ISSN (Online) 2456 -1304

International Journal of Science, Engineering and Management (IJSEM)

Vol 9, Issue 9, September 2022

Covid-19-A Baleful Aftermath for the Stocks of Indian Pharmaceutical Companies

[1] Mayank Gangwani*, [2] Dhun Sehrawat

[1] Research Scholar, Department of Management Studies, Indian Institute of Technology Delhi, New Delhi, India
[2] Research scholar, Department of commerce, Delhi school of Economics, University Enclave, Delhi, India
Email: [1] mayankgangwani523@gmail.com, [2] sehrawtdhun@gmail.com

Abstract*— Covid-19 catastrophe has not spared any market across the world due to widespread disruptions in its supply chain operations. In today's world, however, stock markets serve as a catalyst for a country's economic and financial development. But, with the development of Covid-19 infection and widespread lockdown in the majority of countries, its stock market has plummeted even further into the depths. Therefore, to determine whether the Covid-19 outbreak has impacted the expected return of Nifty Pharma and stock return of 3 leading pharmaceutical companies Cipla, Dr. Reddy's, and Sun Pharma in the before-Covid-19 period (1 Jan 2019 to 20 Mar 2020) and the after-Covid-19 period (23 Mar 2020 to 20 Mar 2021) this study is being carried out. The study aims to uncertain whether there exists a meaningful link between the S&P CNX Nifty index's forecasted market return and the expected security return of Nifty Pharma before and after Covid-19. To evaluate the relevant hypotheses, descriptive statistics event study technique, non-parametric testing, particularly the Wilcoxon Signed test, and regression analysis were used. It was discovered that the expected returns of Nifty Pharma and the expected security returns of Cipla, Dr. Reddy's, and Sun Pharma did not vary significantly before and throughout the Covid-19 epidemic period. However, for both before and throughout the Covid-19 era, there was a link between the predicted market return of the S&P CNX Nifty index and the security return of Nifty Pharma, implying that the benchmark index S&P CNX Nifty was influenced by Nifty Pharma's performance.

***Index Terms*— Covid-19, Stock Market, Pharmaceutical Companies, before and during the Covid-19 period**
JEL Classification code: G10, I10

I. INTRODUCTION

Stock markets have emerged as the leading indicator of a country's economy and progress. With India on the verge of a major catastrophe and Armageddon, the pharmaceutical industry and healthcare institutions have assumed a critical role. However, the WHO's declaration of a global pandemic, Covid-19, slowed growth in areas like as travel, tourism, entertainment, hotels, and air travel. Infectious illness outbreaks and epidemics have grown more common as a result of globalisation, urbanisation, and climate change. The Covid-19 disaster resulted in severe economic loss, increased unemployment, and disruptions in the operations of various businesses, including transportation, service, and manufacturing. As a result, it is clear that most governments around the world have been blind to the hazards of Covid-19 proliferation. That was why coordinated efforts and the implementation of mitigating measures to stop the global spread failed. According to a World Bank report from 2021, the East Asian economy will grow by only 0.5 percent, the South Asian economy will contract by nearly 3 percent, the African economy will contract by nearly 3 percent, the Middle East and North African GDP will grow by around 4%, Europe and Central Asia will grow by nearly 5%, and the Latin American economy will contract by 7.2 percent. It became increasingly difficult for firms around the world to repay their obligations, resulting in insolvency, bankruptcy, and, eventually, financial crisis. Global GDP is expected to fall by 3.3 percent in 2020, according to an IMF research (World Economic Outlook, 2020). According to a report by (PIB, 2021), India's first quarter of 2019-20 saw 5.4 percent growth, which fell to 3% growth in the last quarter. However, it was the in the intial quarter of 2020-21 that substantiated a record negative growth of 24%, which improved to a negative 7.4% in the second quarter, as seen in the table below.

Table 1: India's Quarterly GDP Growth

Year or Quarter	Growth %
2019-20 Q1	5.4%
2019-20 Q2	4.6%
2019-20 Q3	3.3%
2019-20 Q4	3%
2020-21 Q1	-24.6%
2020-21 Q2	-7.4%
2020-21 Q3	0.5%
2020-21 Q4	1.6%

Source: PIB

Covid-19's appearance has a tremendous impact on global financial markets. As seen in the table below, several key stock market indices in the United States, Europe, Japan, China, India, and South Korea, such as the S&P 500, FTSE 100, DAX, SMI, IDX, BSE, and KOSPI, have seen considerable changes in their value.

Table 2; Market Performance among selected economies

Index	% change as of 26th May over 31st Dec 2020
US S&P 500	11.7%
Shanghai Comp	3.5%

ISSN (Online) 2456 -1304
International Journal of Science, Engineering and Management (IJSEM)
Vol 9, Issue 9, September 2022

Japan Nikkei 225	4.4%
Britain FTSE 100	8.8%
Germany DAX	12.6%
Switzerland SMI	6%
India BSE	6.8%
Indonesia IDX	-2.7%
South Korea KOSPI	10.3%

Source: The Economist

However, experts feel that the pharmaceutical industry would be essential in India's recovery from the Covid-19 tragedy. The Indian pharmaceutical sector, according to the (McKinsey & Co. Report, 2020), is one of the top three largest pharmaceutical producers in the world due to its low manufacturing costs and high-quality products. With the establishment of generic R&D centers and production facilities, India became a desirable hotspot. In recent years, the healthcare and pharmaceutical industries have contributed income and jobs. In 2019, India supplied nearly 200 countries, generating $19.14 billion in revenue, with the goal of reaching $22 billion by 2023. Investing additional money in the pharmaceutical and healthcare industries, the Indian government can help the country's poor citizens improve their living standards and protect the economy against unforeseen disasters. Companies were forced to close their operations as a result of the government's lockdown, which produced a sense of anxiety among investors about the future, resulting in stock market volatility. Due to the complete lockout in March 2020, both the BSE SENSEX and the NSE CNX Nifty experienced huge drops of roughly 15% and 19.6%, respectively, resulting in a stock market crash of 23%. However, other international stock markets, such as the S&P 500's Health Care index, plummeted by 7% in February, reflecting investor scepticism. As a result, this analysis was being done to derive whether the Covid-19 pandemic has any effect on Nifty Pharma's projected return as well as the expected security return stocks of Cipla, Dr. Reddy's, and Sun Pharma on the Indian stock market.

