



The Performance of Indian Pharmaceutical Indices during the Covid-19 Outbreak

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Abstract

The Covid-19 outbreak has caused a sharp decline in the economic growth of the globe from March 2020. Financial markets are extremely vulnerable to uncertainties. Such uncertainties created an unprecedented level of risk in the stock markets. Nearly every stock market both developed and developing stock markets of the world have plunged, due to this rapid spread of Covid-19. This research focuses on the performance of Indian pharmaceutical companies during the period of the covid-19 pandemic. The daily data consists of 978 observations from January 2018 to December 2021. Summary statistics, Stock beta, and GARCH (1, 1) models are applied in this study. The results show that before the pandemic announcement period the pharmaceutical companies indices are moving along with the broad market index, but after the pandemic announcement period, the pharmaceutical companies indices are moving in an inverse direction with its broader market index.

Disciplinary: Business Economics, Econometrics, and Finance.

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1 Introduction

The covid-19 outbreak has caused a sharp decline in the economic growth of the globe from March 2020. Many businesses are shut down temporarily and some might be shut down permanently. These shutdowns lead to a sharp decline in the level of output in the world economy. Due to this, the stock markets have declined by over 30%. "In March 2020, the us stock market hit the circuit breaker mechanism four times in ten days. In concert with the US crash, stock markets in Europe and Asia have also plunged" (Zhang et.al, 2020). Indian stock markets are also on the same

wavelength. “Stock market volatilities are highly associated with market uncertainties. The Indian stock market turned out to be more volatile during the Covid-19 pandemic period and the returns exhibit non-normality at all times.” (Chaudhary et.al, 2020). The lower volatility relates to greater chances of the bull market and the higher volatility relates to a greater chance of a bear market. (Ang & Liu, 2007). Most of the investors sacrifice the current consumption with the expectation of high returns in the future. In this process, most of the investors wish to avoid risk, but in general, both risk and return go hand in hand. Especially during uncertainties, the volatility in the financial markets is generally high and this may lead to an increase in risk level and a decrease in the stock return.

2 Literature Review

In March 2020, the World Health Organization (WHO) announced Covid-19 as a global pandemic. Many countries even developed countries struggle with lack of capacity, lack of resources, lack of resolve, and so on. Hence the pandemic significantly impacts the world economy, and this leads to drastic movements in financial markets. “The severity of the pandemic in each country is clearly linked in the individual stock market reactions. The financial markets become highly volatile and unpredictable during the uncertainty of the Covid-19 outbreak” (Zhang et.al, 2020). “The stock market participants anticipated the real economic effects of the Covid-19 health crisis to be amplified by financial channels” (Ramelli and Wagner, 2020). “The persistence of Covid-19 outbreak and its related uncertainty, amplifies the US financial markets volatility, affecting thus the global financial cycle” (Albulescu, 2020). “Covid-19 pandemic has caused the enormous uncertainty shock, which is larger than the one associated with the financial crisis of 2008-2009”. (Baker et.al., 2020). “During Covid-19 the volatility is huge in the US, China, global financial market, and major stock indexes from 64 countries”. (Alfaro et al 2020, Al-Awadhi et al 2020, Zhang et al 2020, & Ashraf 2020).

3 Data and Methodology

This paper initially focuses to study the performance of Indian pharmaceutical indices during this Covid-19 outbreak. The sample indices comprise NSE Nifty 50 and major pharmaceutical companies namely Cipla Limited, Divis laboratories, Dr.Reddys Laboratories Limited, and Sun Pharmaceutical Industries Limited. The daily data from January 2018 to December 2021 were collected for this study. The data is classified into three sections: overall study period (January 2018 to December 2021), before the pandemic announcement period (January 2018 to December 2019), and after the pandemic announcement period (January 2020 to December 2021). Initially, quarterly descriptive statistics are computed on the stock returns. Quarterly stock Beta is also calculated to the individual returns of the pharmaceutical companies. Systematic risk can be measured with the help of Beta and it is the ratio of covariance between market return and the security's return to the market return variance. The beta values close to one indicate the security returns are moving along with its broad market index. A beta less than one signifies that the security returns are less volatile than its market index. The beta value close to zero indicates

that the movement of the security return is uncorrelated with the movement of its benchmark index. Finally, GARCH (1, 1) model is applied to study the volatility level in the sample indices.

4 Result and Discussion

The quarterly results in Table 1 represent the descriptive statistics and beta calculation of the major pharmaceutical companies. The quarterly classification of data helps to ascertain the difference in the movement of stock returns at different quarters. The arithmetic mean values signify that there is a difference between before pandemic and after pandemic announcements. While examining the standard deviation, it is found that the values after the pandemic announcement are greater than the before pandemic announcement periods. During 2020, the first-three quarter's SD values are greater, and then it gradually comes to normal. The beta is calculated using the daily returns of pharmaceutical companies' shares against the daily returns of its broad market index. A beta of less than 1 indicates the companies' returns are less volatile than the market returns. The negative beta values indicate that there is an inverse relationship between the companies and their broad market. During the after pandemic announcement period, the quarterly beta values of sample companies are mostly negative, it clearly shows that the broad market is depressed after the pandemic announcement, but the pharmaceutical companies rose against its broad market.

Table 1: Summary Statistics and quarterly beta calculation

COMPANIES	YEAR	DURATION	MEAN	SD	KURTOSIS	SKEWNESS	BETA
CIPLA	2018	Q1	0.0019	0.015	11.182	2.465	0.7241
		Q2	0.0019	0.017	1.721	0.898	0.7289
		Q3	0.0010	0.014	-0.497	0.201	0.9699
		Q4	0.0038	0.020	2.888	-0.574	0.7962
	2019	Q1	0.0003	0.011	7.550	1.369	0.4828
		Q2	0.0008	0.013	0.351	0.616	0.7133
		Q3	0.0042	0.016	0.434	-0.026	0.2963
		Q4	.0019	0.016	-0.113	0.417	0.1215
	2020	Q1	0.0019	0.026	1.616	0.506	0.4578
		Q2	0.0070	0.029	4.814	1.846	0.2414
		Q3	0.0029	0.024	2.498	0.968	0.8742
		Q4	0.0009	0.018	2.522	-0.159	0.5250
	2021	Q1	0.0001	0.016	-0.657	0.281	0.4171
		Q2	0.0029	0.014	1.775	0.080	0.3020
		Q3	0.0002	0.014	1.823	-0.213	0.9342
		Q4	0.0025	0.017	6.415	1.108	0.1969
DIVISLAB	2018	Q1	0.0001	0.016	-0.620	-0.196	0.853
		Q2	0.0008	0.018	0.297	0.149	0.999
		Q3	0.0038	0.021	-0.013	0.265	0.133
		Q4	0.0020	0.025	14.265	2.754	0.154
	2019	Q1	0.0022	0.016	0.315	0.138	0.393
		Q2	0.0011	0.020	9.820	-1.976	0.599
		Q3	0.0007	0.018	8.788	-1.831	0.575
		Q4	0.0017	0.012	4.951	0.877	0.509
	2020	Q1	0.0012	0.026	6.747	-1.581	0.556
		Q2	0.0023	0.023	2.753	0.958	0.483
		Q3	0.0044	0.025	4.993	1.128	0.746
		Q4	0.0037	0.019	1.706	-0.495	0.888
	2021	Q1	0.0010	0.017	-0.198	0.544	0.798
		Q2	0.0032	0.012	0.826	0.282	0.052
		Q3	0.0013	0.013	1.085	-0.170	0.813
		Q4	0.0012	0.020	4.212	0.706	0.285

Table 1: Summary Statistics and quarterly beta calculation (continue).

COMPANIES	YEAR	DURATION	MEAN	SD	KURTOSIS	SKEWNESS	BETA
DRREDDYS	2018	Q1	0.0025	0.017	1.446	-0.660	0.846
		Q2	0.0011	0.019	1.776	0.643	0.752
		Q3	0.0020	0.022	7.824	-1.641	0.719
		Q4	0.0005	0.021	1.334	0.476	0.330
	2019	Q1	0.0009	0.015	3.311	-1.104	0.197
		Q2	0.0014	0.014	3.571	-0.978	0.112
		Q3	0.0009	0.015	0.499	0.454	0.134
		Q4	0.0010	0.012	0.759	0.124	0.160
	2020	Q1	0.0013	0.025	3.047	0.866	0.123
		Q2	0.0040	0.025	9.987	2.443	0.033
		Q3	0.0041	0.022	5.388	1.725	0.589
		Q4	0.0001	0.015	0.779	0.176	0.113
	0021	Q1	0.0023	0.018	0.838	-0.671	0.377
		Q2	0.0030	0.015	2.189	0.016	0.029
		Q3	0.0017	0.018	24.235	-3.978	0.907
		Q4	0.0014	0.012	0.366	0.520	0.305
SUNPHARMA	2018	Q1	0.0025	0.020	2.279	0.320	0.781
		Q2	0.0020	0.022	2.298	0.705	0.973
		Q3	0.0016	0.019	1.328	0.212	0.349
		Q4	0.0061	0.027	0.849	-0.560	0.417
	2019	Q1	0.0017	0.022	4.034	-1.233	0.306
		Q2	0.0030	0.021	6.334	-0.883	0.507
		Q3	0.0005	0.023	0.071	0.236	0.042
		Q4	0.0017	0.016	1.685	0.283	0.077
	2020	Q1	0.0032	0.028	5.080	-0.722	0.012
		Q2	0.0050	0.027	3.217	1.188	0.154
		Q3	0.0009	0.020	0.992	-0.379	0.015
		Q4	0.0027	0.019	0.118	0.170	0.595
	2021	Q1	0.0002	0.017	-0.535	0.123	0.123
		Q2	0.0020	0.015	3.913	0.488	0.314
		Q3	0.0029	0.017	13.762	2.676	0.646
		Q4	0.0012	0.015	-0.557	-0.043	-0.493

Table 2: Results of GARCH (1, 1) model

NSE Nifty 50 Index													
Overall Period					Before Pandemic Announcement				After Pandemic Announcement				
Mean Eqn	Coefficient	Std.Error	Z-Stat	p-value	Coefficient	Std.Error	Z-Stat	p-value	Coefficient	Std.Error	Z-Stat	p-value	
C	0.0009	<0.001	3.1487	0.002	0.000722	<0.001	2.02831	0.043	0.001378	<0.001	2.351	0.008	
Variance Equation													
C	3.5E-06	9.7E-07	3.58182	<0.001	5.13E-06	2.5E-06	2.04564	0.041	4.10E-06	1.1E-06	3.794	<0.001	
ARCH	0.131	0.017	7.811856	<0.001	0.180506	0.045	4.055923	<0.001	0.05544	0.016	3.385	<0.001	
GARCH	0.846	0.021	40.42132	<0.001	0.775931	0.064	12.11164	<0.001	0.899192	0.020	44.208	0.000	
CIPLA Limited													
Overall Period					Before Pandemic Announcement				After Pandemic Announcement				
Mean Eqn	Coefficient	Std.Error	Z-Stat	p-value	Coefficient	Std.Error	Z-Stat	Prob.	Coefficient	Std.Error	Z-Stat	p-value	
C	0.000426	<0.001	0.819	0.4126	2.04E-05	0.001	0.031	0.9752	0.001099	0.001	1.228	0.219	
Variance Equation													
C	2.16E-05	4.8E-06	4.531	0.0000	2.89E-05	1.2E-05	2.523	0.0116	1.07E-05	2.8E-06	3.761	<0.001	
ARCH	0.104506	0.016	6.422	0.0000	0.127093	0.032	4.004	0.0001	0.017646	0.009	1.914	0.056	
GARCH	0.831251	0.024	35.003	0.0000	0.766323	0.064	11.914	0.0000	0.94567	0.014	66.452	0.000	
Sun Pharmaceutical Industries Ltd													
Overall Period					Before Pandemic Announcement				After Pandemic Announcement				
Mean Eqn	Coefficient	Std.Error	Z-Stat	p-value	Coefficient	Std.Error	Z-Stat	p-value	Coefficient	Std.Error	Z-Stat	p-value	
C	0.000382	<0.001	0.606	0.545	-0.000228	0.001	-0.2459	0.806	0.001482	0.001	1.646	0.099	
Variance Equation													
C	3.74E-05	7.1E-06	5.300	0.000	0.000222	7.9E-05	2.817	0.005	2.06E-05	3.0E-06	6.819	0.000	
ARCH	0.094969	0.018	5.294	0.000	0.143764	0.043	3.326	0.001	-0.01599	0.006	-2.600	0.009	
GARCH	0.821111	0.029	28.291	0.000	0.359974	0.198	1.819	0.069	0.94626	0.011	88.266	0.000	

