A STUDY ON THE IMPACT OF VOLATILITY IN EXCHANGE RATE OF INDIAN RUPEE VERSUS US DOLLAR ON INDIAN CAPITAL MARKET

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INTRODUCTION

FOREX (Foreign Exchange market), refers to an international exchange market where currencies are bought and sold. The Foreign Exchange Market began in the 1970's, when free exchange rates and floating currencies were introduced. In such an environment only participants in the market determine the price of one currency against another, based upon supply and demand for that currency.

The foreign exchange market is most often called the forex market, or simply the FX market is the most traded financial market in the world. The forex market is the crossroads for international capital, the intersection through which global commercial and investment flows have to move. International trade flows, such as when a Swiss electronics company purchases Japanese-made components, were the original basis for the development of the forex markets. Today, however, global financial and investment flows dominate trade as the primary non-speculative source of forex market volume. Whether it's an Australian pension fund investing in U.S. Treasury bonds, or a British insurer allocating assets to the Japanese equity market, or a German conglomerate purchasing a Canadian manufacturing facility, each cross-border transaction passes through the forex market at some stage.

More than anything else, the forex market is a trader's market. It's a market that's open around the clock six days a week, enabling traders to act on news and events as they happen. It's a market where half-billion-dollar trades can be executed in a matter of seconds and may not even move prices noticeably. Forex is a somewhat unique market for a number of reasons. Firstly, it is one of the few markets in which it can be said with very few qualifications that it is free of external controls and that it cannot be manipulated. It is also the largest liquid financial market, with trade reaching between 1 and 1.5 trillion US dollars a day. With this much money moving this fast, it is clear why a single investor would find it near impossible to significantly affect the price of a major currency. Furthermore, the liquidity of the market means that unlike some rarely traded stock, traders are able to open and close positions within a few seconds as there are always willing buying and selling.

Another somewhat unique characteristic of the FOREX money market is the variance of its participants. Investors find a number of reasons for entering the market, some as longer term hedge investors, while others utilize massive credit lines to seek large short term gains. Interestingly, unlike blue-chip stocks, which are usually most attractive only to the long term investor, the combination of rather constant but small daily fluctuations in currency prices, create an environment which attracts investors with a broad range of strategies.

FLUCTUATIONS IN EXCHANGE RATE

A market based exchange rate will change whenever the values of either of the two component currencies change. A currency will tend to become more valuable whenever demand is greater than the

available supply. It will become less valuable whenever demand is less than available supply (this does not mean people no longer want money, it just means they prefer holding their wealth in some other form, possibly in another currency).

Increased demand for a currency is due to either an increased transaction demand for money, or an increased speculative demand for money. The transaction demand for money is highly correlated to the country's level of business activity, Gross Domestic Product (GDP), and employment levels. The more the people are unemployed, the less the public as a whole will spend on goods and services. Central banks typically have little difficulty in adjusting the available money supply to accommodate changes in the demand for money due to business transactions.

VOLATILITY

Volatility refers to the amount of uncertainty or risk about the size of change in a security's value. A higher volatility means that a security's value can potentially be spread out over a larger range of values. This means that the price of the security can change dramatically over a short time period in either direction. A lower volatility means that security's value does not fluctuate dramatically, but changes in value at a steady pace over period of time.

One measure of the relative volatility of a particular stock to the market is beta. A beta approximates the overall volatility of a security's returns against the returns of a relevant benchmark (usually the S&P 500 is used). For example, a stock with a beta value of 1.1 has historically moved 110% for every 100% move in the benchmark, based on price level. Conversely, a stock with a beta of .9 has historically moved 90% for every 100% move in the underlying index.

Volatility refers to the frequency and severity with which the market price of an investment fluctuates. Certain psychological studies have shown that investors as a whole are happiest when volatility is lowest, even if that means making less money over time. It is possible to make money from volatility. Value investors seek to buy assets when no one else wants them. Certain types of option traders make much higher profits when fear is rampant because people are willing to pay those more to write derivatives such as put options. In fact, it may be fair to say that the more professional and intelligent investors, the more beneficial volatility is to him because he can use it to buy more of what is cheap and sell more of what is expensive.

For long-term investors regularly putting away money through a dollar cost averaging plan, volatility is meaningless. The regular contributions should, over the course of many years, even out the average price paid and mean nothing more than a footnote in the history of your financial life.

NATIONAL STOCK EXCHANGE (NSE)

In the fast growing Indian financial market, there are 24 stock Exchanges are trading securities. The National Stock Exchange of India (NSE) situated in Mumbai - is the largest and most advanced exchange with 1016 companies listed and 726 trading members. The NSE is owned by the group of leading financial institutions such as Indian Bank or Life Insurance Corporation of India. However, in the totally de-metalized Exchange, the ownership as well as the management does not have a right to trade on the Exchange. Only qualified traders can be involved in the securities trading.

The National Stock Exchange of India Ltd. provides its clients with a single, fully electronic trading platform that is operated through a VSAT network. Unlike most world Exchanges, the NSE uses the satellite communication system that connects traders from 345 Indian cities. The advanced technologies enable up to 6 million trades to be operated daily on the NSE trading platform.

HISTORY OF NSE OF INDIA

Capital market reforms in India and the launch of the Securities and Exchange Board of India (SEBI) accelerated the incorporation of the second Indian stock exchange called the National Stock Exchange (NSE) in 1992. After a few years of operations, the NSE has become the largest stock exchange in India.

