The outbreak of COVID 19 pandemic and its impact on stock market volatility: Evidence from a worst affected economy". Journal of Public Affairs, December 2019, 1–23. https://doi.org/10.1002/pa.2623

6. Chaudhary, P. R. Sodani & Das (2020), "Effect of COVID-19 on Economy in India: Some Reflections for Policy and Programme", Journal of Health Management,22(2) 169–180, DOI: 10.1177/0972063420935541.

7. Chia, Liew & Rowland (2020), "Daily New Covid-19 Cases, The Movement Control Order, And Malaysian Stock Market Returns", International Journal of Business and Society, Vol. 21 No. 2, 2020, pp 553-568.

8. Czech, Wielechowski, Kotyza, Benesova & Laputkova (2020), “Shaking Stability: COVID-19 Impact on the Visegrad Group Countries’ Financial Markets”, Sustainability, MDPI, Open Access Journal, vol. 12(15), pages 1-18.

9. Desai.A & Bhatiain. (2016). A Multiple Variable Regression Model for Gross Domestic Product Growth Rate Prediction in India Using Key Macroeconomic Indicators. Journal of Economics and Finance,7,2.

10. Gupta. (2014). A Comparative Study of Indian Economy in Pre and Post Reform period: An Econometric Analysis. Global Journal of Research Analysis,3, 2.

11. Gurloveleen. K & Bhatia. BS. (2015). An Impact of Macroeconomic Variables on the functioning of Indian Stock Market: A Study of Manufacturing Firms of BSE 500. Journal of Stock & Forex Trading,5:1.

12. Hada & Suri (2019), “The Service Sector as India’s Road to Economic Growth : An Analysis”, Journal of Contemporary Research in Management, Vol. 14 No.2

13. Ho & Iyke (2017), “On the causal links between the stock market and the economy of Hong Kong”, CONTEMPORARY ECONOMICS, Vol. 11, Issue3, 343-362

14. Hussin & Yik. (2012). “The Contribution of Economic Sectors to Economic Growth: The Cases of China and India”. Research in Applied Economics ISSN 1948-5433 2012, 4, 438.

15. Islam, M. R., & Muyeed, A. (2020). Impacts of Covid-19 Pandemic on Global Economy: a Meta-Analysis Approach. International Journal of Technical Research & Science, 05(05), 8–19. https://doi.org/10.30780/ijtrs.v05.i05.002

16. Kotishwar A. (2020). Impact of Covid-19 Pandemic on Stock Market With ReferenceTo Select Countries-A Study. Academy of Accounting and Financial Studies Journal, 24(4), 1–9.

17. Kotishwar. A (2018), “A Study on Role of Agriculture in Indian Economy”, Journal of Economic Policy & Research, Volume 13, No 2, April-September 2018 pp. 37-46

18. Kumra(2020), “IMPACT OF COVID-19 ON THE INDIAN ECONOMY” ISSN: 2320-5407 Int. J. Adv. Res. 8(08), 17-33 , Article DOI:10.21474/IJAR01/11461.

19. Liu, H. et al. (2020), The COVID-19 outbreak and affected countries stock markets response. International Journal of Environmental Research and Public Health, 17(8), 1–19. https://doi.org/10.3390/ijerph17082800

20. Machmuddah, Z., et al. (2020). Stock market reaction to COVID-19: Evidence in customer goods sector with the implication for open innovation. Journal of Open Innovation: Technology, Market, and Complexity, 6(4), 1–13. https://doi.org/10.3390/joitmc6040099

21. Mani & Mishra (2014), “Impact of Inflation on the Performance of the Indian Economy-An Analysis”, Asia Pacific Journal of Management & Entrepreneurship Research (APJMER), Vol 3, Issue 1, January 2014, Pages 88-110.

22. Nurudeen (2009), “Does Stock Market Development Raise Economic Growth? Evidence From Nigeria”, The Review of Finance and Banking Volume 01, Issue 1, Year 2009, Pages 015—026.

23. Omuroyi, Izekor, & Osaretin (2015), “Stock Market Development and Economic Growth in Nigeria: An Empirical Assessment”, International Journal of Business and Social Science, Vol. 6, No. 9(1); September 2015.

24. Oravsky, Toth & Banociova (2020), “The Ability of Selected European Countries to Face the Impending Economic Crisis Caused by COVID-19 in the Context of the Global Economic Crisis of 2008”, Journal of Risk and Financial Management, Volume 13, Issue 8.

25. Ozili &Arun (2020), “Spillover of COVID-19: impact on the Global Economy”, Researchgate

26. Pal. (2013). “A Study On Financial Performance Of Public Sector Steel Companies In India Under Liberalized Era.” International Journal of Accounting and Financial Management Research,3,2.

27. Prabu. A, Bhattacharyya & Ray. (2013). “Impact of monetary policy on the Indian stock market: Does the devil lie in the detail”. Indian Economic Review, 55:27–50.

28. Roy (2020),” ECONOMIC IMPACT OF COVID-19 PANDEMIC”, Research gate.

29. Sehrawat & Giri. A. K (2019), “Globalization, role of institutions and economic performance in Indian economy Empirical evidence”, Journal of Financial Economic Policy, Vol. 11 No. 1, pp. 82-100

30. Singh. (2018). “Impact of GDP and Inflation on Unemployment Rate: A Study of Indian Economy in 2011-2018”.International Journal of Management, IT & Engineering,8 ,3.