II. LITERATURE REVIEW

Though very little research have been undertaken on the consequences of the Covid-19 disaster on stock performance of pharmaceutical companies in terms of projected stock and portfolio returns, expected risk, and so on. However, in the past, pandemics or widespread diseases have had a negative impact on financial markets. In his study, (Ozili, 2020) emphasized the stock market's role on the global pandemic in his study. Stock markets were thrown into chaos as a result of the entire lockdown and stoppage of company operations due to the pandemic and production gap, demand and supply deficits. Widespread uncertainty resulting from a massive increase of new COVID-19 cases influenced investor behaviour, causing stock market swings. According to a study conducted by (Baldwin and Mauro, 2020) the Covid-19 pandemic has hampered the economic system in three ways, The first effect of the closure or lockout was a reduction in household spending. The second is that a halt in the production process results in lower aggregate demand, which has an impact on import and export. Third, manufacturers had to postpone orders due to the uncertainty of the shutdown time. (Zeren and Hizarci, 2020) undertook a similar analysis to see how the regular growth in the number of COVID-19 cases affected the stock markets in China, Korea, and Spain. In France, Germany, and Italy, however, no significant association was established between the rising number of COVID-19 cases and stock market performance. Several of the investigations were carried out in India as well. (Aravind and Krishnan, 2020) in their study eventually, investigated the aftermath of COVID-19 outbreak on Indian pharmaceutical firms. The study's sample size comprised the top ten pharmaceutical companies. The popular pharmaceutical businesses fared well in this disaster, according to the report. However, as a result of the entire lockdown, supply chain management was harmed, and industrial activity was halted. (Pathak, 2020) conducted a before- and after-analysis to determine the effect of pandemic on the benchmark nifty stocks. The research was descriptive, and it employed secondary data to identify five sectors for pre- and post-analysis. To compare the mean differences during the analysis a paired T-test was being used. Covid-19 had no effect on the stock performance of Nifty Auto and Nifty Infra, but had a favourable impact on the stock performance of Nifty Pharma, Nifty Media, and Nifty FMCG, according to the study's findings. (Anh and Gan, 2020) in their study explored the repercussions of the Covid-19 pandemic on daily stock returns of Vietnamese firms. From January to May 2020, the researchers used a panel data regression model to see if there was a correlation between Covid-19 validated cases and stock returns of 723 public businesses in Vietnam. The increasing number of Covid-19 incidents had a detrimental impact on stock returns, as well as the performance of the Vietnam stock market before and after the introduction of lockdown, according to the data. It was also discovered that the pre-Covid-19 lockdown period and Vietnam stock returns have a negative association. However, there was a favourable correlation between the Covid-19 lockout period and stock performance in various Vietnam sectors. According to the findings, Covid-19-induced lockdown had the greatest impact on banking sector stock returns. (Mittal and Sharma, 2021) aims to analyse the ramifications of the Covid-19 outbreak on healthcare and pharmaceutical markets from May 2019 to April 2020. The secondary source of data acquired from the BSE website was analysed using event research methodology. The intensity of the covid-19 outbreak has an impact on stock performance in the healthcare and pharmaceuticals sectors, according to the study's findings. In their study, (Sharma and Sharma, 2021) looked at the influence of good news on the pharmaceutical industry during the covid-19 pandemic. The study's goal was to determine the volatility index price of the pharmaceutical sector before and after Covid-19, as well as the impact on

prices during Covid-19. The study was descriptive and used a secondary source of data. The method utilised was non-probability sampling. The study found that during the lockdown period, investor panic caused a lot of volatility in stock prices, but because the pharmaceutical industry is so closely linked to the pandemic, any positive news about it caused stock prices to rise. (Amuthan, 2021) investigated the relationship between the benchmark Nifty 50 and the Nifty Bank, Nifty Consumer Durables, Nifty IT, and Nifty Pharma sectors to determine which were the best and worst performing. Correlation and regression were used as the research was analytical. It was elucidated that sectors such as IT and consumer durables had a high correlation with benchmark Nifty 50 indices, that consumer durables had the most upswings, making it the best index among the rest, and that both IT and consumer durables were heavily influenced by changes in the benchmark index. The study found that benchmark index changes had the least impact on Nifty bank and Nifty Pharma by comparing risk and return analyses for the before-Covid-19 and after-Covid-19 periods. (Sony et al., 2021) in their study assessed the brunt of Covid-19 pandemic on many sectors, including the automobile, health care, communication, and information technology. The research was causal, and the data was gathered from a secondary source. On the acquired data, correlation and regression analysis were performed. Hypotheses were tested using a paired sample T-test. Because the p values were smaller than the crucial threshold, the study's findings showed that the expected return and standard deviation of sectors (automobile, health care, communication, and information technology) did not alter significantly between both before and after Covid-19 Crisis. The study derived that the Covid-19 epidemic has no impact on the risk and return of the sectoral index. In their analysis, Covid-19's impact on pharmaceutical firm stock returns was studied in a study carried by (Behera and Rath, 2021). An event research methodology was used to analyse data from a secondary source. The analysis discovered that the pharmaceutical industry's anomalous and cumulative abnormal returns were statistically significant during the Covid-19 outbreak. According to the study, the Indian government should reduce tariffs and provide subsidies to pharmaceutical companies in order to incentivize them to create vaccines.