Three segments of the NSE trading platform were established one after another. The Wholesale Debt Market (WDM) commenced operations in June 1994 and the Capital Market (CM) segment was opened at the end of 1994. Finally, the Futures and Options segment began operating in 2000. Today the NSE takes the 14th position in the top 40 futures Exchanges in the world. In 1996, the National Stock Exchange of India launched S&P CNX Nifty and CNX Junior Indices that make up 100 most liquid stocks in India. CNX Nifty is a diversified index of 50 stocks from 25 different economy sectors. The Indices are owned and managed by India Index Services and Products Ltd (IISL) that has a consulting and licensing agreement with Standard & Poor's.

In 1998, the National Stock Exchange of India launched its web-site and was the first exchange in

India that started trading stock on the Internet in 2000. The NSE has also proved its leadership in the Indian financial market by gaining many awards such as 'Best IT Usage Award' by Computer Society in India (in 1996 and 1997) and CHIP Web Award by CHIP magazine (1999).

INDICES UNDER NSE

The following table shows the major and other indices under National Stock Exchange (NSE) in India.

LIST OF INDICES UNDER NSE

S&P CNX NIFTY
S&P CNX NIFTY JUNIOR
S&P CNX IT
S&P CNX BANK
S&P CNX 100
S&P CNX DEFTY
S&P CNX 500
S&P CNX MIDCAP
S&P CNX INFRASTUCTURE
S&P CNX 200
S&P CNX MIDCAP 50
S&P CNX SMALL CAP INDEX
S&P CNX MIDCAP 200
S&P CNX AUTO
S&P CNX COMMODITIES
S&P CNX CONSUMPTION
S&P CNX MEDIA
S&P CNX MEDIA
S&P CNX METALS
S&P CNX MNC
S&P CNX DIVIDEND OPPORTUNITIES
S&P CNX ENERGY
S&P CNX FINANCE
S&P CNX FMCG
S&P CNX PARMA

There are totally 9 major indices and 14 other indices in NSE. The sample indices taken for this study were eight major indices and one other index.

STATEMENT OF THE PROBLEM

Foreign Exchange Rate is the largest financial market function is converting any foreign currency into another currency. A market based exchange rate will change whenever the values of either of the two component currencies change. A currency will tend to become more valuable whenever demand for it is greater than the available supply. Increased demand for a currency is due to either an increased transaction demand for money, or increased speculative demand for money. The transaction demand for money is highly correlated to the countries level of business activity, Gross Domestic Product (GDP), and employment levels. Most of the peoples are unemployed, the less the public as a whole will spend on goods and services. Central banks typically have little difficulty in adjusting the available money supply to accommodate changes in the demand for money due to business transactions. Such fluctuations in exchange rate have its impact on the economic growth of the economy. Hence the present study aims at finding out the volatility in the exchange rate and stock market.

NEED OF THE STUDY

Various studies have been made to test the volatility of National Stock Exchange indices in India and US exchange rate. In Indian concept, many researchers have been carried out to examine the volatility of various commodities, stocks and index future. No comprehensive study has been undertaken to test the volatility and effects of Exchange rate in Indian Stock Exchange indices. Hence, the present study made an attempt to test the volatility and effects of Exchange rate in National Stock Exchange indices with help of GARCH.

OBJECTIVE OF THE STUDY

- To analyze the volatility in Exchange rate of US dollar on Indian capital market (NSE).

SAMPLE SELECTION

In NSE S&P CNX Nifty, CNX Nifty Junior , CNX 100, CNX Bank, CNX Infrastructure, CNX 200,S&P CNX 500, CNX IT, CNX Midcap, Nifty Midcap 50, CNX Small cap Index, S&P CNX Defty, CNX Midcap 200, CNX Auto, CNX Commodities, CNX Consumption, CNX Media, CNX Metals, CNX MNC, CNX Dividend Opportunities, CNX Energy, CNX Finance, CNX FMCG, CNX Parma Indices are available. Here I have taken major nine indices because most traded indices in National Stock Exchange.

List of Selected National Stock Index Indices 1

SOURCE OF DATA

Secondary data is the information that is already available and which is used by the researcher as source for data used in his/her research. Different forms of secondary data include:

- Journals;
- Books;
- Census Data;
- Newspaper articles; and
- Biographies

The data for the present study is mainly collected form Secondary data for stock exchange web sites:

www.yahoofinance.com
www.bloomberg.com

www.rbi.org.in
www.google.com

Further, the additional information were collected from the journals, books, published reports etc. the references of all those material referred were listed in Bibliography section.

PERIOD OF THE STUDY

The present study covers five year period from Jan 2007 to Dec 2011. The daily closing sector price indices, exchange rates are used for the period 1 Jan 2007 to 31 Dec 2011. The foreign exchanges are stated in US dollars per local currency. These variables are used to demonstrate the impact of exchange and interest rate changes on the underlying index volatility. Composite index, such as S&P CNX Infrastructure, S&P CNX IT, S&P CNX MIDCAP, S&P CNX 500, S&P CNX Bank index, S&P CNX NIFTY JOUNIOR, S&P CNX DEFTY, S&P CNX100, S&P CNXNIFTY are used for analysis .The National Stock Exchange indices are especially important to examine because they are widely used for measuring sector performance in US and financial market.