31. Sivasubramaniyan (2017), “SECTORAL CONTRIBUTION AND THEIR RELEVANCE IN INDIA WITH SPECIAL REFERENCE TO THREE SOUTH INDIAN STATES” International Journal of Research,Vol.5 (Iss.9), ISSN- 2350-0530(O), ISSN- 2394-3629(P) ,DOI: 10.5281.

32. Solo. N & Angami (2012), “Service Sector’s contribution to the State Economy A Study of Nagaland”, SUMEDHA Journal of Management, Vol. 1, No.4 October - December, 2012

33. Sreelakshmi. P & Jain (2018), “Did the Selected Economic Variables Impact the Inflationand GDP Growth of India During 1990-2016?”, SUMEDHA Journal of Management, Vol.7, No.3, July-September 2018

34. Tamilselvan M & Manikandan. (2015). “A Study on Impact of Foreign Direct Investment on Gross Domestic Production in India”. International Journal of Academic Research in Business and Social Sciences, 5, 10.

35. Thomas, T. C., Sankararaman, G., & Suresh, S. (2020). Impact of Covid-19 Announcements on Nifty Stocks. Journal of Critical Reviews, 7(14), 471–475. https://doi.org/10.31838/jcr.07.14.124

36. Turegun. (2019). “Performance Analysis Of The Restaurant And Hotel Industry: Evidence From Borsa Istanbul”, Journal of Economics, Finance and Accounting,6,3.

37. Ullah & Rauf (2013), “Impacts Of Macroeconomic Variables On Economic Growth: A Panel Data Analysis Of Selected Asian Countries”, International Journal of Information, Business and Management, Vol. 5, No.2, 2013, Pages 4-12.

38. Ultana, Kagdigal, Goyal M, Chakkala & Rajeshri Primar. (2019). Impact of FDI on Indian conomy. Journal of Critical Reviews,6, 6.

39. Vasiev, Bi, Denisov & Bocharnikov (2020), “How COVID-19 Pandemics Influences Chinese Economic Sustainability”. Foresight and STI Governance, vol. 14, no 2, pp. 7–22. DOI: 10.17323/2500-2597.2020.2.7.22.

40. Verma & Sinha (2020), “Has COVID 19 Infected Indian Stock Market Volatility? Evidence from NSE.”, AAYAM : AKGIM Journal of Management, Vol. 10 No. 1, January-June, 2020

41. Yue et al. (2020), “Risk Prediction and Assessment: Duration, Infections, and Death Toll of the COVID-19 and Its Impact on China’s Economy”, Journal of risk and Financial Management, 13,66.

Websites :

1. Ahmed (2020), “Impact of COVID-19 on Performance of Pakistan Stock Exchange”, Retrieved from http://dx.doi.org/10.2139/ssrn.3643316

2. Ameida (2020) “[COVID19] 10 Most Severely Affected Industries by Coronavirus”, Retrieved from https://tradebrains.in/severely-affected-industries-by-coronavirus/

3. Angel Broking (2020) , “Stock Market Crash 2020: The Black Monday”, Retrieved from https://www.angelbroking.com/knowledge-center/share-market/stock-market-crash-2020

4. Business Insider (2020, March 20). A comprehensive timeline of the new coronavirus pandemic, from China’s first COVID-19 case to the present. Retrieved from https://www.businessinsider.in/slideshows/miscellaneous/a-comprehensive-timeline-of-the-new-coronavirus-pandemic-from-chinas-first-covid-19-case-to-the-present/slidelist/74721133.cms

5. Drishti IAS (2019) “Sectors of Indian Economy”, Retrieved from https://www.drishtiias.com/to-the-points/paper3/sectors-of-indian-economy

6. Farayibi. O & Asongu. A “The Economic Consequences of the COVID-19 Pandemic in Nigeria”. European Xtramile Centre of African Studies, WP/20/042 (2020). Retrieved from http://dx.doi.org/10.2139/ssrn.3637668

7. Pak, et al. (2020, May 29). Consequences of the COVID-19 outbreak: the Need for Epidemic Preparedness. Retrieved from https://www.frontiersin.org/articles/10.3389/fpubh.2020.00241/full

8. Ravelo & Jerving (2020, November 2020). COVID-19 - a timeline of the coronavirus outbreak. Retrieved from https://www.devex.com/news/covid-19-a-timeline-of-the-coronavirus-outbreak-96396

9. The Indian Express (2020), "IT sector remains least impacted during COVID: Report", Retrieved from https://indianexpress.com/article/jobs/it-sector-remains-least-impacted-during-covid-naukri-report-7057498/

10. The Indian Express (2020, May 16). How COVID-19 has affected the global economy. Retrieved from https://indianexpress.com/article/explained/explained-how-has-covid-19-affected-the-global-economy-6410494/

11. The Wire (2020). COVID-19 India Timeline. Retrieved from https://thewire.in/covid-19-india-timeline

12. World Health Organization (2020, July 31). Rolling updates on coronavirus disease (COVID-19). Retrieved from https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen.