

AN EMPIRICAL STUDY ON STOCKS USING GARCH MODEL REFERENCE TO NSE INDEX

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Abstract

Stock market plays a vital role in the economy of the country as it builds the wealth of the individuals and the institutions. But it may sometimes wipe out the wealth of investors if they don't invest their money in a proper manner. Studying the stocks, their volatility and their prices from the past and predicting their future prices can be one of the best methods for managing the wealth. GARCH model is one of the best methods for analysing the volatility and predicting their future prices based upon their past performances. Diversifying the portfolio across various classes of stocks might help to mitigate the risks associated with the volatility of the market and the individual stocks. The present study attempts to analyse the volatility of the stocks of the 15 public sector companies for the period of 6 months starting from the month of July 2022 till December 2022 using GARCH Model.

Key words: Volatility, Heterokedasticity and Autoregression

Introduction

Stock markets have always helped in generating personal wealth in the economy. For the individual investor the stock market provides a way to invest their income and to earn a share of company's profit. Stock market and economic performance of the country are not always aligned with each other. Strong stock market performance does not always signal a growing economy. There are various models for analysing the volatility and for predicting the future prices of stocks based on their past performances. Virtually all the financial uses of volatility models entail forecasting aspects of future returns. Stock market volatility is usually caused by economic or policy factors, including the changes in the other markets, changes in monetary policies, interest rates, etc. Political instability and other global events like pandemic or war can also lead to market volatility. This volatility depicts the risk associated with the stock prices in the market, higher the volatility higher is the risk and vice-a-versa. Diversifying the portfolio across various classes of stocks might help to mitigate the risks associated with the volatility of the market and the individual stocks. GARCH Model is one of the best models used for analysing the volatility and for prediction of the prices of the stocks in the near future.

GARCH MODEL

GARCH Model stands for Generalized AutoRegressive Conditional Heterokedasticity. GARCH is an econometric term developed in the year 1982 by Robert F. Engle. It is a statistical modelling technique used to help in predicting the volatility of returns of any financial assets. This model is useful to assess risk and expected return for assets that exhibit volatility in returns. GARCH Model includes time series, correlation, regression and standard deviations.

There are several forms of GARCH modelling. Financial professionals often prefer the GARCH process because it helps in providing a real world contexts than the other models while predicting the prices of the financial instruments.

The GARCH Model involves three steps: i) to estimate the best fitting autoregressive model, ii) to compute autocorrelations of the terms, iii) to test the significance.

Time Series

Time Series is one or more measured output channels with no measured inputs. This is also known as Signal Model. Time series analysis is a specific way of analysing the data points which are arranged in a sequence and collected over a particular period of time. Time series is a collection of observations of the data that is collected over a specific period of time. An observed time series can be decomposed into three components: the trend (long-term direction), the seasonal (systematic, calendar related movements) and the irregular (unsystematic, short-term fluctuations).

Auto Regression

Auto regression is a time series model that uses observations from previous time as input to a regression equations to predict the value at the next time step.

Basically, it predicts future values on the basis of past values. They are widely used in technical analysis to forecast future security prices.

Heterokedasticity

Heterokedasticity describes the irregular patterns of variation of the variable. In simple words, heterokedasticity means an error term with a variance.

Objectives

1. To analyse the volatility of those selected public sector companies using GARCH Model.
2. To give valuable suggestion on the basis of the analysis made.

Methodology

- A sample of 15 public sector companies from the National Stock Exchange (NSE) has been taken into consideration for the study.
- The data for the study is purely a secondary data collected from the historical prices of the selected public sector companies for a time period of 6 months starting from the month of July 2022 to December 2022 for each company.
- The GARCH process is taken into consideration for analysing the performance of the selected companies.
- Out of the 50 public sector companies from Nifty 50, only 15 companies have been selected for the study which have shown a higher correlation of more than 0.65 with the Index and have been in the top 50 for the duration of previous 6 months.