TOOLS USED FOR ANALYSIS

Generalized Autoregressive Conditional Heteroscedasticity (GARCH)

In statistics, a sequence or a vector of random variables is heteroskedastic, or heteroscedastic, if the random variables have different variances. The complementary concept is called homoskedasticity. The term means "differing variance" and comes from the Greek "hetero" ('different') and "skedasis" ('dispersion'). When using some statistical techniques, such as ordinary least squares (OLS), a number of assumptions are typically made. One of these is that the error term has a constant variance. This will be true if the observations of the error term are assumed to be drawn from identical distributions. Heteroskedasticity is a violation of this assumption. Consider the ARCH model suggested by Geweke (1986), Numerous parametric specifications for the time varying conditional variance have been proposed in the literature. In the linear ARCH(q) model originally introduced by Engle (1982), the conditional variance is postulated to be a linear function of the past squared

$$\sigma_t^2 = \omega + \sum_{i=1,q} \alpha_i \varepsilon_{t-i}^2 \equiv \omega + \alpha(L)\varepsilon_{t-1}^2,$$

Where,

L denotes the lag or backshift operator, L'y, = Y,_~. Of course, for this model to be well defined and the conditional variance to be positive, almost surely the

Parameters must satisfy w > 0 and c(~ 3 0,. . . , a, > 0.Defining v, = E: - a,

EXCHANGE RATE

Table-1 reveals the result of the GRACH model for testing the price volatility. It shows the coefficient of ARCH parameter ? and the GARCH parameter ?. It is clear that the GARCH estimate for Exchange Rate is larger than the ARCH parameters. It indicates that shocks to conditional variance take a long time die out and therefore volatility is persistence Beta, Omega, Alpha values are 0.011589, 0.00024, and 0.352416. The values are less than 1. It proves that the series are stationary and the persistence changes in volatility decline for every Exchange Rate.

Table 1 Showing Volatility in Exchange Rate

Chart 1 Showing Variation and Prediction of Exchange Rate

S&P CNX NIFTY

Table-2 reveals the ARCH and GARCH parameter estimates for volatility testing of Nifty index. The probably values of Omega, Alpha and Beta values are (0.983476), (0.999597) and (0.961823) revealing that Omega records higher volatility. The coefficient values of Alpha and Beta show that Alpha i,e ARCH estimate is high volatile.

Table 2 Showing Volatility in Nifty Indices

Chart 2 Showing Variation and Prediction of Nifty Indices

S&P CNX NIFTY JUNIOR

Table-3 indicates the GRACH model for testing the price volatility for National Stock Exchange in S&P CNX NIFTY JUNIOR index. Alpha values are 0.99756, Beta values are 0.92484, while Omega values are 0.934944.

Table 3 Showing Volatility in Nifty Junior Indices

Chart 3 Showing Variation and Prediction of Nifty Junior Indices

S&P CNX IT

Table-5 indicates the GRACH model for testing the price volatility for National Stock Exchange in S&P CNX IT index. Alpha values are 0.999918021, Beta values are 0.955586356, while Omega values are 0.961164904.

Table 5 Showing Volatility in IT Indices

Chart 5 Showing Variation and Prediction of IT Indices

S&P CNX BANK INDICES

Table-6 gives the result of the GARCH model

for testing the price Volatility of CNX Bank index. It is evident from the table that ARCH estimates are more than the GARCH estimates, indicating the Higher Volatility for ARCH estimate. Probability values reveal that Omega values (0.935215) records higher volatility.

S&P CNX 100

Table-7 shows the results of price volatility testing for CNX 100 index. (0.979524), (0.999323), (0.956942) are the probability values for Omega, Alpha and Beta respectively indicating, the higher volatility for Omega values. The comparison of Alpha (0.999323) value shows that the GARCH estimates have higher volatility.

Table 7 Showing Volatility in CNX 100 Indices

Chart 7 Showing Variation and Prediction of CNX 100 Indices

S&P CNX DEFTY

Table-8 GRACH model results for testing the volatility of S&P CNX Defty Indices is presented in the Table-19. Omega, Alpha, Beta values are 0.91662239, 0.9998311, 0.84063686 respectively.

Table 8 Showing Volatility in CNX Defty Indices

Chart 8 Showing Variation and Prediction of CNX Defty Indices

S&P CNX 500

Table-9 Indicates the price volatility since its value (0.955672) is lower than Alpha (0.999381) and Beta (0.946047). The comparison of ARCH and GARCH estimates indicates that ARCH estimates (0.946047) records high volatility.

Table 9 Showing Volatility in CNX 500 Indices

Chart 9 Showing Variation and Prediction of CNX 500 Indices

S&P CNX MIDCAP

Table-10 reveals the result of the GRACH model for testing the price volatility. It shows the coefficient of ARCH parameter ? and the GARCH parameter ?.It is clear that the GARCH estimate for Midcap is larger than the ARCH parameters. It indicates that shocks to conditional variance take a long time die out and therefore volatility is persistence Beta, Omega, Alpha values are 0.964552, 0.999893, and 0.956615. The values are less than 1. It proves that the series are stationary and the persistence changes in volatility decline for every Midcap index.

Table 10 Showing Volatility in Midcap Indices

Chart 10 Showing Variation and Prediction of Midcap Indices

S&P CNX INFRASTRUCTURE

Table-11 reveals the ARCH and GARCH parameter estimates for volatility testing of Infrastructure index. The probably values of Omega, Alpha and Beta values are (0.970819), (0.999028) and (0.925426) revealing that Omega records higher volatility. The coefficient values of Alpha and Beta show that Alpha i,e ARCH estimate is high volatile.

Table 11 Showing Volatility in Infrastructure Indices

Chart 11 Showing Variation and Prediction of Infrastructure Indices

FINDINGS & SUGGESTIONS OF THE STUDY

1. GARCH models were used to understand volatility of the NSE (sensex) and US Dollar Exchange rate.
2. Whenever the market predicted the price movements exactly, it would minimize the risk. Hence it would be beneficial to the investors, hedgers and brokers.
3. The volatility in the stock market provides accurate price prediction. Hence the investors could invest for short term profitability.
4. Regulators should introduce new regulation for forecasting for the benefit of investors, brokers and financial market participants.
5. The study suggested that the US Exchange rate and National Stock Exchange, are highly volatile and therefore the speculative type of investor can use this opportunity.

