

Integration and Volatility Spillover of Automobile Companies Stock Price on BSE SENSEX and BSE AUTO Index

S. Baranidharan^{*1}, A.Alex², N. Dhivya³

^{1*} Assistant Professor, Department of Business Administration,
ST. Joseph College of Arts and Science (Autonomous), Cuddalore - 607001, India.

² Head of the Department, Department of B.com Bank Management,

ST. Joseph College of Arts and Science (Autonomous), Cuddalore - 607001, India.

³ Assistant Professor, Department of Management Studies, IFET College of Engineering, Villupuram, India.

^{1*} s.baranidharanphd@gmail.com

² fatheralex@yahoo.co.in

³ dhivyarikibcs@gmail.com

Corresponding author: S. Baranidharan

Abstract- Indian economy is the fastest growing and emerging economy in the world economy. The automobile industry in India determines the prominent place in the manufacturing sector and it also act as indicator to the development of the Indian economy among the world. The automobile industry not only influence the manufacturing sector and also trigger the other segment as the driver of the economy growth. In India, The automobile industry reached its peak due to the technology influence and quality parts. It increases the thirst of rural and young generation for the two wheelers and tempt them to purchase the two wheelers and four wheelers. This increases the by 9.5 percent year on year to 4.02 million units. The main outcome of the study is ascertain the combination and ups and downs in the volatility of automobile companies stock price such as APOLLO TYRES, ASHOK LAY, BAJAJ AUTO, MARUTISUZU, MOTHER SUMI and MRF on BSE SENSEX and BSE AUTO Index. The research paper has been employed the collected data by using the Augmented Dickey Fuller test, GRACH MODEL and Johansen Co integration Rank Test. Through this study, it was found that there was significant and reliable relationship exist among the automobile companies such as APOLLO TYRES, ASHOK LAY, BAJAJ AUTO, MARUTISUZU, MOTHER SUMI and MRF on BSE SENSEX and BSE AUTO Index since the critical value of 1%, 5% and 10% level are lesser than the ADF t – statistics values of variables. Therefore the study concluded that fluctuations or discharge of volatility of stock prices on APOLLO TYRES, ASHOK LAY, BAJAJ AUTO, MARUTISUZU, MOTHER SUMI and MRF are highly significant by the stock price movement of BSE SENSEX and BSE AUTO. This work helps the institutional investor to aware about the ups and down of the stock price of automobile companies and also portrays them to loss their hesitation to make investment in the automobile companies. This research article influenced the investment decision making of both institutional and individual investor effectively and efficiently on the stock of automobile companies list on the Bombay stock exchange.

Keywords- Economic, Investment, Inflation, Price, Institutional Investor, Investment Decision, Policy.

JEL Classifications- A1, D25, P22, E31, G23, G11, F68

I. INTRODUCTION

The robust of the global economy and Indian economy has been majorly contributed by the automobile sector. The barometer of the economy is influenced by the trending performance of the automobile sector. It act as market leader in the manufacturing sector by contributing the qualified product with the advanced technology. This trigger the Indian economy to become the economy wise healthy among the world economy since automobile sector act as a sun rising sector among the world economy. The utmost projecting dynamic factor that influence the evolution of the automobile industry is the unpredictability of stock prices on the stock exchanges based on the productivity of the automobiles. Indian economy is majorly influenced by the movement of stock prices in the stock exchange and also the market capitalization that tempt the investors to make their investment in the share market. Stock exchange is the capital market where the all the type of securities such as bonds, stocks and other securities are traded. It act as regulatory framework in order to protect the interest of investors from the fraudulent activities and also supports the perceptive business to reduce the risk in speculation and increases the return.