Table 1. Correlation of related stocks				
S.No	Company Name	Correlation(r)	r²	%
1	Reliance Industries Ltd.	0.661894237	0.438103981	43.81%
2	HDFC Bank	0.778958776	0.606776775	60.68%
3	Infosys	0.711058717	0.505604499	50.56%
4	HDFC Ltd.	0.800445802	0.640713482	64.07%
5	ICICI	0.784708543	0.615767497	61.58%
6	TCS	0.724308426	0.524622697	52.46%
7	Kotak Mahindra	0.661770688	0.437940443	43.79%
8	SBI	0.660378625	0.436099928	43.61%
9	Bajaj Finance Ltd.	0.722639433	0.52220775	52.22%
10	TATA Steel	0.655735998	0.429989699	43.00%
11	WIPRO	0.706352804	0.498934283	49.89%
12	Mahindra & Mahindra	0.662431208	0.438815105	43.88%
13	Bajaj Financial Services Ltd.	0.705649691	0.497941487	49.79%
14	Tech Mahindra	0.750905831	0.563859567	56.39%
15	TATA Motors	0.748255667	0.559886543	55.99%

- Reliance industries Ltd. has a positive correlation of 0.661 which implies that 43.81 percent of change in the stock price of Reliance is because of change in NSE Nifty and balanced 56.19 percent is of other factors.
- The correlation of HDFC Bank got recorded at 0.778 which is a positive correlation. This shows that around 60.68 percent of change in the share price of HDFC is due to change in NSE Nifty and remaining 39.32 percent is because of other factors.
- The correlation between Infosys and Nifty stands at a positive of 0.711 which depicts that 50.56 percent change is because of change in the price of Nifty and remaining 49.44 percent is of other factors.
- There exists a positive correlation of 0.80 between HDFC Ltd. and Nifty which implies that around 64.07 percent change is due to change in the price of Nifty and balanced 35.93 percent is due to other factors.
- ICICI has a positive correlation of 0.784 which implies that 61.58 percent of change in the stock price of ICICI is because of change in NSE Nifty and balanced 38.42 percent is of other factors.
- The correlation of TCS got recorded at 0.724 which is a positive correlation. This shows that around 52.46 percent of change in the share price of TCS is due to change in NSE Nifty and remaining 47.54 percent is because of other factors.
- The correlation between Kotak Mahindra and Nifty stands at a positive of 0.661 which depicts that 43.79 percent change is because of change in the price of Nifty and remaining 56.21 percent is of other factors.
- There exists a positive correlation of 0.660 between SBI and Nifty which implies that around 43.61 percent change is due to change in the price of Nifty and balanced 56.39 percent is due to other factors.
- BAJAJ Finance Ltd. has a positive correlation of 0.722 which implies that 52.22 percent of change in the stock price of BAJAJ Finance Ltd. is because of change in NSE Nifty and balanced 47.78 percent is of other factors.
- The correlation of TATA Steel got recorded at 0.655 which is a positive correlation. This shows that around 43 percent of change in the share price of TCS is due to change in NSE Nifty and remaining 57 percent is because of other factors.

- The correlation between WIPRO and Nifty stands at a positive of 0.706 which depicts that 49.89 percent change is because of change in the price of Nifty and remaining 50.11 percent is of other factors.
- There exists a positive correlation of 0.662 between Mahindra & Mahindra and Nifty which implies that around 43.88 percent change is due to change in the price of Nifty and balanced 56.12 percent is due to other factors.
- BAJAJ Financial Services Ltd. has a positive correlation of 0.705 which implies that 49.79 percent of change in the stock price of BAJAJ Financial Services Ltd. is because of change in NSE Nifty and balanced 50.21 percent is of other factors.
- The correlation of Tech Mahindra got recorded at 0.750 which is a positive correlation. This shows that around 56.39 percent of change in the share price of TCS is due to change in NSE Nifty and remaining 43.61 percent is because of other factors.
- There exists a positive correlation of 0.748 between TATA Motors and Nifty which implies that around 55.99 percent change is due to change in the price of Nifty and balanced 44.01 percent is due to other factors.