CONCLUSION

This study investigated the volatility of US dollar exchange rate and the stock market. It is also analysis the impact of exchange rate on the indices namely S&P CNX NIFTY, S&P CNX NIFTY JUNIOR, S&P CNX IT, S&P CNX BANK, S&P CNX 100, S&P CNX DEFTY, S&P CNX 500, S&P CNX MIDCAP, S&P CNX INFRASTURARE, index. Regarding returns, even though there is evidence that index return decrease in response to changes in Exchange rate. The study proves statistically that there is a significant volatility in US Exchange rate and National Stock Exchange measured by different models. The predictive ability of GARCH model used with more modification in the variance equation truly captures the trend of volatility. In addition, base US Exchange rate is exposed more often to exogenous variable which disturb volatility levels more than stock index. GARCH model analysis reveals the volatility of Exchange rare and Stock indices.

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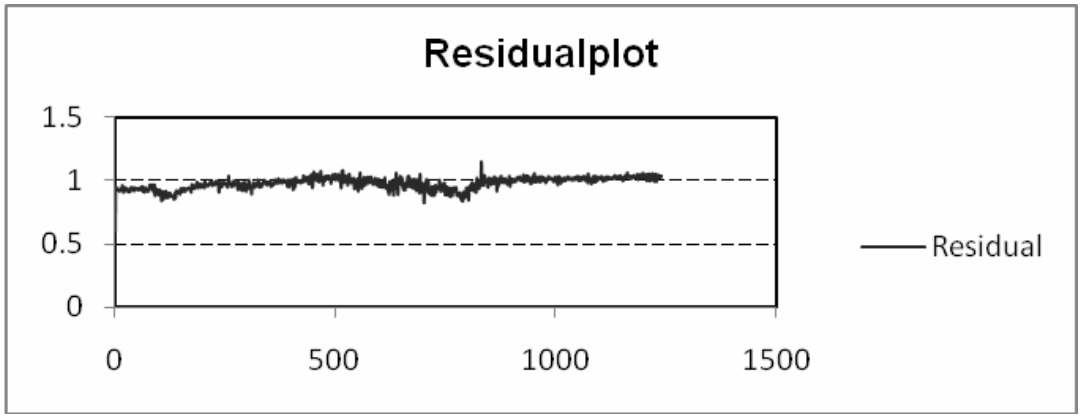
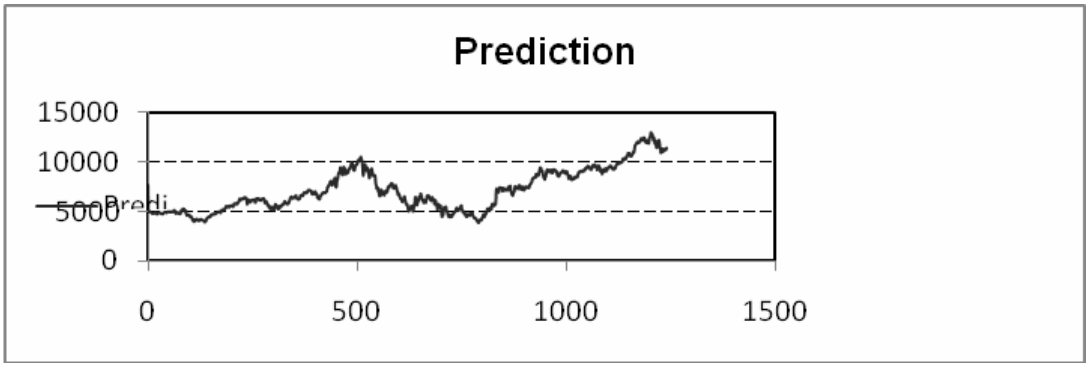
Particulars	Coefficient	Std. Error	z-Statistic	Prob.
Omega	4927717.063	60622266	0.0812856	0.935215
alpha_1	0.011585941	9.7318754	0.0011905	0.99905
beta_1	0.904245884	8.9842813	0.1006475	0.91983





List of Selected National Stock Index Indices 1

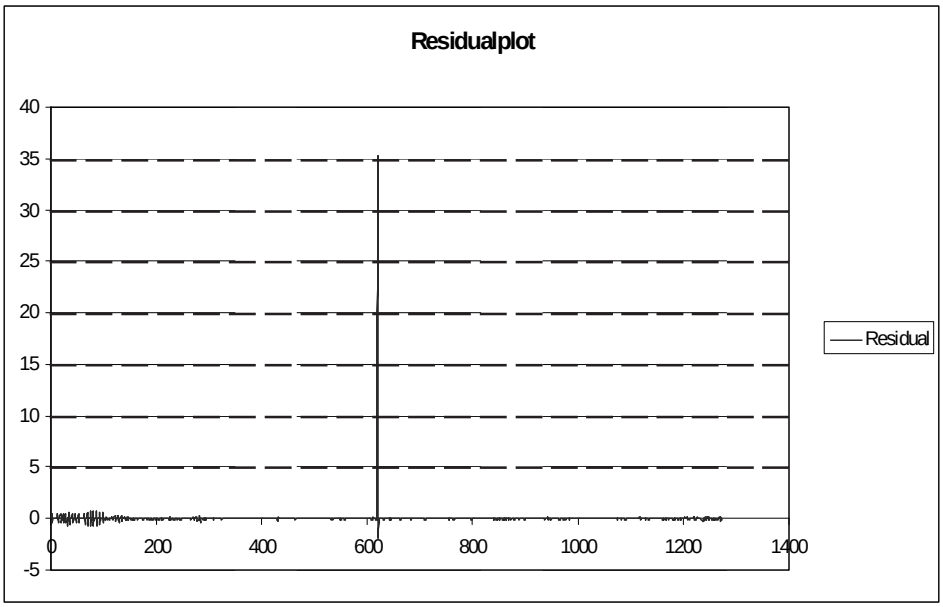
S.NO	Name of the indices
1	S&P CNX INFRASTRUCTURE
2	S&P CNX IT
3	S&P CNX MIDCAP
4	S&P CNX 500
5	S&P CNX BANK INDEX
6	S&P CNX NIFTY JOUNIOR
7	S&P CNX DEFTY
8	S&P CNX100
9	S&P CNXNIFTY