III. OBJECTIVES OF THE STUDY

1. To compare the predicted return and risk before and after the Covid-19 outbreak on Nifty Pharma companies.
2. To see if the Covid-19 epidemic has had an impact on pharmaceutical company stock performance by comparing expected return and risk before and after the Covid-19 outbreak.
3. To compare the likelihood of good or bad days in terms of (negative or positive holding period return) of Pharmaceutical stocks before and after the Covid-19 period.
4. Calculate and compare the characteristic line and Beta for pharmaceutical company stocks before and after Covid-19.
5. To see if there was a link between the market-based S&P CNX Nifty index and Nifty Pharma stock returns before and after the Covid-19 era.
6. To see if there was a link between the stock returns of Cipla, Dr. Reddy's, and Sun Pharma before and after the Covid-19 era and the predicted returns of a market-based S&P CNX Nifty index.

IV. RESEARCH METHODOLOGY

This study employs a descriptive research design. For both before Covid-19 period from (1 January 2019 to 20 March 2020) and after Covid-19 period from (23 Mar 2020 to 20 Mar 2021), the daily prices of market indices like S&P CNX Nifty 50 and sectoral indices Nifty Pharma, as well as individual stock prices of Cipla, Sun Pharma, and Dr. Reddy's were taken into consideration for the analysis. These firms were chosen primarily for their market capitalization and contribution to the Nifty Pharma Index. The material was gathered from secondary sources such as textbooks, journal articles, and information on the internet, specifically the NSE website. Market indices such as the S&P CNX Nifty 50 are made up of a weighted average of stocks from India's top 50 firms, divided into various sectors. The study employed the benchmark index S&P CNX Nifty 50 market returns as the dependent variable and Nifty Pharma stock returns as the independent variable, which included individual stock returns from Cipla, Sun Pharma, and Dr. Reddy's. As a sampling approach, the study used a purposive sampling of non-probability sampling strategy. The holding period return was computed using the calculations below, taking into account both the opening and closing stock prices for the before-Covid-19 (1 January 2019 to 20 March 2020) and after-Covid-19 (23 March 2020 to 20 March 2021) periods. A well-known event methodology method was applied in the research. It contains 558 daily price observations, of which 307 were from before Covid-19 and 251 were from after Covid-19 which is similar to various studies by (Pathak, 2020) and (Mittal and Sharma, 2021). The formula for computing holding period return was:

$$Holding\ period\ return = Pn - Po/Po$$

Pn= Closing prices
Po= Opening prices

IBM SPSS Statistics was used to analyse the information gathered. The Wilcoxon sign rank test of the nonparametric test was used on the acquired data to evaluate the study's relevant hypotheses at a 5% level of significance, as well as linear and multiple regression analysis. Similar past research conducted by (Anh and Gan, 2020); (Amuthan, 2021); (Sony et al., 2021) and others have influenced the choice of analysis approach (Behera and Rath, 2021).

ISSN (Online) 2456 -1304

International Journal of Science, Engineering and Management (IJSEM)

Vol 9, Issue 9, September 2022

In the linear regression, Y= β0 + βX + €, Y the before and after Covid-19 market return of **S&PCNX Nifty 50 are dependent variables** whereas X, the before and after Covid-19 security return of Nifty Pharma, independent variables of the study.

In the following multiple regression analysis, the study's dependent variables are the S&P CNX Nifty 50 market returns before and after Covid-19, while the independent variables are Cipla, Sun Pharma, and Dr. Reddy's market returns before and after Covid-19. The following is the multiple regression equation:

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \ldots. + \beta nXn + €$$

Y= before and after Covid-19 market returns of **S&P CNX Nifty 50**

β0= Constant

β1X1 = before and after Covid-19 security returns of Cipla

β2X2 = before and after Covid-19 security returns of Sun Pharma

β3X3 = before and after Covid-19 security returns of Dr. Reddy's

V. EMPIRICAL DATA ANALYSIS

The COVID-19 epidemic had brought the entire planet to a halt. Due to the entire lockdown or shutdown, industry output and manufacturing activities ceased, causing investor bewilderment and resulting in the global stock market collapse. Only pharmaceutical company stocks, however, provided some relief to investors. The predicted mean returns and estimated risk for both before and after the Covid-19 era were calculated using information available from the NSE website about daily stock prices of Nifty Pharma.

Table 3: Mean return and Risk of NIFTY Pharma for both before and after Covid-19 period

Stock	Before Covid-19 crisis from (1 Jan 2019 to 20th march 2020)		AfterCovid-19 crisis from (23 mar 2020 to 30th mar 2021)	
	Mean Returns	S.D/Risk	Mean Returns	S.D/Risk
NIFTY Pharma	-0.13	1.40	-0.15	1.55

The predicted mean returns and risk of Nifty Pharma for both before and after the Covid-19 era were calculated in the above table to demonstrate the influence of the Covid-19 lockout on Nifty Pharma stock performance. As it can be observed, expected mean returns before the COVID-19 periods were greater than expected mean returns after the COVID-19 period. When compared to before Covid-19, however, the predicted risk increased, meaning that heightened investor uncertainty led to increased volatility regarding future operations of industries and enterprises, resulting in substantial stock market selling and a reduction in Nifty Pharma stock prices.