The two major stock exchange in India are Bombay stock Exchange and National Stock Exchange that influence the Indian market towards the growth of the Indian economy among the world economy. Bombay stock exchange is the one of the oldest stock exchange among the Asia and it was originated in 1887. Volatility is the statistical measure refers to the amount of uncertainty or risk can be manipulated by the size of changes in the security value. A higher volatility is the over a short time period the price of the security can be changed in either direction whereas the lower volatility signifies the value of the security are steady does not fluctuate. This has been examined by analysing the study conducted by the **Dr.S. Baranidharan, Rev.Fr.A.Alex, N. Dhivya (June 2019)**endeavoured by the data collected from the period of 2014 to 2018 by using SPSS software made the study on the causal effect and Volatility of BSE Sensex and sectoral Indices with special references to Indian Stock Market. The study examined that the allocations were not normal by the Jargue Bera test and also inferred that there was a long run relationship and price drive in various indices of BSE interrupts the Indian Stock Market. The analytical study made by the **Subramanian (2015)** by means of the three-monthly data from December 2005 to June 2012 detected that the stock market index were powerfully subjective by the macroeconomic variables.

The present study “Integration and volatility spillover of automobile companies stock price on BSE SENSEX and BSE AUTO index” has selected the two indices such as BSE SENSEX and BSE Sectoral Indices such as BSE AUTO EX to determine and prediction the association of fluctuations in the stock prices of the selected indices on the Automobile Companies. This present work has analysed the secondary data collected from the period of 2nd June 2009 to 31st July 2019 by using the statistical tools such as the Augmented Dickey Fuller test, GRACH MODEL and Johansen Co integration Rank Test. The study has adopted the sample size as 6 companies from the automobile industry such as Apollo, Ashok Leyland, Bajaj auto, Maruti Suzuki, Mother Sumi and MRF to ascertain the fluctuation of share price of selected indices on the automobile industry. The study found that the sum of alpha coefficient and beta coefficient of 6 selected companies such as Apollo, Ashok Leyland, Bajaj auto, Maruti Suzuki, Mother Sumi and MRF and BSE Indices such as BSE SENSEX and BSE AUTO are the value nearly 1, it clearly defines that there was a high volatility and also significantly volatility in the selected variables, so the investors can invest in the stock of Apollo, Ashok Leyland, Bajaj auto, Maruti Suzuki, Mother Sumi and MRF since they are influenced by the market capitalization and also the share prices and its fluctuations of the BSE indices such as BSE SENSEX and BSE AUTO.

II. REVIEW OF LITERATURE

This research work “Integration and volatility spillover of automobile companies stock price on BSE SENSEX and BSE AUTO index” discloses the hollow of cause of prices and its variations in the Bombay Stock Exchange SENSEX and AUTO on the APOLLO TYRES, ASHOK LAY, BAJAJ AUTO, MARUTISUZU, MOTHER SUMI and MRF.

Dr.S. Baranidharan & N. Dhivya (August 2019) attempted the study on Empirical Relationship among various Macroeconomic Variables on Indian Stock Market and Japanese Stock Market through the data collected from the period 1st April 2013 to 31st March 2019 by using e-views Software, Descriptive Statics and Correlation. The study originated that investors to contemplate all applicable basis of data for Investment Decision making.

Dr. S. Baranidharan, Mr. M. Om Prakash, Ms. N. Dhivya (June 2019) attempted a study on share price movements of selected Indian cement companies and established that there was optimistic movement in the share prices of stocks listed under cement industry and discovered that ACC limited has been found to the greatest one for making investment.

Dr.S.Baranidharan, Ph.D., Ms. N.Dhivya and Rev.Fr.A.Alex (2019) made the study on Impact of Macroeconomic Variables on Bombay Stock Exchange (BSE) Sensex through the data collected from the period of April 2008 to March 2018. Using SPSS software, the Descriptive statistics and Correlation to

analyse the consequence of Macroeconomic variables on Bombay Stock Exchange Sensex. The study found that understanding behaviour of Macroeconomic variables affected the stock market indexes and it was helpful for policy makers, Institutional investors, traders and all other stakeholders to take investment decision.

Vandana Singh (2017) made the study on Growth of automobile industry and its economic impact: An Indian perspective to analyse the growth pattern and economic impact of automobile industry on Indian economy. This research work examined the trends in the automobile industry and its impact on the economy in terms of GDP, Exports, FDI, Employment etc. are positively impacted by the growth of Indian automobile industry.