Source: www.nseindia.com

Table 1 Showing Volatility in Exchange Rate

	Coefficient	Std. Error	z-Statistic	Prob.
Omega	0.011589	6.14-05	188.7649	0.000000
alpha_1	0.00024	0.005042	0.047574	0.962056
beta_1	0.352416	0.326958	1.077862	0.281096

Chart 1 Showing Variation and Prediction of Exchange Rate



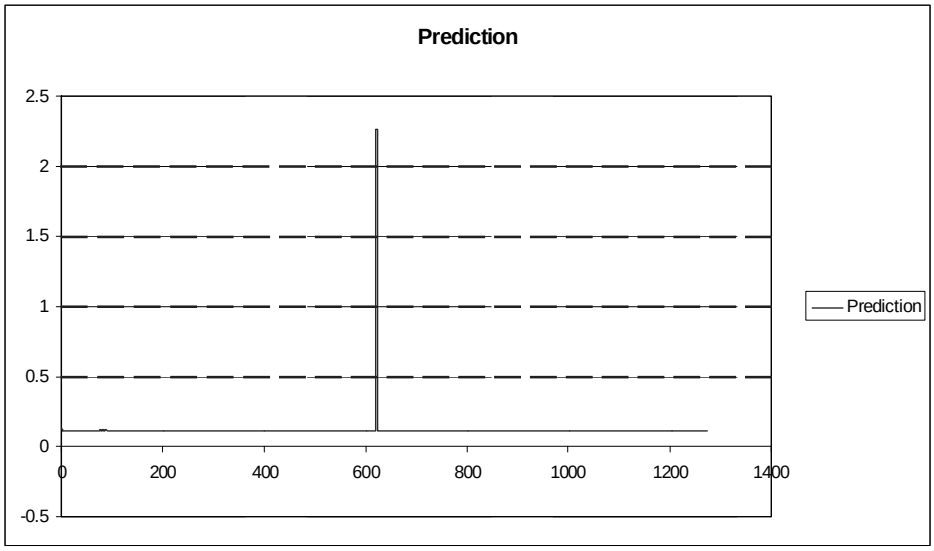
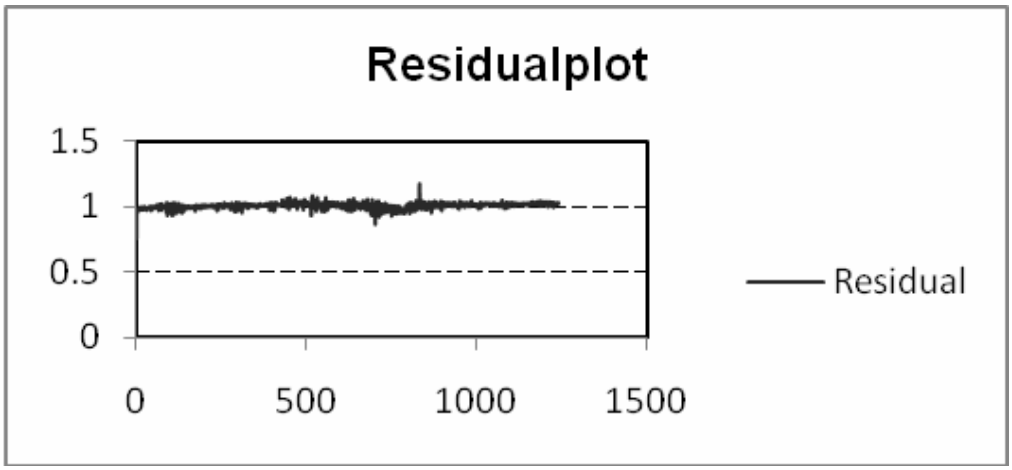


Table 2 Showing Volatility in Nifty Indices

Particular	Coefficient	Std. Error	z-Statistic	Prob.
Omega	853723.563	41220006	0.0207114	0.983476
alpha_1	0.01045192	20.676595	0.0005055	0.999597
beta_1	0.93165885	19.463878	0.047866	0.961823

