Original Article

Relationship between COVID-19 and the Performance of Pharmaceutical Industry

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Abstract

The aim of the study was to determine how covid-19 affects the pharmaceutical stock market. The monthly data was used in this study span two years, from 2020 to 2022. For the study the independent variables were taken are daily new cases and daily deaths, market to book value and their effect on the market return of pharmaceutical industry. The results showed that the COVID-19 outbreak has had a significant impact on the sector's stock performance. Investors believe healthcare and pharmaceutical companies will benefit from this pandemic as they invest in research and development to prepare for the current epidemic and all subsequent pandemics. The results of this survey showed that investors will continue to invest in healthcare and pharmaceutical companies over time.

Keywords: New covid cases, New daily deaths, Stock Returns.

INTRODUCTION

The World Health Organization (WHO) identified COVID-19, which started in Wuhan, China, in December 2019, as a pandemic on March11, 2020. The COVID-19 epidemic and the world economy both had an effect on the pharmaceutical business found by Liu et al., 2020 [1]. The global health crisis brought on by this pandemic and the efforts made by a number of nations and organizations to contain it have also contributed to the largest economic crisis in modern history found by Singh et al, 2020 [2]. The interruption and breakdown of local and global supply chains has led to a significant decline in global trade in goods and services, which has resulted in high unemployment rates worldwide, worsened social inequalities, and dramatically increased extreme poverty by more than 90 million people worldwide found by Giorgi et al. 2020 [3].

The possibility that the corona virus outbreak will affect the travel, tourism, entertainment, hotel, and airline industries has been clearly stated in a number of articles by Demirgüç-Kunt et al, 2022 [4]. However, during times of disease outbreak, the pharmaceutical industry played a crucial role. When looking at the most recent research, it is interesting to note that the pharmaceutical industry was not given much attention during the coronavirus era found by Haidere et al, 2021 [5]. This gap provided an excellent source of guidance for us as we looked into how COVID 19 would affect prominent pharmaceutical stocks listed on the NSE. The Nifty benchmark stock index in India was appeared stable or positive when COVID 19 was first announced in China in November 2019, indicating that the crisis in China will likely favour Indian businesses found by Rai et al. 2021 [6]. Since December, the epidemic has reached over sixty nations, including India. As the country's confirmed coronavirus cases grew rapidly, the Nifty began to decline gradually. The theoretical model that Fama, 1970 [7] proposed is the foundation for the development of this study. According to this theory Market information significantly influences investment decisions. Additionally, he asserts that "markets are rational and efficient investors overreact to both positive and negative news." This enables us to identify two investment strategies, namely Momentum strategy and a contrarian strategy Investors will overreact to information in a contrarian strategy, whereas investors in a momentum strategy will slowly react to market information. To put it another way, a momentum strategy can be used if investors are acting in line with the overall trend in the market. Contrarily, investors will act precisely the opposite of the market's movements using the contrarian strategy. This theoretical assumption is that investors' reactions to pharmaceutical stocks during the COVID 19 outbreak must be evaluated. Aravind, 2016 [8] suggested a model which served as the basis for the mathematical testing of this research.

The global economy is heavily reliant on the pharmaceutical sector. Given the expanding and aging population, emerging medical conditions, and emergence of new diseases, the industry's long-term growth potentials remain optimistic found by Chowdhury et al, 2019 [9]. Over the past five decades, the Indian pharmaceutical industry has experienced significant growth in both domestic and international markets. From contributing only 5% of the medication utilization in 1969 (95% offer with worldwide pharma), the portion of "Made in India" drugs in Indian pharma market is presently a strong 80% in 2020 found by found Dokholyan & Makaryan, 2018 [10]. More importantly, the country has become known as the "Pharmacy of the world" during the same time that it has established itself as the global leader in generic pharmaceuticals found by Purushothaman & Moolakkattu, 2021 [11]. India's pharmaceutical industry accounts for more than 20% of the world's generics market and 62% of vaccine demand. With a growth rate of 9.8 percent between 2018 and 2019, the Indian domestic pharmaceutical market reached US$20.3 billion. Despite the pandemic's slow start to the year, the domestic market grew by 2.2% between April and September of 2020 compared to the same time last year. Indian pharmaceutical exports increased by 8.4% year-over-year in FY20 to reach $20 billion found by Self et al., 2021 [12].