Table 4: Probability of Good and bad days of NIFTY Pharma for both before and after Covid-19 period

Stock	Probability of Good or bad days before Covid-19 crisis from (1 Jan 2019 to 20 March 2020)		Probability of Good or bad days after Covid-19 crisis from (23 March 2020 to 30 March 2021)	
	Good	Bad	Good	Bad
NIFTY Pharma	0.48	0.52	0.44	0.56

The accompanying table's interpretive analysis illustrates the likelihood of happy or terrible days before and after the Covid-19 era. Days with a positive holding period return are considered good, whereas days with a negative holding period return are considered terrible. It can be seen that the chance of favourable days has decreased from before to after the Covid-19 period, implying lower positive holding returns. Similarly, the likelihood of bad days has grown from the before-Covid-19 period to the after-Covid-19 period, predicting more negative holding return days. As a result of the selling pressure in the stock market caused by the complete suspension of operations and supply chain disruptions, the stock prices of the Pharma sector have fallen. As a result, it posted lower-than-expected results.

The information obtained from NSE website about daily stock prices of Cipla, Sun Pharma, and Dr. Reddy's was used to calculate mean returns and risk of before and after Covid-19 period.

Table 5.: Mean Return and Risk of Cipla, Sun Pharma, and Dr. Reddy's for both before and after Covid-19 period

Stock	Before Covid-19 crisis from (1 Jan 2019 to 20th march 2020)		After Covid-19 crisis from (23 mar 2020 to 20th mar 2021)	
	Mean Returns	S.D/Risk	Mean Returns	S.D/Risk
Cipla	-0.000981901	0.0169081 8	-0.00246000 4	0.0204235 75
Dr. Reddy's	0.00007470 8	0.0093953 9	-0.000537	0.0113208 48
Sun Pharma	-0.0010117 9339	0.0207329 8841	-0.00195313 1976	0.0217546 1817

As seen in the table above, the expected mean returns and expected risk of Cipla, Dr. Reddy's, and Sun Pharma have decreased from before Covid-19 to after Covid-19, achieving the study's goal of determining how the Covid-19 outbreak has affected the stock returns of Nifty Pharma's three leading pharmaceutical companies. Sun Pharma's predicted mean

ISSN (Online) 2456 -1304
International Journal of Science, Engineering and Management (IJSEM)
Vol 9, Issue 9, September 2022

returns have declined in a smaller proportion than Dr. Reddy's and Cipla's expected mean returns. It is also obvious from interpretive analysis that the expected risk of Cipla, Dr. Reddy's, and Sun Pharma has grown from before Covid-19 to after Covid-19 due to stock market volatility, which has put investors in a bind. However, as mentioned in several other existing studies and available literature like (Aravind and krishnan, 2020) and (Tashanova et al., 2020) Pharma sector has fared well in comparison to other sectors or industries.

Table 6.: Probability of Good and bad days of Cipla, Sun Pharma, and Dr. Reddy's for both before and after Covid-19 period

Stock	Probability of Good or bad days in before Covid-19 crisis from (1 Jan 2019 to 20 March 2020)		Probability of Good or bad days in after Covid-19 crisis from (23 March 2020 to 20 March 2021)	
	Good	Bad	Good	Bad
Cipla	0.45302	0.54698	0.38462	0.6153
Dr. Reddy's	0.5342	0.4657	0.4741	0.5258
Sun Pharma	0.4715	0.5284	0.4457	0.5542

The accompanying table's interpretive analysis illustrates the likelihood of happy or terrible days before and after the Covid-19 era. Days with a positive holding period return are considered good, whereas days with a negative holding period return are considered terrible. From before and after the Covid-19 incident, it is clear that the likelihood of happy days has reduced while the likelihood of unpleasant days has increased. As previously said, investor anxiety produced a stir, resulting in selling pressure on stocks, resulting in a lower holding period return after the Covid-19 issue than before the crisis.

Table 7.

Beta and Characteristic line of stocks of Cipla, Sun Pharma, and Dr. Reddy's for both before and after Covid-19 period

Stocks	Before the Covid-19 crisis from (1 Jan 2019 to 20th March 2020)		After the Covid-19 crisis from (23 March 2020 to 20th March 2021)	
	B	Characteristic line	B	Characteristic line
Cipla	0.69	-0.04 + 0.69rm + e	0.305	0.228 + 0.305rm + e
Dr. Reddy's	-0.0022	0.01 + -0.0022β + e	0.259	0.14 + 0.259rm + e
Sun Pharma	0.661	0.008 + 0.661rm + e	0.563	0.100 + 0.563rm + e

Beta measures the volatility in security or stock return in comparison to the market return. A beta higher than 1 indicates higher volatility means a change in the value of a security is more than a change in the market value whereas beta less than 1 indicates low volatility means A stock's value fluctuates less than the market's. Beta and the characteristic line were also computed to compare the sensitivity in return of security (stocks of Nifty Pharma) with market return (**S&P CNX Nifty 50** indexes) for both before and after the Covid-19 crisis. The correlation of an asset's return with the market return is known as beta.

$$\beta = \frac{Covariance\ (Rm,Ri)}{VarianceRm}$$

Regression analysis, on the other hand, aids in the formation of a characteristic line that evaluates the link between the systematic risk and rate of return of a given investment. The characteristic line compares the performance of a security with that of the markets.

$\gamma = \alpha + \beta * Rm + e$

Alpha stands for asset or security's return beyond risk-free rate. Beta is the slope of the characteristic line that measures systematic risk. Surprisingly, the interpretive analysis in the above data shows that the value of fell for both Cipla and Sun Pharma before and after the Covid-19 crisis period, with the exception of Dr. Reddy's, which saw a considerable increase. Prior to the Covid-19 crisis, it is obvious that Pharma stocks were more volatile than the market return, indicating a larger systematic risk, however during and after the Covid-19 crisis, stock volatility is lower than the market return. Positive vaccine news pushed investors to invest in Cipla and Sun Pharma stocks during or after the Covid-19 issue. However, in comparison to the market, Dr. Reddy's saw increased volatility in its security's return (Nifty index). As a result, except from Dr. Reddy's, it may be deduced that pharmaceutical stocks were less susceptible to changing nifty index during the crisis time than before the crisis period.