E.Geetha and Ti. M. Swaminathan (2015) made a study on the factors influencing stock price A Comparative study of Automobile and Information Technology Industries stocks in India to compare the performance of stock price movements in the market four company specific factors such as EPS, book value, P/E ratio and dividend yield have chosen to analyse the influencing factors which affects the movement of stock price either upward or down trend. The study found that there was significant effect on the influence of book value, earnings per share and price earnings ratio towards the market 109 price of the share.

III. HYPOTHESIS

A. Null Hypothesis:

H01: There is no significant relationship between selected companies of automobile industry and BSE SENSEX and BSE AUTO EX

H02: There is no impact of high volatility of stock prices on selected companies of automobile industry and BSE SENSEX and BSE AUTO EX.

H03: There is no influence the price movements of stock prices of BSE SENSEX and BSE AUTO and price movements of stock price of selected companies of automobile industry.

B. Alternate Hypothesis:

H11: There is significant relationship between selected companies of automobile industry and BSE SENSEX and BSE AUTO EX

H12: There is impact of high volatility of stock prices on selected companies of automobile industry and BSE SENSEX and BSE AUTO EX.

H13: There is influence the price movements of stock prices of BSE SENSEX and BSE AUTO and price movements of stock price of selected companies of automobile industry.

IV. RESEARCH METHODOLOGY

A. Statement of the problem

BSE AUTO index has fallen due to main effect consumer sentiment and slowdown in the sector. The sales rate of automobile sector have reduced since July 2019 indicating that slowdown in demand in automobile market. The main cause of automobile recession were weak consumer sentiment, and the increase of production of the automobile segment and also decrease of demand of automobile vehicles in rural areas. It also negatively influenced on the other segment of the Indian economy. The present study act as a backbone to investors to aware about the market capitalization and also the share prices BSE indices such as BSE SENSEX and BSE AUTO on selected companies of automobile industry to make the make the rational decision making on investment.

B. Objectives

1. To understand the significant relationship between selected companies of automobile industry and BSE SENSEX and BSE AUTO EX
2. To ascertain the impact of high volatility of stock prices on selected companies of automobile industry and BSE SENSEX and BSE AUTO EX.

3. To obtain the influence the price movements of stock prices of BSE SENSEX and BSE AUTO and price movements of stock price of selected companies of automobile industry.

C. Scope

The purpose of the Integration and volatility spillover of automobile companies stock price on BSE SENSEX and BSE AUTO index is to appraise the amount of uncertainty or risk related equity market in order to influence the potential investors to make investments without any hesitation. The study discovered the integration and volatility of stock prices of BSE SENSEX and BSE AUTO EX on the stock prices automobile industry by using the Eviews.9 software through extracting the data from the period of 2nd June 2009 to 31st July 2019. It portrays the investors to aware about the market capitalization and also the share prices BSE indices such as BSE SENSEX and BSE AUTO on selected companies of automobile industry to make the rational decision making on investment.

D. Source and Collection of data

The research has been made by collecting information as the secondary data of daily stock prices of 6 companies from the Automobile industry and stock prices of 2 indices such as BSE SENSEX and BSE AUTO of the Bombay Stock Exchange by using the website such as www.bseindia.com

E. Sample selection

The present study has done by choosing the sample as 2 indices of Bombay stock exchange and 6 companies from automobile industry.

- BSE SENSEX
- BSE AUTO
- APOLLO TYRES
- ASHOK LEYLAND
- BAJAJ AUTO
- MARUTI_SUZUKI
- MOTHERSUMI
- MRF

F. Study period

The research work entitled as Integration and volatility spillover of automobile companies stock price on BSE SENSEX and BSE AUTO index has attempted by extracting the data from the period of 2nd June 2009 to 31st July 2019.