In addition to economists, the Stock Exchange has resentful the interest of the general public. As part of financial liberalisation, the stock market has been given a significant role in funding the Indian business sector. Similar to how buyers can immediately raise capital for funding, the stock market provides buyers with liquidity and contributes significantly to the regulation and traceability of business management. So during pandemic only pharma companies got the tremendous growth. That is why this topic was choose.

OBJECTIVES OF THE STUDY

- To study the performance of the pharmaceutical industry during the Covid 19.
- Examine how the COVID 19 Pandemic has affected pharmaceutical businesses' returns

LITERATURE REVIEW

Stock prices are impacted as a result of abnormal circumstances, which typically strike the capital market by traumatizing investors. As a result, it could be argued that major events influence the stock market.

According to Rao et al., 1999 [14], this performance is partly due to his FII and liberalization policies in the sector. The authors measured the impact of COVID 19 on market performance in various industries through empirical studies using the event-study method. They noted that the transportation, power, mining and heating, and environmental industries have been adversely affected by the pandemic. However, the pandemic has not affected the manufacturing, education, information technology (IT), or healthcare sectors. Takyia and Bentum-Ennin 2020 [14] investigated and measured the short-term impact of COVID-19 on stock market performance in 13 African countries. They used a unique Bayesian structural time series model and daily market closing data from October 1, 2019 to June 30, 2020 to estimate his COVID 19 proportionality to stock market performance. determined the impact. The results show that the COVID-19 epidemic had a significant negative impact on stock markets in 10 countries.

Topcu and Gulal, 2020 [15] examined the impact of COVID-19 on emerging equity markets from 10 March to 30 April 2020. According to their findings, there is a gradual slope during the pandemic, but it will begin to recede by mid-April 2020. In addition, the authors have noted that Asian markets experience the greatest impact from the outbreak, whereas European markets experience the least. In relation to the study's hypothetical assumption, Abdollahiasl et al. 2014 [16] confirmed that a variety of factors, including net profit, operating cycle, working capital, and inflation rate, influence the return on pharmaceutical shares. According to Ellison and Mullin, 2001 [17], recent news had a short-term impact on pharmaceutical stock price movements.

Furthermore, a study by Hwang, 2013 [19] demonstrated that stocks underperformed when there were positive events, but not when there were negative events. Based on the framework of this study, the pharmaceutical sector's stock prices should be positively impacted by the negative COVID 19 event. The authors applied the conventional nonparametric Mann-Whitney test and the t-test to empirically study daily stock market return data in the open markets of South Korea, Italy, China, France, Germany, Spain, Japan, and the United States. Did. According to the results, there are indications that COVID-19 is having a positive impact on the country's stock market.

Al-Awadi et al., 2020 [19] examined the stock market center to indicate the current state of the currency framework and react to significant events. The same is occasionally shown in previous literature, such as how information affects the stock market. The daily increase in both the total number of COVID-19 cases and the total number of deaths had a large negative impact on the negative return of China's stock market.

Chatterjee, 2020 [20] examined that Medical and scientific organizations are pressing for the distribution of crucial drugs and equipment; not only that, but they also need to spend money on research and development in order to develop vaccines against the disease. Buyers should be aware that these businesses' sales margins will increase in the upcoming quarters, and that bulk buying could also increase their percentage rate. However, when you consider that facilities in China are closed due to the coronavirus outbreak, and that over 70% of the active pharmaceutical ingredients (APIs) used by Indian companies come from China (Bloomberg), the Indian pharmaceutical industry is already under pressure.

Jenny, (2020 [21] found that the monetary expense of Coronavirus can be significantly more when contrasted with that of the overall fiasco of 2008, as people had been fit for artworks around then, and Western worldwide areas could likewise also lose roughly 15% in their Gross domestic product withinside the fast the monetary charge of the concealment approach for holding Coronavirus may be tremendous. Notwithstanding, it's far the best decision to be needed to keep the world. To help countries and organizations respond to the spread of COVID-19, a package of fast-track financing worth US$14 billion has been approved by the World Bank Group.