Chart 2 Showing Variation and Prediction of Nifty Indices



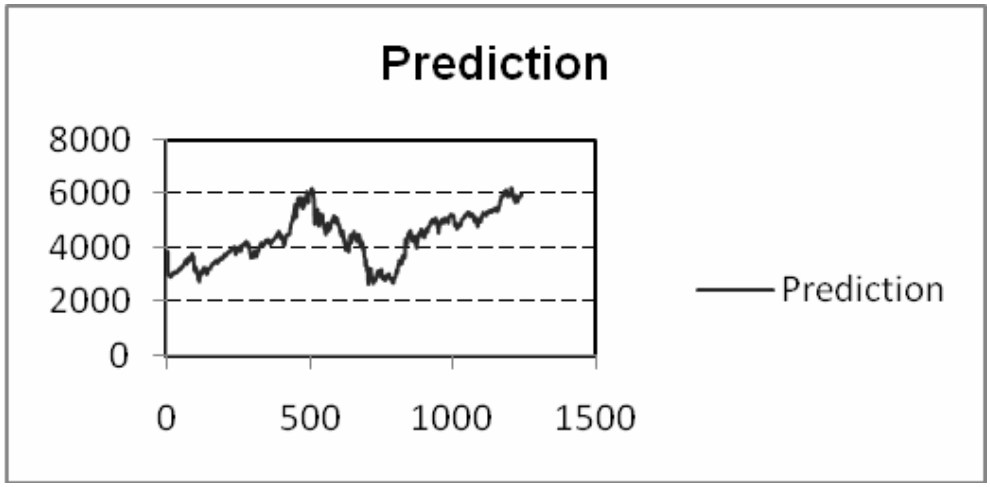
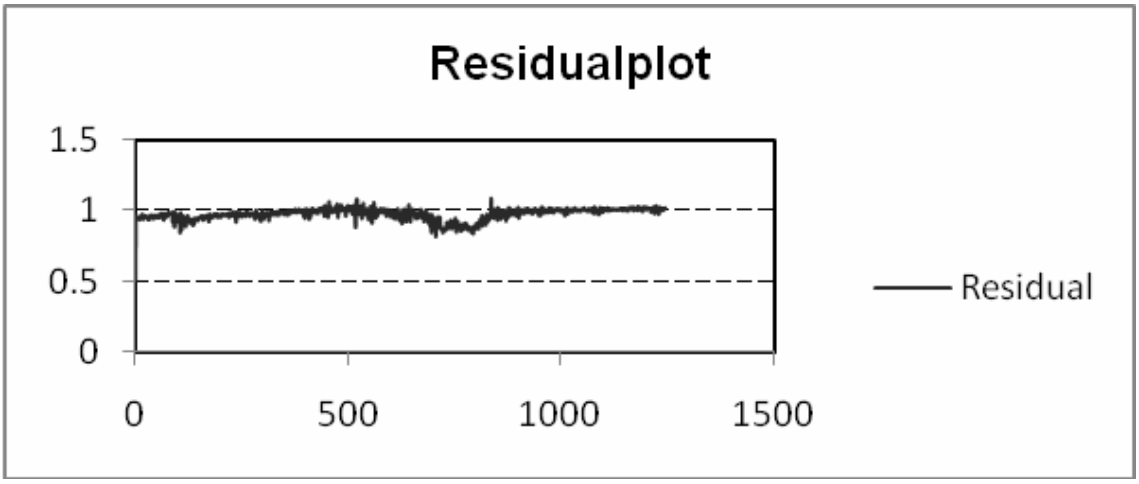


Table 3 Showing Volatility in Nifty Junior Indices

Particular	Coefficient	Std. Error	z-Statistic	Prob.
Omega	5519472.72	67619161.66	0.08162587	0.934944
alpha_1	0.03060166	10.00800515	0.00305772	0.99756
beta_1	0.92566025	9.812131795	0.09433834	0.92484

Chart 3 Showing Variation and Prediction of Nifty Junior Indices



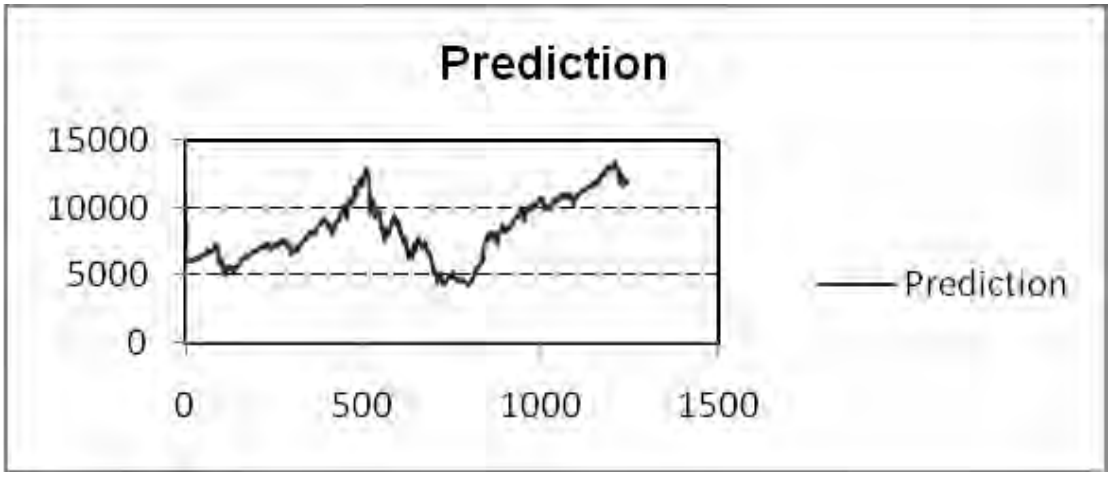
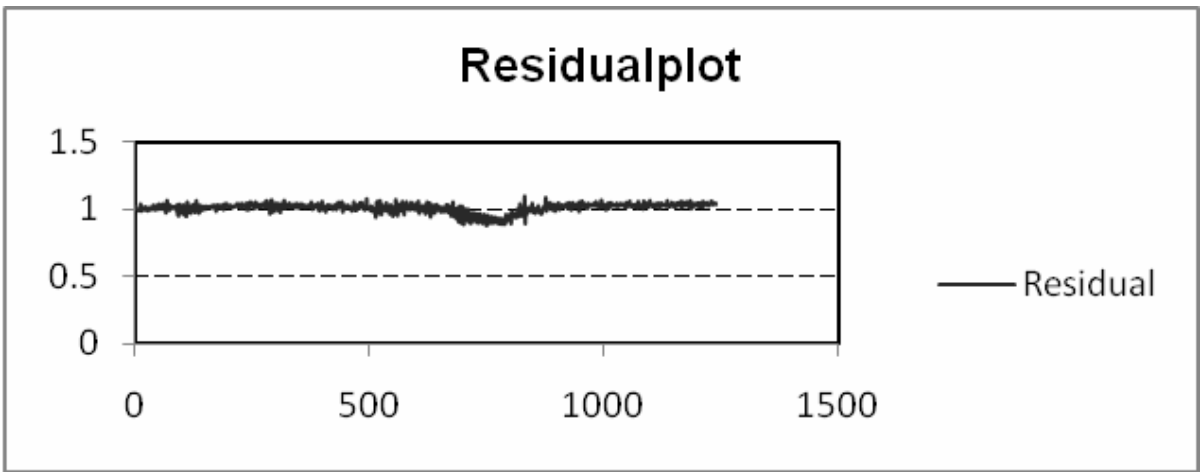