G. Tools

To test the Integration and volatility spillover of automobile companies stock price on BSE SENSEX and BSE AUTO index, the following tools has been used:

1. Augmented Dickey Fuller test
2. GRACH Model
3. Johansen Co integration Rank Test

G.1 Augmented Dickey Fuller test

An augmented Dickey–Fuller test (ADF) is a tests that the null hypothesis of unit root is present in a time series sample. The alternative hypothesis is different depending on which version of the test is used, but is usually stationarity or trend-stationarity. It is an augmented version of the Dickey–Fuller test for a larger and more complicated set of time series models.

The augmented Dickey–Fuller (ADF) statistic is used to test the given number is negative number. The more negative it is, the stronger the rejection of the hypothesis that there is a unit root at some level of confidence.

G.2 GRACH Model

A GARCH (generalized autoregressive conditionally heteroscedastic) model uses values of the past squared observations and past variances to model the variance at time t.

G.3 Johansen Co integration Rank Test

In statistics, the Johansen test is a procedure for testing Cointegration of several of time series. There are two types of Johansen test, either with trace or with Eigen, and the inferences might be a little bit different. The null hypothesis for the trace test is that the number of cointegration vectors is $r=r^* < k$, vs. the alternative that $r=k$. The null hypothesis for the "maximum Eigen value" test is as for the trace test but the alternative is $r=r^* + 1$.

H. Analysis and interpretation

H.1 Augmented Dickey Fuller test

Table 1 Analysis for Augmented Dickey Fuller test for BSE SENSEX and BSE AUTO and selected companies of automobile industry.

Variables	Augmented Dickey-Fuller test statistic	Test critical values:			Probability
		1% level	5% level	10% level	
APOLLO TYR	-50.39	-3.43	-2.86	-2.57	0.0001
ASHOKLAY	-49.06	-3.43	-2.86	-2.57	0.0001
BAJAJ AUTO	-47.88	-3.43	-2.86	-2.57	0.0001
MARUTI SUZU	-48.05	-3.43	-2.86	-2.57	0.0001
MOTHER SUMI	-49.55	-3.43	-2.86	-2.57	0.0001
MRF	-47.06	-3.43	-2.86	-2.57	0.0001
BSE SENSEX	-47.38	-3.43	-2.86	-2.57	0.0001
BSE AUTO	-45.51	-3.43	-2.86	-2.57	0.0001

Source: The data for the analysis collected from www.bseindia.com and computed in eviews 9

Interpretation

Table 1 represents the Augmented Dickey Fuller test to designate selected indices and company are stationary or not. The critical value of 1%, 5% and 10% level are lesser than the ADF t – statistics values of variables. It is from the above table that all the indices such as BSE AUTO (45.51), BSE SENSEX (47.38), APOLLO TYR (50.39), ASHOKLAY (49.06), BAJAJ AUTO (47.88) MOTHER SUMI (49.55), MRF (47.06) and MARUTI SUZU (48.05) were superior than the critical value of 1% (3.43), 5% (2.86) and 10% (2.57). Hence the null hypothesis of the unit root test BSE SENSEX and BSE AUTO and selected companies of automobile industry is rejected. This resulted the test would be significant and reliable and it also revealed that there is existence of stationary in selected variables during the study period. The study resulted that there is a significant changes in the stock prices of the BSE SENSEX and AUTO on the stock price of the APOLLO TYRES, ASHOK LAY, BAJAJ AUTO, MARUTISUZU, MOTHER SUMI and MRF.

H.2 GRACH Model

Table 2 Analysis for GRACH MODEL for APOLLO TYR.

Dependent Variable: APOLLO_TY				
Method: ML - ARCH (Marquardt) - Normal distribution				
Date: 08/18/19 Time: 13:10				
Sample (adjusted): 6/03/2009 7/31/2019				
Included observations: 2523 after adjustments				
Convergence achieved after 20 iterations				
Presample variance: backcast (parameter = 0.7)				
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.0009	0.0005	1.8572	0.0633
APOLLO TY(-1)	-0.0037	0.0206	-0.1791	0.8579
Variance Equation				

C	0.0000	0.0000	5.2948	0.0000
RESID(-1)^2	0.0607	0.0089	6.8151	0.0000
GARCH(-1)	0.8876	0.0164	54.1446	0.0000

Source: The data for the analysis collected from www.bseindia.com and computed in eviews 9

Interpretation

Table 2 indicates that GRACH model to measure the volatility of stock prices that relating to the investment decision. The above table elucidates the value of alpha coefficient is 0.0607 and the Beta coefficient is 0.8876 and the sum of the alpha coefficient and beta coefficient is 0.9483 indicates the value is near to the value 1 clearly defines that there was a high volatility inside APOLLO_TY and also significantly volatility, so the investors can invest in the APOLLO_TY indices.