Dev and Sengupta, 2020 [22] got to the conclusion that the financial markets were already hazardous and that COVID-19's entry into the market increased the force of charge slumps, prominent to stock market smashes across nations while analysing market fluctuations by noting US stock market jumps above 2.5%. The traditional relationships between variables can be disrupted by sudden movements within the stock marketplace in a crisis-like scenario. This motivates us to investigate the pandemic's impact on marketplace volume and return. Some researchers have looked into the connection between stock markets and COVID-19, and others have also looked into how businesses have retorted to the pandemic.

Ali et al., 2020 [23] investigated in their study that when each indexed company experienced a loss of 23% of its market capitalization. In general, stock costs decreased continuously within the month of March 2020 for the financial market.

Singh and Neog, 2020 [24] employed the NIFTY and Sensex as models to address these deteriorating dynamics of the Indian stock market. After the first week of March 2020, it is evident that the decline accelerated. They also confirmed that the envisioned lack of 2 caused almost total disruption in the Financial, Real Estate, and Banking sectors. 81 million crores. He investigated how the Indian stock market was affected by the duration of the COVID19 block. According to their findings, atypical returns plummeted as a result of public panic during the pre-pandemic lockdown. However, throughout the lockdown, public confidence increased, which was shown in the high-quality and large exceptional returns.

When COVID-19 was widely distributed to most countries in March of 2020, Ozili and Arun, 2020 [25] conducted their research. The study made advantage of the core regulations of the government, such as financial protection, public health initiatives, and restrictive measures. These guidelines were followed throughout the study. The author used empirical research to find out how social distance rules affected financial sports and stock market indices in the United States. The results showed that restrictions on inner movement and increased spending on economic coverage had a positive impact on the level of financial sports, but the growing number of coronavirus cases had no significant impact on the level of financial sports.

Azimili, 2020 [26] looked into the extent and nature of risk-return dependence in the US and how the coronavirus affected it. The results suggest that following the Coronavirus flare-up the recognition of reliance among returns and the market portfolio filled in preferable quantiles over the decrease in broadening benefits. The author also looked at stock back-dating and the GSIC. The lower tails responded negatively about twice as much as the top tails, according to his analysis of the GSIC backdating, which showed an inconsistent pattern.

Sisman e al., 2020 [27] has determined that COVID-19 causes global share crashes. The collapse of the global financial market had a significant impact on the Indian stock market as well. Once more, fall in FPIs furthermore diminishes the return of the Indian stock commercial center. The author has determined that COVID-19 is also a "black swan" event after reviewing the records of all unexpected events. Essentially, he dissected records of the breakdown and recuperation of the Indian financial exchange. concluded that an effective public-fitness system is necessary for the financial system's recovery.

Khunti et al., 2020 [28] led an exploratory review to conceptualize the thoughts and tests of at first flagging effect of pandemic on Indian offer market in the later the pandemic notice by the World Exchange Association. Using correlation, they compared the number of COVID 19 cases that were reported during the initial pandemic to the closing price of the Sensex. The study found a statistically significant negative correlation between the number of cases and stock prices.

Chaudhary et. al, 2020 [29] carried out an empirical investigation into the performance of Indian stock market during COVID-19. In addition to the BSE 500 and BSE Sensex composite indices, the authors also considered eight BSE sectoral indices. During the pandemic, they used descriptive statistics and GLS regression to measure the volatility of daily stock prices. The results showed a negative return during the emergencies time frame contrasted with the pre-emergencies time frame.

Ranjani and Priya, 2020 [30] attempted to investigate the impact of COVID-19 on the Indian stock market, with 15 companies listed on the NSE and 10 industries each represented. Banks, electric equipment, pharmaceuticals, paper, information technology, cement, iron and steel, NBFCs, food, construction, and so on were among them. 176 daily price observations from 150 selected businesses comprised the data under consideration for analysis. They divided the study period into two: the pre-crisis period, which ran from September 3, 2019, to May 26, 2020. To determine the beta, they compared the daily returns to the benchmarking index NIFTY 500. The conclusion was that COVID 19 has an effect on the scripts.