Table 5 Showing Volatility in IT Indices

Particulars	Coefficient	Std. Error	z-Statistic	Prob.
Omega	1290450.136	26502407.24	0.048691808	0.961164904
alpha_1	0.001839663	17.90511333	0.000102745	0.999918021
beta_1	0.913087541	16.39500689	0.055693026	0.955586356

Chart 5 Showing Variation and Prediction of IT Indices



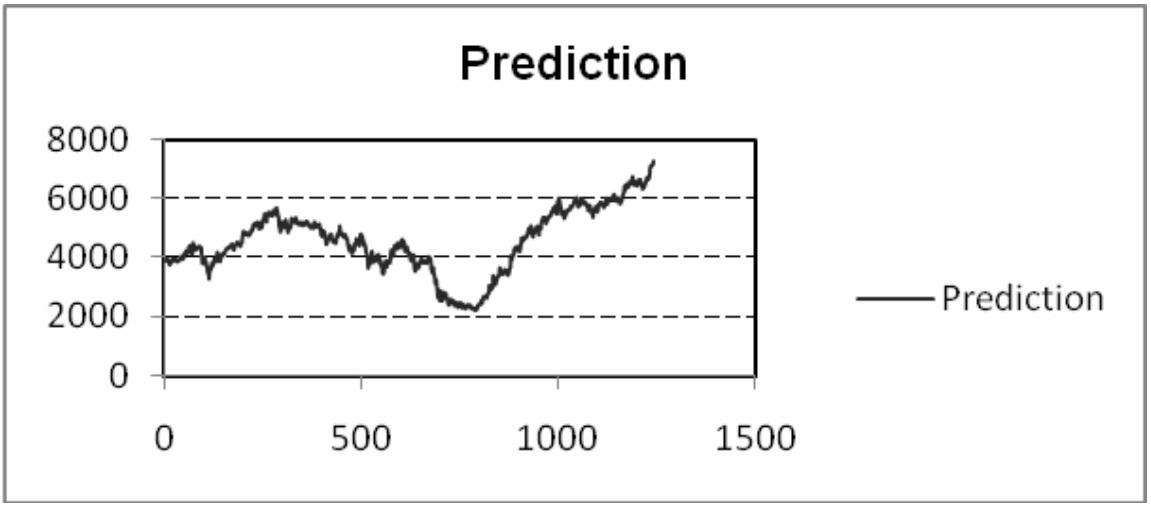
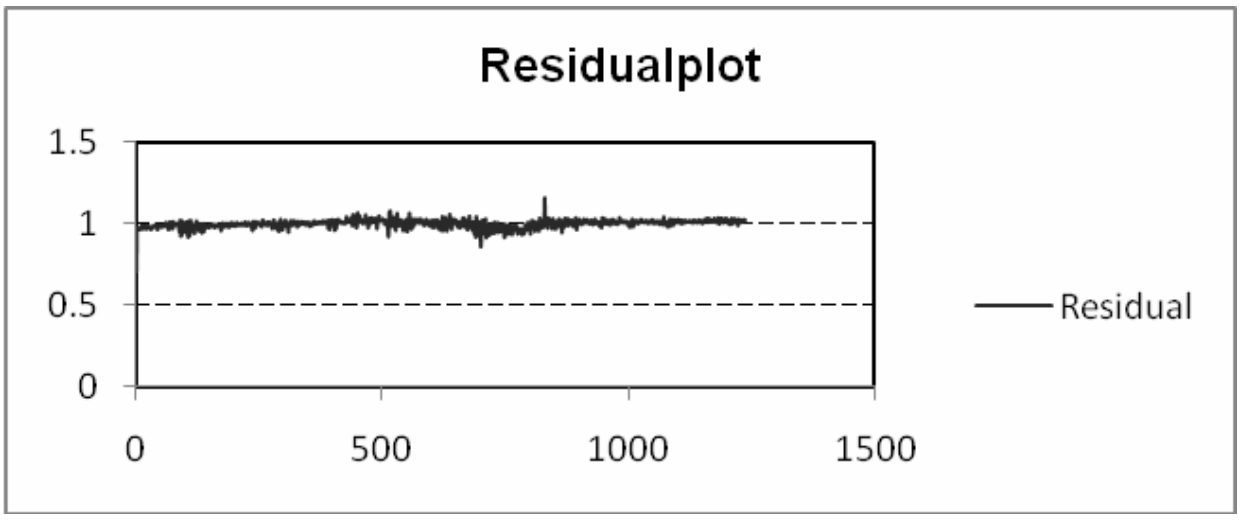


Table 7 Showing Volatility in CNX 100 Indices

Particulars	Coefficient	Std. Error	z-Statistic	Prob.
omega	890920.5	34712742	0.025665518	0.979524
alpha_1	0.0153904	18.130191	0.000848881	0.999323
beta_1	0.9298821	17.22292	0.053990966	0.956942