Table 3 Analysis for GRACH MODEL for ASHOK LAY.

Dependent Variable: ASHOKLAY				
Method: ML - ARCH (Marquardt) - Normal distribution				
Date: 08/18/19 Time: 13:11				
Sample (adjusted): 6/03/2009 7/31/2019				
Included observations: 2523 after adjustments				
Convergence achieved after 119 iterations				
Presample variance: backcast (parameter = 0.7)				
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.0006	0.0006	1.1065	0.2685
ASHOKLAY(-1)	0.0351	0.0205	1.7075	0.0877
Variance Equation				
C	0.0000	0.0000	2.4936	0.0126
RESID(-1)^2	0.0005	0.0007	0.6611	0.5086
GARCH(-1)	0.9773	0.0090	108.0057	0.0000

Source: The data for the analysis collected from www.bseindia.com and computed in eviews 9

Interpretation

Table 3 indicates that GRACH model to measure the volatility of stock prices that concerning the investment decision. The above table elucidates the value of alpha coefficient is 0.0005 and the Beta coefficient is 0.9773 and the sum of the alpha coefficient and beta coefficient is 0.9483 indicates the value is near to the value 1 clearly defines the investors can make invest in the AHOK LAY indices since there was a high volatility inside ASHOK LAY and also significantly volatility.

Table 4 Analysis for GRACH MODEL for BAJAJ AUTO

Dependent Variable: BAJAJ_AUTO				
Method: ML - ARCH (Marquardt) - Normal distribution				
Date: 08/18/19 Time: 13:12				
Sample (adjusted): 6/03/2009 7/31/2019				

Included observations: 2523 after adjustments				
Convergence achieved after 192 iterations				
Presample variance: backcast (parameter = 0.7)				
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.0003	0.0003	0.9709	0.3316
BAJAJ_AUTO(-1)	-0.0341	0.0259	-1.3185	0.1873
Variance Equation				
C	0.0001	0.0000	8.7911	0.0000
RESID(-1)^2	0.3467	0.0224	15.4496	0.0000
GARCH(-1)	0.5943	0.0281	21.1371	0.0000

Source: The data for the analysis collected from www.bseindia.com and computed in eviews 9

Interpretation

Table 4 indicates that GRACH model to measure the unpredictability of changes in the stock prices that related to investment decision. From the above table, the sum of the alpha coefficient and beta coefficient is 0.941 since the value of alpha coefficient is 0.3467 and the Beta coefficient is 0.5943 indicates the value is near to the value 1 clearly defines the investors can invest in the BAJAJ AUTO indices since there was a high volatility inside BAJAJ AUTO and also significantly volatility.

Table 5 Analysis for GRACH MODEL for MARUTI SUZU

Dependent Variable: MARUTI_SUZU				
Method: ML - ARCH (Marquardt) - Normal distribution				
Date: 08/18/19 Time: 13:16				
Sample (adjusted): 6/03/2009 7/31/2019				
Included observations: 2523 after adjustments				
Convergence achieved after 38 iterations				
Presample variance: backcast (parameter = 0.7)				
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.0009	0.0003	2.8247	0.0047
MARUTI_SUZU(-1)	0.0557	0.0182	3.0540	0.0023
Variance Equation				
C	0.0000	0.0000	4.5370	0.0000
RESID(-1)^2	0.0277	0.0035	8.0147	0.0000
GARCH(-1)	0.9591	0.0053	180.2124	0.0000

Source: The data for the analysis collected from www.bseindia.com and computed in eviews 9

Interpretation

Table 5 indicates that GRACH model to measure the unpredictability of changes in the stock prices that related to investment decision. The above table explains the value of alpha coefficient is 0.0277 and the Beta coefficient is 0.9591 and the sum of the alpha coefficient and beta coefficient is 0.9868 indicates the value is near to the value 1 clearly defines that there was a high volatility inside MARUTI SUZU and also significantly volatility, so the investors can invest in the MARUTI SUZU indices.