Roychoudhury et al., 2020 [31] studies on the impact of the COVID 19 outbreak on the Indian stock market. They measured the impact by looking at the trend of eight Indian stock market indices, the actions of FIIs and DIIs, changes in the Indian IPO, and the market regulators' responses to crises. They discovered that the Indian stock market was trending downward. There was a significant FII sell-off in March. Additionally, it demonstrates that the outbreak has harmed the Indian IPO. Additionally, studies conveyed that the flare-up of the clever crown has hit the majority of the enterprises like Diversion, the travel industry, Transport, Flight, and Inn industry. However, it should be noted that the pharmaceutical industry is crucial during pandemics.

A review of the literature prior to 2019 reveals that there have been studies on the factors that influence stock prices in various industries listed on the BSE and NSE in India. There are very few empirical studies on the effects of COVID-19 on stock prices and financial markets, both in advanced and emerging economies. In addition, the most recent research on the impact of the COVID-19 study on the pharmaceutical industry has not received much attention.

The aim of the study was to determine how covid-19 affects the pharmaceutical stock market. The monthly data was used in this study span two years, from 2020 to 2022. For the study the independent variables were taken are daily new cases and daily deaths, market to book value and their effect on the market return of pharmaceutical industry.

RESEARCH METHODS

This study was carried out to know the impact of selected variables i.e. Daily deaths, daily new cases, market to book value on market return rate of pharmaceutical.

SOURCES OF DATA

Secondary data was collected from the company for the last 2 years and websites, journals and Magazines. Time span of the financial data of the last 2 years 2020-2022 of the pharmaceutical Industry.

Sampling

This study used probability sampling design and simple random sampling method.

DATA ANALYSIS TECHNIQUES

The data analysis techniques used for this study are descriptive analysis, Normality, serial correlation, Ramsey RESET test cointegration and ARDL.

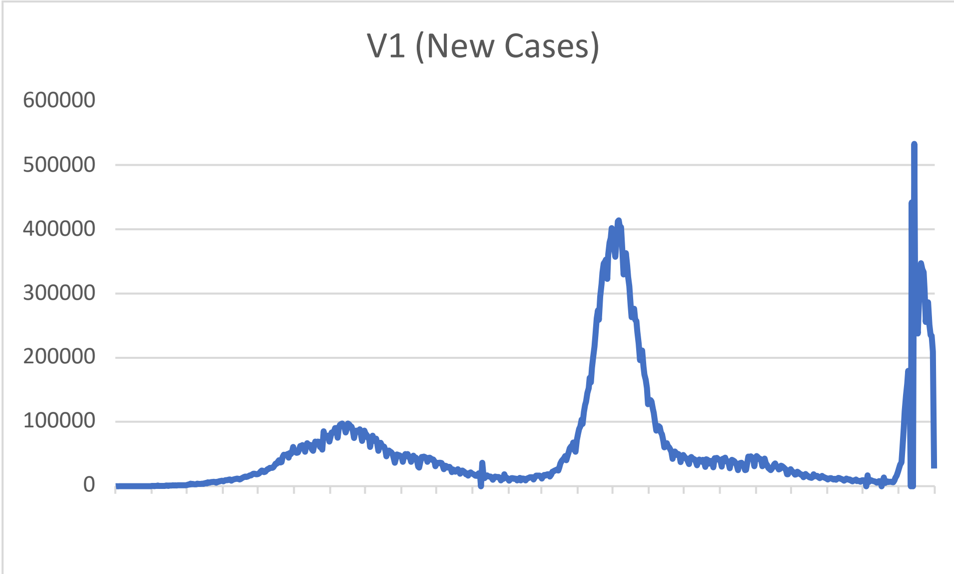
Descriptive Analysis

Descriptive analysis is the kind of research that looks at information and tries to show, describe, or summarize things in a way that makes sense so that there are examples that fit each state of the data. It is one of the most important steps in conducting authoritative information research. It is a summary measurement that quantitatively depicts or summarizes highlights from a variety of data. Illustrative insights, on the other hand, are the steps involved in utilizing and examining those insights.

Data Analysis was done through excel to to calculate mean, mode, median, standard deviation, kurtosis, skewness and count.