VI. TESTING OF HYPOTHESIS

Several of the study's objectives were transformed into null hypotheses. The hypotheses below were tested using the Wilcoxon Signed test of non-parametric test with a significance threshold of 5%.

H01: There is no significant difference that exists between the expected return in Cipla stocks for before and after Covid-19 period.

Ranks

		N	Mean Rank	Sum of Ranks
after Covid-19 holding return - before Covid-19 holding return	Negative Ranks	141a	118.28	16677.00
	Positive Ranks	107b	132.70	14199.00
	Ties	0c		
	Total	248		

a. After Covid-19 holding return < Before-Covid-19 holding return

b. After Covid-19 holding return > Before-Covid-19 holding return

c. After Covid-19 holding return = Before-Covid-19 holding return

ISSN (Online) 2456 -1304

International Journal of Science, Engineering and Management (IJSEM)

Vol 9, Issue 9, September 2022

Test Statistics

	After Covid-19 holding return - Before Covid-19 holding return
Z	-1.096b
Asymp. Sig. (2-tailed)	.273

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.

By interpreting the above table, it could be seen that the significance level or P-value (0.273) is greater than 0.05 which means that the expected return of Cipla has not changed much between before and after the Covid-19 period.

H02: There is no significant difference that exists between before and after Covid-19 expected return of Sun Pharma.

Ranks

		N	Mean Rank	Sum of Ranks
After covid-19pandemic holding return - Before covid-19 pandemic holding return	Negative Ranks	129a	126.69	16343.00
	Positive Ranks	120b	123.18	14782.00
	Ties	0c		
	Total	249		

a. After covid-19 holding return < before covid-19 holding return
b. After covid-19 holding return > before covid-19 holding return
c. After covid-19 holding return = before covid-19 holding return

Test Statistics[a]

	After covid-19 holding return - Before covid-19 holding return
Z	-.686b
Asymp. Sig. (2-tailed)	.493

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.

The significance level or P-value (0.493) in the preceding table is greater than 0.05, indicating that null hypotheses are not being dismissed. As a result, one might conclude that there is little influence on Sun Pharmaceuticals' estimated return before and after the Covid-19 period.

H03: There is no change that exists between the expected return of Dr. Reddy's stock for the period of before and after Covid-19.

Ranks

		N	Mean Rank	Sum of Ranks
after covid-19 Holding period return - before covid-19 holding period of return	Negative Ranks	129a	125.02	16127.00
	Positive Ranks	120b	124.98	14998.00
	Ties	0c		
	Total	249		

a. after covid-19 Holding period return < before covid-19 holding period of return
b. after covid-19 Holding period return > before covid-19 holding period of return
c. after covid-19 Holding period return = before covid-19 holding period of return

Test Statistics[a]

	after covid-19 Holding period return - before covid-19 holding period of return
Z	-.496b
Asymp. Sig. (2-tailed)	.620

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.

The significance level or P-value (0.620) in the table above is greater than 0.05, indicating that there is no significant difference in predicted return in Dr. Reddy's stock before and after the Covid-19 era.

H04: There is no significant change that exists between the expected return of Nifty Pharma for the before and after Covid-19 period.

Ranks

		N	Mean Rank	Sum of Ranks
Post Covid-19 Holding period return - Pre Covid-19 holding period return	Negative Ranks	127a	125.46	15933.00
	Positive Ranks	127b	129.54	16452.00
	Ties	0c		
	Total	254		

a. After Covid-19 Holding period return < before Covid-19 holding period return
b. After Covid-19 Holding period return > before Covid-19 holding period return
c. After Covid-19 Holding period return = before Covid-19 holding period return

Test Statistics[a]

	After Covid-19 Holding period return - Before Covid-19 holding period return
Z	-.221b
Asymp. Sig. (2-tailed)	.825

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

ISSN (Online) 2456 -1304

International Journal of Science, Engineering and Management (IJSEM)

Vol 9, Issue 9, September 2022

The significance level or P-value (0.825) was more than 0.05, which is not significant, as the interpretive analysis in the above table indicates. As a result, it is possible to conclude that there is no median difference in the NIFTY Pharma stock's predicted return before and after Covid-19.

H05: There exists no significant relationship between expected market return of **S&P CNX Nifty 50 and expected security returns of Nifty Pharma for the Pre Covid-19 period.**

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.682a	.465	.463	.954036299780311	1.725

a. Predictors: (Constant), Pre Covid-19 security return of N Pharma

b. Dependent Variable: Pre Covid-19 market return of benchm **S&P CNX Nifty 50**

The greater value of R (0.682) in the before-covid-19 per indicates a strong degree of correlation between market returns S&P CNX Nifty 50 and predicted security returns of Nifty Phar according to the above table. The value of R^2 indicates that an independent variable explains 47 percent of the change in the dependent variable.

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	235.522	1	235.522	258.763	.000[b]
	Residual	271.235	298	.910		
	Total	506.757	299			

a. Dependent Variable: Pre covid-19 market return of S&P C Nifty 50

b. Predictors: (Constant), Pre covid-19 sec return of Nifty Pharm

The data in the regression equation is effectively fitted in the table above. Because the regression model's P-value (0.00), was lower than 0.05, it was assumed that the model is statistically significant and predicts the outcome variable. As a result, null hypotheses are dismissed. As a result, it is possible to conclude that the NIFTY 50 benchmark index and Nifty Pharma have a link during the period prior to Covid-19.