Table 6 Analysis for GRACH MODEL for MOTHER SUMI

Dependent Variable: MOTHERSUMI				
Method: ML - ARCH (Marquardt) - Normal distribution				
Date: 08/18/19 Time: 13:17				
Sample (adjusted): 6/03/2009 7/31/2019				
Included observations: 2523 after adjustments				
Convergence achieved after 145 iterations				
Presample variance: backcast (parameter = 0.7)				
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.0005	0.0006	0.8257	0.4090
MOTHERSUMI(-1)	0.0133	0.0216	0.6123	0.5403
Variance Equation				
C	0.0001	0.0001	1.8278	0.0676
RESID(-1)^2	0.0090	0.0047	1.9322	0.0533
GARCH(-1)	0.8379	0.0877	9.5502	0.0000

Source: The data for the analysis collected from www.bseindia.com and computed in views 9

Interpretation

Table 6 indicates that GRACH model to measure the unpredictability of changes in the stock prices that related to investment decision. The above table explains that the sum of the alpha coefficient and beta coefficient is 0.8469 since the value of alpha coefficient is 0.0090 and the Beta coefficient is 0.8379 indicates the value is near to the value 1 clearly defines the investors can invest in the MOTHER SUMI indices since there was a high volatility inside MOTHER SUMI and also significantly volatility.

Table 7 Analysis for GRACH MODEL for MRF

Dependent Variable: MRF				
Method: ML - ARCH (Marquardt) - Normal distribution				
Date: 08/18/19 Time: 13:17				
Sample (adjusted): 6/03/2009 7/31/2019				
Included observations: 2523 after adjustments				
Convergence achieved after 20 iterations				
Presample variance: backcast (parameter = 0.7)				
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)				

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.0009	0.0004	2.3795	0.0173
MRF(-1)	0.0765	0.0184	4.1497	0.0000
Variance Equation				
C	0.0000	0.0000	4.9079	0.0000
RESID(-1)^2	0.0216	0.0026	8.2959	0.0000
GARCH(-1)	0.9699	0.0033	292.4954	0.0000

Source: The data for the analysis collected from www.bseindia.com and computed in eviews 9

Interpretation

Table 7 indicates that GRACH model to measure the unpredictability of changes in the stock prices that related to investment decision. The above table explains the value of alpha coefficient is 0.0216 and the Beta coefficient is 0.9699 and the sum of the alpha coefficient and beta coefficient is 0.9915 indicates the value is near to the value 1 clearly defines that there was a high volatility inside MRF and also significantly volatility, so the investors can invest in the MRF indices.

Table 8 Analysis for GRACH MODEL for BSE AUTO

Dependent Variable: BSE_AUTO				
Method: ML - ARCH (Marquardt) - Normal distribution				
Date: 08/18/19 Time: 13:19				
Sample (adjusted): 6/03/2009 7/31/2019				
Included observations: 2523 after adjustments				
Convergence achieved after 11 iterations				
Presample variance: backcast (parameter = 0.7)				
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.0007	0.0002	3.0950	0.0020
BSE_AUTO(-1)	0.1052	0.0206	5.1188	0.0000
Variance Equation				
C	0.0000	0.0000	4.4424	0.0000
RESID(-1)^2	0.0744	0.0095	7.8482	0.0000
GARCH(-1)	0.8945	0.0137	65.0971	0.0000

Source: The data for the analysis collected from www.bseindia.com and computed in eviews 9

Interpretation

Table 8 indicates that GRACH model to measure the unpredictability of changes in the stock prices that related to investment decision. The above table explains that the sum of the alpha coefficient and beta coefficient is 0.9689 since the value of alpha coefficient is 0.0744 and the Beta coefficient is 0.8945 indicates the value is near to the value 1 clearly defines that there was a high volatility inside BSE AUTO and also significantly volatility, so the investors can invest in the BSE AUTO indices.