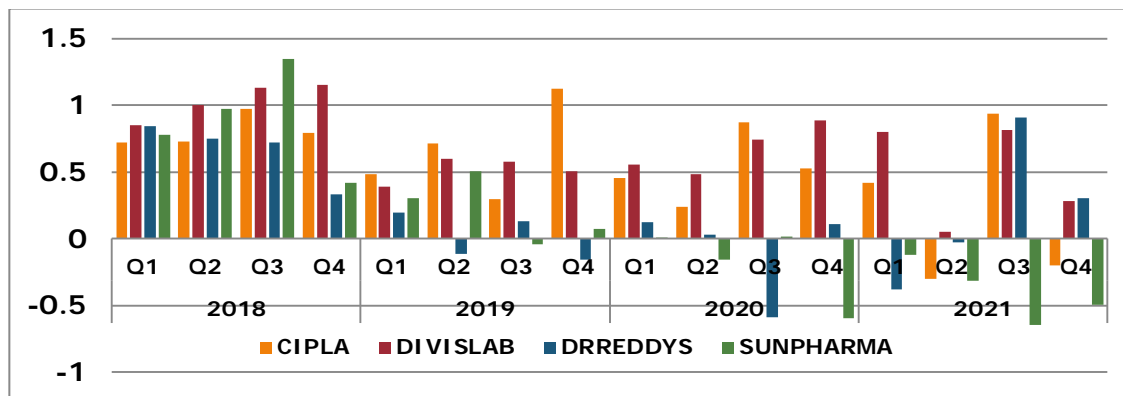


Figure 1: Quarterly stock beta values

The GARCH (1, 1) model results are presented in Table 2. GARCH (1, 1) model is used to check the volatility of pharmaceutical companies during the Covid-19 outbreak. Before going with GARCH test the volatility clustering, stationarity test, and ARCH LM test were accomplished. The result indicates that the daily returns show the volatility clustering and stationary during the period for all the sample companies. But the ARCH LM test results show that the only NSE Nifty 50 Index, Cipla Limited, and Sun Pharmaceutical Industries Limited's daily returns have ARCH effects in their residuals, and the Divis Laboratories and Dr.Reddy's Laboratories daily returns does not have ARCH effect in the residuals. Hence the GARCH model is applied for the former indices and not for the other two companies. The positive and statistically significant ARCH and GARCH values indicate the stability conditions, that remarks the shocks to the conditional variance will be highly persistent, it implies that the large changes in the returns are typically followed by large changes and small changes typically followed by the small changes for a certain period.

The GARCH results NSE Nifty 50 show that the constant terms are positive and statistically significant at a 5% level for all three classified periods. The ARCH and GARCH values together are close to one for all three periods, and the GARCH values are greater than the ARCH value implying that the reason for the volatility is highly persistent. GARCH results of Cipla Limited show that for the overall sample period and before the pandemic announcement period the sum of ARCH and GARCH values are close to one and statistically significant at a 5% level. It implies that during these periods the volatility is highly persistent. But after the pandemic announcement period, the ARCH value is not statistically significant at the 5% level. Likewise, Sun Pharmaceutical Industries Limited's before pandemic GARCH values are not statistically significant at the 5% level and after the pandemic announcement period, the ARCH values are also negative. It signifies that due to the covid-19 pandemic the volatility of pharmaceutical companies' indices is not highly persistent.

5 Conclusion

The paper initially focuses to study the risk and return analysis of pharmaceutical companies during the covid-19 outbreak. Data from January 2018 to December 2021 were used and the data is classified into three sections: overall study period (January 2018 to December 2021), before pandemic announcement period (January 2018 to December 2019), and after pandemic announcement period (January 2020 to December 2021). During the after pandemic announcement

period the arithmetic mean and standard deviation values are high as compared to other periods, which indicates that the amount of variation is greater during the after pandemic announcement period. During the after pandemic announcement period, the quarterly beta values of sample companies are mostly negative, it clearly shows that the broad market is depressed after the pandemic announcement, but the pharmaceutical companies rose against its broad market index. The GARCH results of the NSE Nifty 50 Index imply that the reason for the volatility is highly persistent for all three periods. But for individual pharmaceutical companies, the indices are not highly persistent.

6 Availability of Data and Material

Data can be made available by contacting the corresponding author.

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