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	T	Sig.	Collinearity Statistics Tolerance	VIF
1	(Constant)	.025	.055		.444	.657		
	Pre Covid-19 sec return	.629	.039	.682	16.086	.000	1.000	1.000

a. Dependent Variable: Pre Covid-19 market return of benchmark **S&P CNX Nifty 50**

The above coefficient table in general shows the Pre Covid-19 security return (Nifty Pharma) to the Pre Covid-19 market return **(S&P CNX Nifty 50)** model. Therefore, the regression equation is:

Y= α + β*x, where Y is Pre Covid-19 market return of **S&P CNX Nifty 50**and X is Pre Covid-19 security return of Nifty Pharma

Y = 0.025 + 0.629 (Pre Covid-19 security return)

H06: There exists no significant relationship between the expected market return of benchmark **S&P CNX Nifty 50 and the expected security return of Nifty Pharma for during or Post Covid-19 period.**

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.228a	.052	.048	1.474788887344077	2.158

a. Predictors: (Constant), During Covid-19 security return of Nifty Pharma

b. Dependent Variable: During Covid-19 market return of **S&P CNX Nifty 50**

The value of R (0.228) indicates a low degree of correlation, whereas the value of R^2 shows the independent variable has 6 percent variation in the dependent variable.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.980	1	29.980	13.784	.000b
	Residual	545.926	251	2.175		
	Total	575.906	252			

a. Dependent Variable: During Covid-19 market return of benchmark index **S&P CNX Nifty 50**

b. Predictors: (Constant), During Covid-19 security return of Nifty Pharma

Because the significance level or P-value (0.00) was less than 0.05 in the above table, it was deduced that null hypotheses were rejected. As a result, it is possible to deduce that the predicted returns of the benchmark index S&P CNX Nifty 50 and Nifty Pharma for the both during or after the Covid-19 period are related.

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Co linearity Statistics Tolerance	VIF
1	(Constant)	-.193	.094		-2.056	.041		

ISSN (Online) 2456 -1304

International Journal of Science, Engineering and Management (IJSEM)

Vol 9, Issue 9, September 2022

during Covid-19 security return	.209	.056	.228	3.713	.000	1.000	1.000

a. Dependent Variable: During Covid-19 market return of **S&P CNX Nifty 50**

The coefficient table in general shows the contribution of the Post Covid-19 security return to the Post Covid-19 market return (**S&P CNX Nifty 50)** model. Therefore, the regression equation is:

Y= α + β*x, where Y is Pre Covid-19 market return of **S&P CNX Nifty 50** and X is Pre Covid-19 security return of Nifty Pharma

Y = -0.193 + 0.209 (Pre Covid-19 security return)

H07: There was no substantial correlation between the predicted market return of the S&P CNX Nifty 50 and the expected security return of Cipla, Sun Pharma, and Dr. Reddy's In the before-Covid-19 period,.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.419a	.176	.167	.87656061556545 9	1.689

a. Predictors: (Constant), Pre Covid-19 security return of Sun Pharma, Pre Covid-19 security return of Dr. Reddy, Pre Covid-19 security return of Cipla

b. Dependent Variable: Pre Covid-19 market return of **S&P CNX Nifty 50**

Multiple correlation coefficients are shown in R in the above table. A result of (0.419) suggests that both dependent and independent variables explains a good relationship. The R^2 score (18%) indicates how well the independent variable captures variation in the dependent variable. The Durbin-Watson value (1.689) lies between 1.5<d<2.5 that states no first-order autocorrelation in multiple regression data.

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	46.758	3	15.586	20.285	.000b
	Residual	218.982	285	.768		
	Total	265.741	288			

a. Dependent Variable: Pre Covid-19 market return of **S&P CNX Nifty 50**

b. Predictors: (Constant), Pre covid-19 security return of Sun Pharma, Pre Covid-19 security return of Dr. Reddy's, Pre Covid-19 security return of Cipla

Since the significance level (0.00) is lower than 0.05, the null hypothesis stands rejected and the regression model explains a statistical significance in predicting the outcome variable, according to the table above. The regression model is an excellent fit with an F value of 20.285, and a P-value of less than 0.05. So it could be concluded that expected security returns of Cipla, Sun Pharma, and Dr. Reddy's have impacted the expected market return of **S&P CNX Nifty 50 in the Pre Covid-19 period.**

Coefficients[a]

Model	Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	T	Sig.	Co linearity Statistics Tolerance	VIF
(Constant)	.004	.052		.071	.944		
Pre Covid-19 security return of Cipla (X1)	.194	.037	.303	5.282	.000	.879	1.138
Pre Covid-19 security return of Dr. Reddy (X2)	-.015	.029	-.028	-.528	.598	1.000	1.000
Pre Covid-19 security return of Sun Pharma (X3)	.096	.027	.202	3.528	.000	.879	1.138

a. Dependent Variable: Pre Covid-19 market return of **S&P CNX Nifty 50**

The above-stated table indicated the variation of the dependent variable with all other independent variables. For coefficients to be statistically significant it is the significance level or P-value that has to be less than 0.05. By interpreting the above table, coefficients of X1 and X3 were statistically significant. However, the coefficient has X2 has P-value > 0.05 which indicates not statistically significant. The multiple regression equation is:

$\mathbf{Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots. + \beta_n X_n + €}$

Y= Pre Covid-19 market return of **S&P CNX Nifty 50**

β_0= Constant

$\beta_1 X_1$ = Pre Covid-19 security return of Cipla

$\beta_2 X_2$= Pre Covid-19 security return of Sun Pharma

$\beta_3 X_3$= Pre Covid-19 security return of Dr. Reddy's

$\mathbf{Y= 0.04 + 0.194X_1 – 0.015X_2 + 0.096X_3}$

H08: There exists no significant relationship between the expected market return of **S&P CNX Nifty 50 and expected Security returns of Cipla, Sun Pharma, and Dr. Reddy's during or Post Covid-19 period.**