DATA ANALYSIS

DESCRIPTIVE ANALYSIS OF NEW CASES

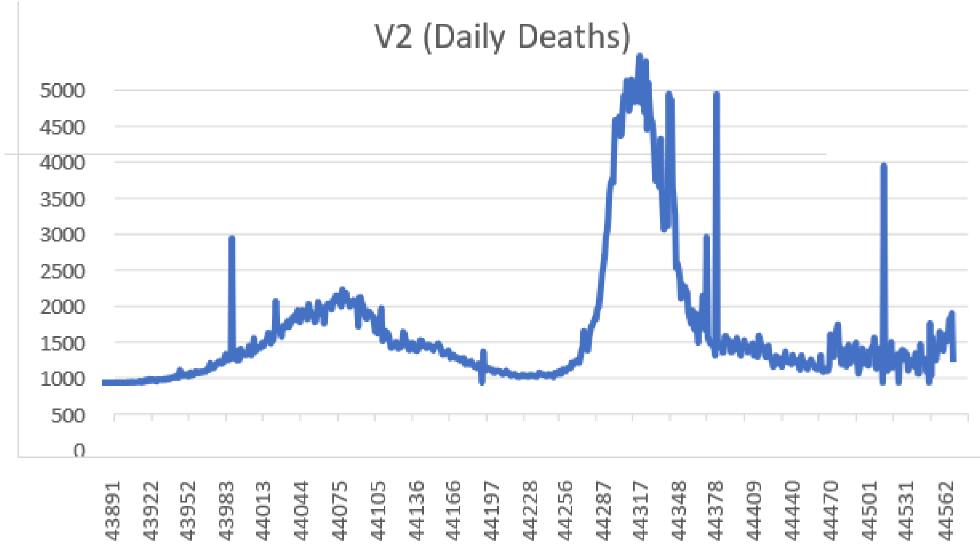


V1 (New Cases)	
Mean	**58874.62963**
Standard Error	**3257.157024**
Median	**30548.5**
Mode	**0**
Standard Deviation	**86299.29582**
Sample Variance	**7447568459**
Kurtosis	**6.636076211**
Skewness	**2.622171631**
Range	**533035**
Minimum	**0**
Maximum	**533035**
Sum	**41329990**
Count	**702**
Largest (2)	**442137**
Smallest (2)	**0**
Confidence Level (95.0%)	**6394.951816**

Interpretation

From the above table and chart, it is interpreted that the largest of the value is 442137 and the smallest of the value is 0. This indicates that the Daily New cases process is not going in the proper stage as the cases are increasing every day which impacts the economic growth.