Table 9 Analysis for GRACH MODEL for BSE SENSEX

Dependent Variable: BSE_SENSEX				
Method: ML - ARCH (Marquardt) - Normal distribution				
Date: 08/18/19 Time: 13:25				
Sample (adjusted): 6/03/2009 7/31/2019				
Included observations: 2523 after adjustments				
Convergence achieved after 11 iterations				
Presample variance: backcast (parameter = 0.7)				
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.0006	0.0002	3.4532	0.0006
BSE_SENSEX(-1)	0.0674	0.0217	3.1148	0.0018
Variance Equation				
C	0.0000	0.0000	3.7201	0.0002
RESID(-1)^2	0.0522	0.0072	7.2356	0.0000
GARCH(-1)	0.9364	0.0085	109.8429	0.0000

Source: The data for the analysis collected from www.bseindia.com and computed in eviews 9

Interpretation

Table 9 indicates that GRACH model to measure the unpredictability of changes in the stock prices that related to investment decision. The above table explains the value of alpha coefficient is 0.0522 and the Beta coefficient is 0.9364 and the sum of the alpha coefficient and beta coefficient is 0.9886 indicates the value is near to the value 1 clearly defines that there was a high volatility inside BSE SENSEX and also significantly volatility, so the investors can invest in the BSE SENSEX indices.

H.3 Johansen Co integration Rank Test:

Table 10 Analysis for Johansen Co integration Rank Test for BSE SENSEX and BSE AUTO and selected companies of automobile industry.

Series: APOLLO_TY ASHOKLAY BAJAJ_AUTO MARUTI_SUZU MOTHERSUMI MRF BSE_AUTO BSE_SENSEX				
Lags interval (in first differences): 1 to 4				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.210157	3950.592	159.5297	0.0001
At most 1 *	0.201216	3356.308	125.6154	0.0001
At most 2 *	0.188509	2790.378	95.75366	0.0001
At most 3 *	0.182717	2264.205	69.81889	0.0001
At most 4 *	0.169556	1755.948	47.85613	0.0001
At most 5 *	0.16557	1287.931	29.79707	0.0001
At most 6 *	0.156404	831.9768	15.49471	0.0001
At most 7 *	0.148025	403.5404	3.841466	0.0001

Trace test indicates 8 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
		Max-Eigen	0.05	
Hypothesized		Statistic	Critical Value	Prob.**
No. of CE(s)	Eigenvalue			
None *	0.210157	594.2841	52.36261	0.0001
At most 1 *	0.201216	565.9307	46.23142	0.0001
At most 2 *	0.188509	526.1722	40.07757	0.0001
At most 3 *	0.182717	508.2575	33.87687	0.0001
At most 4 *	0.169556	468.0165	27.58434	0.0001
At most 5 *	0.16557	455.9545	21.13162	0.0001
At most 6 *	0.156404	428.4364	14.2646	0.0001
At most 7 *	0.148025	403.5404	3.841466	0
Max-eigenvalue test indicates 8 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Source: The data for the analysis collected from www.bseindia.com and computed in eviews 9

Interpretation:

The unrestricted Johnson Co-integration test are report the results in Table 10. It consists of two basics types of test statistics. The first block reports are called trace statistics (λ trace) and the second block reports the maximum Eigen value (λ max). Both the trace statistic and maximum Eigen value statistics indicating that trace statistics are APOLLO TYR (3950.592), ASHOK LAY (3356.308), BAJAJ AUTO (2790.378), MARUTI SUZU (2264.205), MOTHER SUMI (1755.948), MRF (1287.931), BSE AUTO (831.9768) and BSE SENSEX (403.5404) and the maximum Eigen value are APOLLO TYR (594.2841), ASHOK LAY (565.9307), BAJAJ AUTO (526.1722), MARUTI SUZU (508.2575), MOTHER SUMI (468.0165), MRF (455.9545), BSE AUTO (428.4364) and BSE SENSEX (403.5404) co integrated at the 0.05 level. Hence it concluded that there will be a long run relationship between APOLLO TYRES, ASHOK LAY, BAJAJ AUTO, MARUTISUZU, MOTHER SUMI and MRF on BSE SENSEX and BSE AUTO Indexand also the price movement of the BSE SENSEX and BSE AUTO Indexcauses the Indian Stock Market Returns on the selected companies stock price of Automobile industry which increases the investing power of both individualand institutional investors.

V. FINDINGS

- 1) Augmented Dickey Fuller test indicates that there was significant and reliable relationship exist among the automobile companies such as APOLLO TYRES, ASHOK LAY, BAJAJ AUTO, MARUTISUZU,

MOTHER SUMI and MRF on BSE SENSEX and BSE AUTO Index since the critical value of 1%, 5% and 10% level are lesser than the ADF t – statistics values of variables.

- 2) GRACH model indicates that the sum of alpha coefficient and beta coefficient of 6 selected companies such as Apollo, Ashok Leyland, Bajaj auto, Maruti Suzuki, Mother Sumi and MRF and BSE Indices such as BSE SENSEX and BSE AUTO are the value nearly 1, it clearly defines that there was a high volatility and also significantly volatility in the selected variables, so the investors can invest in the stock of Apollo, Ashok Leyland, Bajaj auto, Maruti Suzuki, Mother Sumi and MRF since they are influenced by the market capitalization and also the share prices and its fluctuations of the BSE indices such as BSE SENSEX and BSE AUTO.
- 3) Johnson Co integration Rank Test there will be a long run relationship between APOLLO TYRES, ASHOK LAY, BAJAJ AUTO, MARUTISUZU, MOTHER SUMI and MRF on BSE SENSEX and BSE AUTO Index and also the price movement of the BSE SENSEX and BSE AUTO Index causes the Indian Stock Market Returns on the selected companies stock price of Automobile industry.

VI. CONCLUSION

The Paper “Integration and volatility spillover of automobile companies stock price on BSE SENSEX and BSE AUTO index” exposed that the combination and volatility spillover of BSE Indices such as BSE SENSEX and BSE AUTO on selected companies of auto mobile such as APOLLO TYRES, ASHOK LAY, BAJAJ AUTO, MARUTISUZU, MOTHER SUMI and MRF have been examined through the tools such as Augmented Dickey Fuller test, GRACH MODEL and Johansen Co integration Rank Test for the period 2009-2019. It shows that there was significant and reliable relationship exist among the automobile companies such as APOLLO TYRES, ASHOK LAY, BAJAJ AUTO, MARUTISUZU, MOTHER SUMI and MRF on BSE SENSEX and BSE AUTO Index since the critical value of 1%, 5% and 10% level are lesser than the ADF t – statistics values of variables. The study revealed that there was a high volatility and also significantly volatility in the selected variables, so the investors can invest in the stock of Apollo, Ashok Leyland, Bajaj auto, Maruti Suzuki, Mother Sumi and MRF since they are influenced by the market capitalization and also the share prices and its fluctuations of the BSE indices such as BSE SENSEX and BSE AUTO. Through the Johnson Co integration Rank Test that there will be a long run relationship between APOLLO TYRES, ASHOK LAY, BAJAJ AUTO, MARUTISUZU, MOTHER SUMI and MRF on BSE SENSEX and BSE AUTO Index and also the price movement of the BSE SENSEX and BSE AUTO Index causes the Indian Stock Market Returns on the selected companies stock price of Automobile industry. This work helps the institutional investor to aware about the ups and down of the stock price of automobile companies and also portrays them to loss their hesitation to make investment in the automobile companies. This research article influenced the investment decision making of both institutional and individual investor effectively and efficiently on the stock of automobile companies list on the Bombay stock exchange.

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