ISSN (Online) 2456 -1304

International Journal of Science, Engineering and Management (IJSEM)

Vol 9, Issue 9, September 2022

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.393[a]	.155	.144	1.4312558995662 52	2.140

a. Predictors: (Constant), Post covid-19 security return of Sun Pharma, Post covid-19 security return of Dr. Reddy's, Post covid-19 security return of Cipla

b. Dependent Variable: Post covid-19 Market Return of benchmark index **S&P CNX Nifty 50**

The value of R (0.393) in the above table suggests a low degree of correlation. R2 (15%) indicates how much alteration in the dependent variable is explained by the independent variable. Durbin-Watson (2.140) has a value between 1.5<d<2.5, shows that there is no first-order autocorrelation in multiple regression data.

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	88.933	3	29.644	14.471	.000b
	Residual	485.493	237	2.048		
	Total	574.426	240			

a. Dependent Variable: Post covid-19 Market Return of **S&P CNX Nifty 50**

b. Predictors: (Constant), Post covid-19 security return of Sun Pharma, Post covid-19 security return of Dr. Reddy's, Post covid-19 security return of Cipla

Since the significance level or P-value (0.00) is less than 0.05, the model is statistically significant, according to the above ANOVA table. The regression model is well-fitting, with a F value of 14.471 and a P-value being less than 0.05. So it could be concluded that the expected market return of benchmark index **S&P CNX Nifty 50 in the Post or during the Covid-19 period was impacted by the** expected security returns of Cipla, Sun Pharma, and Dr. Reddy's.

Coefficients[a]

Model	Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	T	Sig.	Co linearity Statistics Tolerance	VIF
1(Constant)	.219	.094		2.341	.020		
Post Covid-19 security return of Cipla (X1)	-.036	.049	-.054	-.735	.463	.656	1.523
Post covid-19 security return of Dr. Reddy's (X2)	.017	.045	.024	.387	.699	.905	1.106
Post covid-19 security return of Sun Pharma (X3)	.292	.053	.415	5.484	.000	.624	1.603

a. Dependent Variable: Post covid-19 market return of **S&P CNX Nifty 50**

For coefficients to be statistically significant it is the significance level or P-value that has to be less than 0.05. By interpreting the above table, the coefficient of X_3 is statistically significant. However, X_1 and X_2 coefficients were not statistically significant since their P-value > 0.05. The multiple regression equation is:

$\mathbf{Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots. + \beta_n X_n + €}$

Y= Post covid-19 market return of **S&P CNX Nifty 50**

β_0= Constant

$\beta_1 X_1$ = Post covid-19 security return of Cipla

$\beta_2 X_2$= Post covid-19 security return of Sun Pharma

$\beta_3 X_3$= Post covid-19 security return of Dr. Reddy's

$\mathbf{Y= 0.219 - 0.036X_1 + 0.017X_2 + 0.292X_3}$

VII. CONCLUSION

The devastating COVID-19 pandemic is currently affecting nearly every country on the planet. The most powerful markets are weak, and the crisis is out of control. The main aim of this research was to see what effect the Covid-19 outbreak has on Nifty Pharma and other pharmaceutical companies such as Cipla, Sun Pharma, and Dr. Reddy's, as well as to see if there was a significant relationship between Nifty Pharma's expected returns and the S&P CNX Nifty 50 before and after the outbreak. The researchers also wanted to see if there was a link between the market-based S&P CNX Nifty index and stock performances for Cipla, Dr. Reddy, and Sun Pharma before and after the covid-19 era. Several outcomes were revealed after examining the survey information and analysing the data, which were similar to current research in the literature. The general consensus was that there would be a considerable variation in expected returns between before-covid-19 and after-covid-19 periods for chosen pharmaceutical companies. However, it was discovered that the predicted returns of Nifty Pharma did not differ much before and after the Covid-19 period. There was also no significant difference between Cipla, Dr. Reddy's, and Sun Pharma's predicted security returns for before and after Covid-19 periods, which was identical to the findings of research carried out by (Sony et al.,

2021) and (Mittal and Sharma, 2021). The predicted market return of the benchmark S&P CNX Nifty index and the expected return of Nifty Pharma have a significant association in the before and after a covid-19 period, according to the study's findings, which are comparable to those of a study by (Amuthan, 2021). According to (Fama et al., 1969), the returns of the security are proportional to the returns of the market portfolio. The study also showed a strong link between the benchmark index S&P CNX Nifty index's estimated market return and the expected stock return of Cipla, Dr. Reddy's, and Sun Pharma for both before and after covid-19, which was identical to the study conducted by (Behera and Rath, 2004). Due to the entire lockdown, supply chain management and production activities were halted, resulting in substantial selling pressure on pharmaceutical companies, raising the estimated risk of investing in these stocks dramatically. As a result, from both before the Covid-19 to after the Covid-19 crisis, it could be deduced that Covid-19 has damaged the stocks of prominent pharmaceutical companies in terms of decreased expected returns and higher expected risk, which is similar to a study conducted by (Aravind and Manoj Krishnan, 2020). Finally, a global pandemic such as this can be described as fear instilled in the general public, affecting demand and consumption patterns, while the entire shutdown of industry disrupted supply chain operations, resulting in a shutdown of all sectors. However, in this bleak environment, the pharmaceutical and healthcare industries provide a ray of optimism for the economy. However, Covid-19 might be viewed as a "wake-up call" to world leaders to join hands in working and establishing plans to combat pandemics as soon as possible, as well as assisting with the necessary finance for international collective action.