Table 2. Regression of the stocks to estimate the relative risk

S.No	Company Name	Intercept	Average	Significance (F)	Predicted Amount
1	Reliance Industries Ltd.	820.19	0.097	0.05	2526.91
2	HDFC Bank	-400.98	0.107	0.05	1481.69
3	Infosys	601.04	0.052	0.05	1515.98
4	HDFC Ltd.	-961.25	0.193	0.05	2434.59
5	ICICI	-364.204	0.0702	0.05	870.97
6	TCS	1714.082	0.085	0.05	3209.66
7	Kotak Mahindra	606.48	0.071	0.05	1855.73
8	SBI	-341.256	0.05	0.05	538.50
9	Bajaj Finance Ltd.	1997.524	0.278	0.05	6888.95
10	TATA Steel	-34.99	0.0078	0.05	102.25
11	WIPRO	488.655	-0.00476	0.05	404.90
12	Mahindra & Mahindra	239.237	0.057	0.05	1242.15
13	Bajaj Financial Services Ltd.	-1370.35	0.168	0.05	1585.62
14	Tech Mahindra	381.043	0.037	0.05	1032.06
15	TATA Motors	452.94	-0.00124	0.05	431.12

Table 3. Showing the range of significant levels of regression

Average	0.01 To 0.05	0.06 To 0.10	0.11 To 0.15	0.16 To 0.20	0.26 To 0.30
	TATA Steel	Infosys	HDFC Bank	Bajaj Financial Services Ltd.	Bajaj Finance Ltd.
	Tech Mahindra	Mahindra & Mahindra		HDFC Ltd.	
	SBI	ICICI			
		Kotak Mahindra			
		TCS			
		Reliance Industries Ltd.			

BAJAJ Finance Ltd. calculated value is 0.278 which falls in the average category of 0.26 to 0.30. This indicates that the stock is performing the best amongst all the other stocks taken into consideration for the study.

The calculated values of BAJAJ Financial Services Ltd. and HDFC Ltd. recorded at 0.163 and 0.193 respectively. These calculations fall under the average category of 0.16 to 0.20 which in turn indicates that these two stocks are performing better when compared to other stocks.

The value calculated of HDFC Bank recorded at 0.107 which falls under the average category of 0.11 to 0.15. This in turn depicts that the stock is performing good as compared to the other stocks.

Reliance Industries Ltd., Infosys, Mahindra & Mahindra, ICICI, Kotak Mahindra, and TCS calculated values stood at 0.097, 0.052, 0.057, 0.0702, 0.071 and 0.085 respectively. These stocks fall under the average category of 0.06 to 0.10 which implies that the stocks are performing good but not better than the stocks mentioned previously.

The calculated values of TATA Steel, Tech Mahindra and SBI recorded at 0.0078, 0.037 and 0.05 respectively which falls under the category of 0.01 to 0.05. This is an indication that there exists a significant impact on the stock.

As the calculated value of regression is more than the significant value of 0.05, it enables that the stock can be positively predicted for their future prices. But if the calculated values of regression are less than the significant value of 0.05, then the stock cannot be predicted for their future prices. Since, the stocks of WIPRO, TATA Steel, TATA Motors, Tech Mahindra and SBI fall below the significance level of 0.05, the future values of the stocks cannot be predicted.

Conclusion

An investor should always be keen about not losing the wealth that they have collected. To do so they must study the stocks and their volatility with in jaxta position to the indices. The study conducted shows the changes in stock prices when the index as a whole shows oscillations. The results show that the stock prices of some companies are highly affected with a rise or fall in the points of the Indices. Investments in such stocks can be made by studying the movements in the Index as a whole. The study shows the 10 stocks from Nifty 50 which have a higher correlation with the Index and are mostly affected due to the changes occurring in the Indices.

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