DESCRIPTIVE ANALYSIS OF DAILY DEATHS

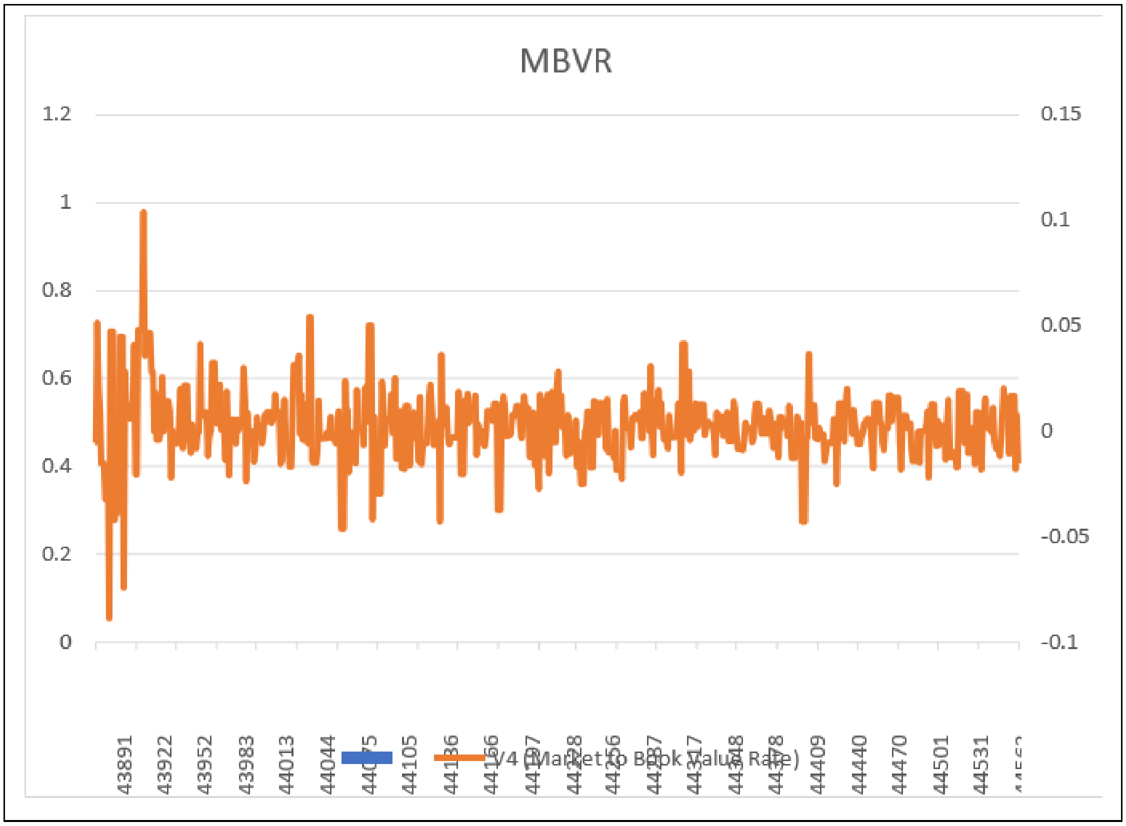


V2 (Daily Deaths)	
Mean	698.2008547
Standard Error	34.45540852
Median	417.5
Mode	0
Standard Deviation	912.9057859
Sample Variance	833396.9739
Kurtosis	6.095036589
Skewness	2.551112731
Range	4530
Minimum	-1
Maximum	4529
Sum	490137
Count	702
Largest (2)	4454
Smallest (2)	0
Confidence Level (95.0%)	67.64815933

Interpretation

From the above table and chart, it is interpreted that the largest of the value is 4454 and the smallest of the value is 0. This indicates that the position of the Daily Deaths is absolutely not perfect as the number of deaths are increasing very fast which indicates that the country has poor health facilities.

DESCRIPTIVE ANALYSIS OF MARKET TO BOOK VAUE RATE



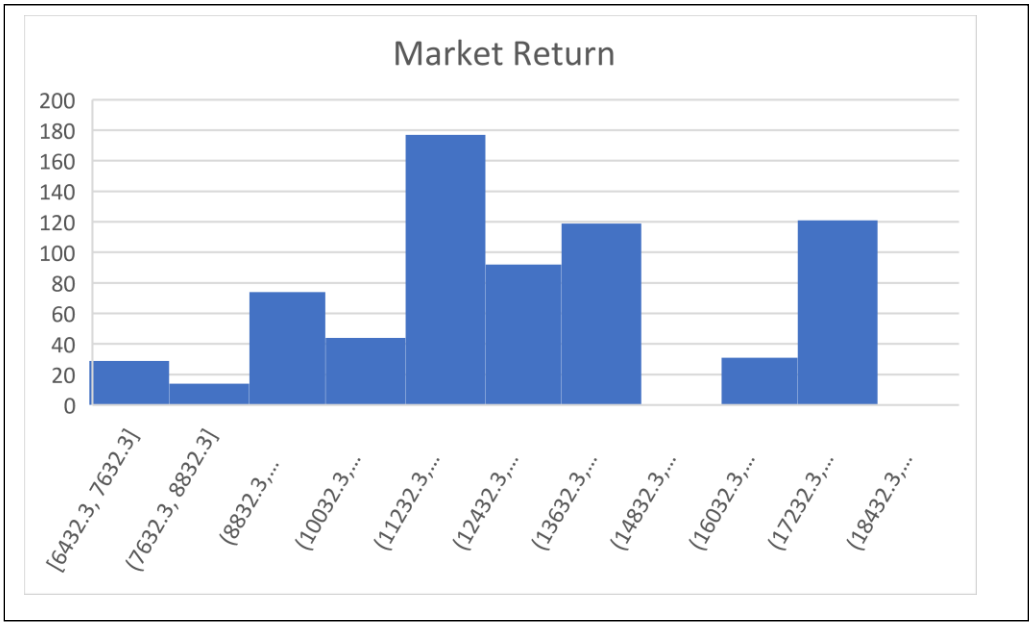
V4 (Market to Book Value Rate)	
Mean	0.001953348
Standard Error	0.000623306
Median	0.00155
Mode	0.0032
Standard Deviation	0.016514658
Sample Variance	0.000272734
Kurtosis	4.853913761
Skewness	0.257340355
Range	0.193
Minimum	-0.0893
Maximum	0.1037
Sum	1.37125
Count	702
Largest(2)	0.0537