VIII. LIMITATIONS AND SCOPE FOR FURTHER RESEARCH

1. This analysis uses only a small sample of Nifty Pharma pharmaceutical businesses (Cipla, Sun Pharma, and Dr. Reddy's) to establish a meaningful association with the S&P CNX Nifty index. As a result, future research could include additional Indian pharmaceutical businesses, and the sample size could be enlarged.
2. This research was limited to an Indian perspective. Future scholars could perform studies in international cultures using well-known global market indices to acquire a broader perspective.
3. Data was examined in most research utilising one or two common procedures such as paired t-test and correlation analysis. Other statistical techniques could be utilised in future studies to undertake analysis.
4. Because this research was limited to the pharmaceutical industry. Researchers can, however, study the healthcare industry in the future to obtain a larger perspective.

IX. CONFLICT OF INTEREST

I hereby confirm that the manuscript has no any actual or potential conflict of interest with any parties, including any financial, personal or other relationships with other people or organizations within three years of beginning the submitted work that could inappropriately influence or be perceived to influence. We confirm that the paper has not been published previously, it is not under consideration for publication elsewhere, and the manuscript is not being simultaneously submitted elsewhere.

X. ACKNOWLEDGMENT

First and foremost, the author would like to thank his family for their support and motivation they provided throughout the journey of this research paper. The author would gratefully acknowledge the guidance, support and suggestions of my friends and seniors at each and every step during the work. The author has not received any funding from the institution.

REFERENCES

[1] Amuthan, R. (2021). Co relating NIFTY 50 Index Trend's impact on NSE's Sector based Indices Growth Momentum in Post COVID-19 led Indian Economy with Special reference to NIFTY Bank, NIFTY Consumer Durables, NIFTY IT and NIFTY Pharma Indices using Arithmetic Modelling. *Turkish Journal of Computer and Mathematics Education (TURCOMAT), 12*(6), 2184-2189.

[2] Anh, D. L. T., & Gan, C. (2020). The impact of the COVID-19 lockdown on stock market performance: evidence from Vietnam. *Journal of Economic Studies*.

[3] Aravind M, Manojkrishnan C (2020). COVID19: Effect on Leading Pharmaceutical Stocks Listed with NSE. *International Journal of Research in Pharmaceutical Sciences. 11(*1): 31-36.

[4] Baldwin, R., & Di Mauro, B. W. (2020). Economics in the time of COVID-19: A new eBook. *VOX CEPR Policy Portal*.

[5] Behera, C., & Rath, B. N. (2021). The COVID-19 Pandemic and Indian Pharmaceutical Companies: An Event Study Analysis. *Bulletin of Monetary Economics and Banking, Special*, (2021), 1-14.

[6] Economic Times 2020. Covid-19 Impact: Fears of Chinese API shortage hurt pharma players; Glenmark Pharmaceuticals was the biggest loser on the healthcare index.

[7] Gopalakrishnan, M. M., Vijay, A. K. K. 2017. A Study on Risk-Return Analysis of Pharmaceutical Industries in the Indian Stock Market. *Imperial Journal of Interdisciplinary Research, 3(*5):1869–1874.

[8] International Air Transport Association (IATA) (2020). COVID-19 puts over half of 2020 passenger revenues at risk. Retrieved from https://www.iata.org/en/pressroom/pr/2020-04-14-01/

[9] International Monetary Fund, (2020), World Economic Outlook: a long and difficult ascent, Washington, DC. October.

[10] Kebriaeezadeh, A., Zartab, S., Fatemi, S. F., & Radmanesh, R. (2013). Fundamentals and stock return in pharmaceutical companies: A panel data model of Iranian industry. *Iranian Journal of Pharmaceutical Sciences*, *9*(1), 55-60.

[11] Lynch, H., Page, S., Panariello, R. A., Tzitzouris Jr, J. A., & Giroux, D. (2019). The revenge of the stock pickers. *Financial Analysts Journal*, *75*(2), 34-43.

[12] Mckinsey&Company (2020). India Pharma 2020 Propelling access and acceptance, realizing true potential. (Available at: https://www.mckinsey.com/~/media/mckinsey/dotcom/client_service/Pharma%20and%20Medical%20Products/PMP%20NEW/PDFs/778886_India_Pharma_2020_Propelling_Access_and_Accepta nce_Realising_True_Potential.ashx).

[13] Mittal, S., & Sharma, D. (2021). The Impact of COVID-19 on Stock Returns of the Indian Healthcare and Pharmaceutical Sector. *Australasian Accounting, Business and Finance Journal*, *15*(1), 5-21.

[14] Ozili, P. K. (2020). Covid-19 pandemic and economic crisis: The Nigerian experience and structural causes. *Journal of Economic and Administrative Sciences*.

[15] Pathak, V (2020). A Study of Measuring Covid-19 Impact on Stock Performance of Selected Sectors.

[16] Press Information Bureau (PIB) (2021). *PIB's Special Webpage on COVID19*. Government of India.

[17] Saini, R. (2020). The impact of Corona Virus on Indian Economy. *Available at SSRN 3595300*.

[18] Soni, C. M. (2021). IMPACT OF COVID 19 PANDEMIC ON STOCK MARKET. *PalArch's Journal of Archaeology of Egypt/Egyptology*, *18*(4), 7706-7712.

[19] Tashanova, D., Sekerbay, A., Chen, D., Luo, Y., Zhao, S., & Zhang, T. (2020). Investment opportunities and strategies in an era of Coronavirus pandemic. *Available at SSRN 3567445*.

[20] World Bank. (2021). *World Development Report 2021: Data for Better Lives*. The World Bank.

[21] Zeren, F., & HIZARCI, A. (2020). The impact of COVID-19 corona virus on stock markets: evidence from selected countries. *Muhasebe ve Finans İncelemeleri Dergisi*, *3*(1), 78-84.