Smallest(2)	-0.0747
Confidence Level(95.0%)	0.001223769

Interpretation

From the above table and chart, it is interpreted that the largest of the value is 0.0537 and the smallest of the value is -0.0747. This indicates that the position of Market to book value rate is absolutely perfect and also in the growing stage.

DESCRIPTIVE ANALYSIS OF MARKET RETURN



V3 (Daily Market Return)	
Mean	13034.45164
Standard Error	113.0901241
Median	12570.15
Mode	7361.6
Standard Deviation	2996.354798
Sample Variance	8978142.078
Kurtosis	-0.666038305
Skewness	0.159573255
Range	12044.75
Minimum	6432.3
Maximum	18477.05
Sum	9150185.05
Count	702
Largest(2)	18418.75
Smallest(2)	6611.05

Confidence Level(95.0%)	222.0359318

Interpretation

From the above table and chart, it is interpreted that the largest of the value is 18418.75 and the smallest of the value is 6611.05. This indicates that the position of the market return is absolutely perfect and in the growing stage.

RESULTS AND DISCUSSIONS

Stationarity Test and Lag Length Selection

Before Co-Integration ARDL unit root test was used to test the series' integration properties prior to conducting co-integration tests. It was found that all of the variables are non-stationary at levels, according to the stationarity tests. The following stage is to contrast the factors once to make fixed tests on different factors. All of the other variables were found to be stationary after only one difference was made between them. It is important to note that all of the variables used in this study are integrated of order one.

Therefore, the cointegration method used in this study is the autoregressive distributed lag (ARDL) method. Furthermore, it is important to ensure that the optimal lag order of the model is properly chosen to avoid serially correlated error terms in the equation. As a result, Narayan and Narayan (2006) recommend making the lag order high enough to prevent the problem of over-parameterization from affecting conditional ECM. Based on the LR criterion (the sequentially modified LR test statistic), the optimal lag length looks like 4 according to the lag length selection criteria. Determining long-term relationships of variables using the ARDL approach to cointegration is the next step in empirical estimation. Apply the OLS regression method to the first difference part of equation (1) to determine whether the parameters for the lag level variables are jointly significant when added to the first regression. The combined hypothesis stating that the coefficient of the equation for the lag level variable is zero is tested using the F-statistic.

Diagnostic tests for the estimation model and the computed F-statistics are shown in Table 1. As the results show, the calculated F-statistic was 5.59053. Therefore, at the 5% level, the computed F-statistic exceeds the upper critical value. This suggests that the model variables — Market to Book Value (LMTBV), Covid new cases index (LNC), daily Death rate (LDD), and market return (LMR) — have a co-integrating relationship.

Table-1. ARDL Bounds test

Panel I: Bound testing to co-integration

Estimated Equation: LMTBV = F (LNC, LDD, LMR)

Indicators	
Optimal lag	03
F – Statistics	5.59053

Panel II: Diagnostic Tests Diagnostic Tests

Indicators	
Normality J-B value	0.7901
Serial Correlation LM Test	1.6121
Heteroscedasticity Test (ARCH)	1.1405
Ramsey Reset Test	0.0824

Estimating the ARDL test's short and long-run estimates is the second step. The long run results are shown in Table 2. The findings demonstrate that the pharmaceutical industry's market to book value rises as a result of an increase in new cases, daily deaths, and market return. Market to book value returns (LMTBV), daily deaths (LDD), and index of new cases (LNC) all have coefficients that are statistically significant and positive at 5%. The table demonstrates that market retunrs (Sensex) rise by 7.90%, 7.5%, and 2.4%, respectively, for every 5% increase in NC, DD, and MTBV.

The lags of some of the variables have a significant impact on the market returns as shown in Table 4. At the 5% level of confidence, there is a highly significant effect on the first and second lags of new cases and daily deaths. There is also have a significant effect on the market returns, and there is no lag of market to book value rate.

Table 4 The results of ARDL (2,2,0) model

Table-2. Estimated Long Run Coefficients using ARDL Approach (Dependent variable: LMR)

Variable	Coefficient	Standard Error	T-Test	Significant
NC	7.950	3.770	2.108	0.035
DD	7.950	3.210	2.474	0.013
MTBV	2.420	4.220	5.747	0.000
C	0.002	0.000	2.611	0.009
R2 = 0.8166 AIC = 4.833 SC = 4.75 HQC = 4.803				

Table 3 depicts the pharmaceutical industry's short-term relationship between new cases, daily deaths, and market to book value on market returns. As should be visible from the table, new cases and market to book value emphatically affects market returns in pharmaceutical industry in the short run additionally at 5% level, separately. The daily death rate is 5%, which is negative in both the short and long term. ECM coefficients are used to examine short-term adjustment processes. The coefficients range from 0 to 1, indicating convergence of the long-term equilibrium path and response to external shocks. However, the equilibrium will differ from the ECM test's reported values if the value is positive. At the 5% level of significance, the lagged error-correction term's coefficient (-1) is significant. According to this coefficient, even if the stock index deviates by 1% in the current period, it will be corrected by 1% in the next period to keep equilibrium.

Table-3. Estimated Short Run Coefficients using ARDL Approach (Dependent variable: LMTBV)

Variable	Coefficient	Standard Error	T-Test	Significant
NC	0.000	0.000	2.108	0.0354
DD	-0.000	0.000	-2.474	0.0136
MR	0.000	0.000	5.747	0.0000
ECM	-1.000	0.037	-27.112	0.0000
R2 = 0.530 AIC = -4-826 SC =- 4.75 HQC = -4.797				

FINDINGS (DISCUSSION)

From Analysis it is interpreted that:

- the largest of the value is 442137 and the smallest of the value is 0. This indicates that the Daily New cases process is not going in the proper stage as the cases are increasing every day which impacts the economic growth.
- the largest of the value is 4454 and the smallest of the value is 0. This indicates that the position of the Daily Deaths is absolutely not perfect as the number of deaths are increasing very fast which indicates that the country has poor health facilities.
- the largest of the value is 0.0537 and the smallest of the value is -0.0747. This indicates that the position of Market to book value rate is absolutely perfect and also in the growing stage.
- the largest of the value is 18418.75 and the smallest of the value is 6611.05. This indicates that the position of the market return is absolutely perfect and in the growing stage.
- There is no significant impact of New Cases, daily deaths and Market to book value rate on COVID-19 on Daily Market return in case of pharmaceutical industry.

CONCLUSIONS

This research was conducted to examine the performance of the Indian stock market during the COVID-19 outbreak. In this study, author put research to good use to examine how covid situation affects stock prices. The healthcare industry is expected to expand rapidly in the near future due to changes in people's lifestyles and life expectancy. India is a strong contender for him to rise from No. 3 to No. 1 in the pharmaceutical industry. This paper examined how the COVID-19 pandemic has impacted stock returns in the pharmaceutical industry. The benchmark for the subsequent analysis has been the closing values of the BSE Healthcare index, which covers the entire pharmaceutical and healthcare industry. The results showed that the

COVID-19 outbreak has had a significant impact on the sector's stock performance. Investors believe healthcare and pharmaceutical companies will benefit from this pandemic as they invest in research and development to prepare for the current epidemic and all subsequent pandemics. The results of this survey showed that investors will continue to invest in healthcare and pharmaceutical companies over time.

RECOMMENDATIONS

Based on the findings, these suggestions have been provided. These suggestions can be used in order to improve the factors of the COVID-19 variables so that there can be a huge improvement.

- To improve the Indian stock market.
- To stabilize the Covid cases as the increase in covid cases impact the market return.
- This paper is firmly encouraging the requirement for in reverse mix and upgraded innovative work exercises to Indian Drug area for guaranteeing their practical long-run activities.

LIMITATIONS OF THE STUDY

This study is limited to the stock exchange of India only it could have been expanded for other countries a data was also limited to 2 years. Time was a limitation as it is a vast topic.

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