Chart 7 Showing Variation and Prediction of CNX 100 Indices



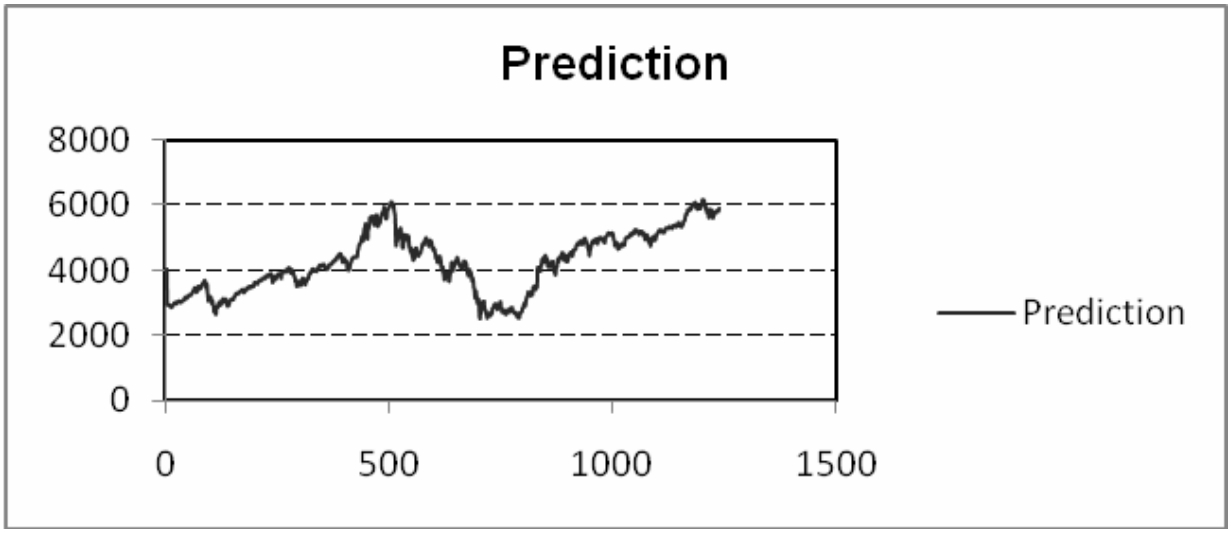
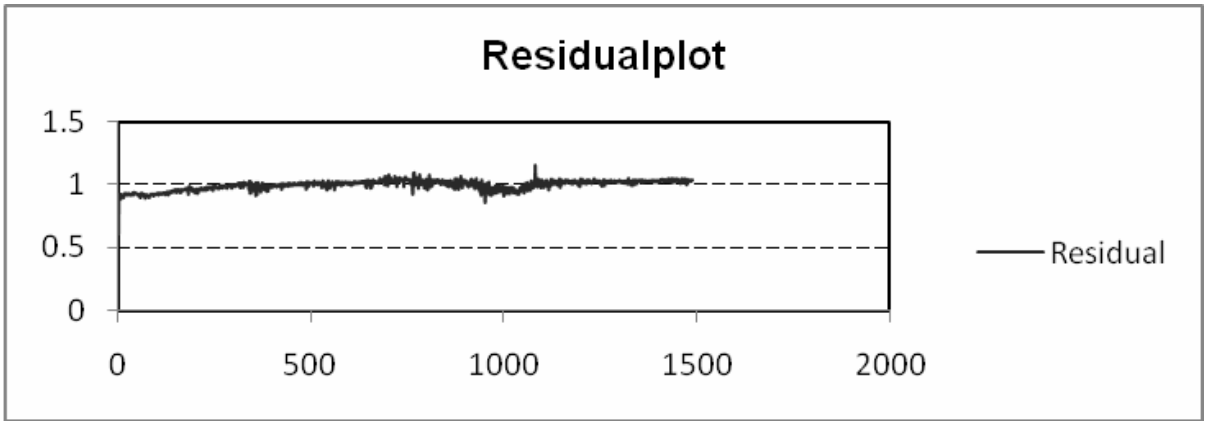


Table 8 Showing Volatility in CNX Defty Indices

Particular	Coefficient	Std. Error	z-Statistic	Prob.
Omega	858866.107	8203956.67	0.10468925	0.91662239
alpha_1	0.00100904	4.76672727	0.00021168	0.9998311
beta_1	0.9024444	4.48801082	0.20107893	0.84063686

Chart 8 Showing Variation and Prediction of CNX Defty Indices



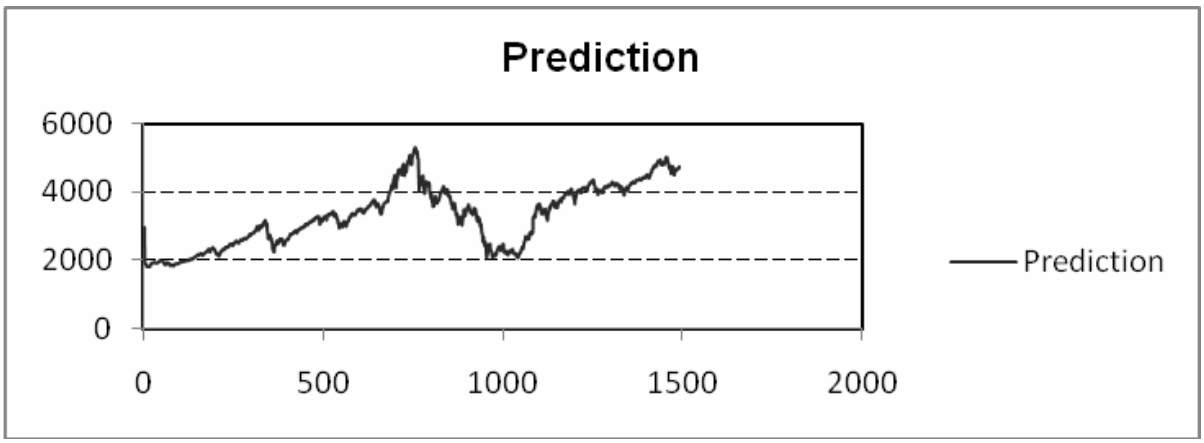
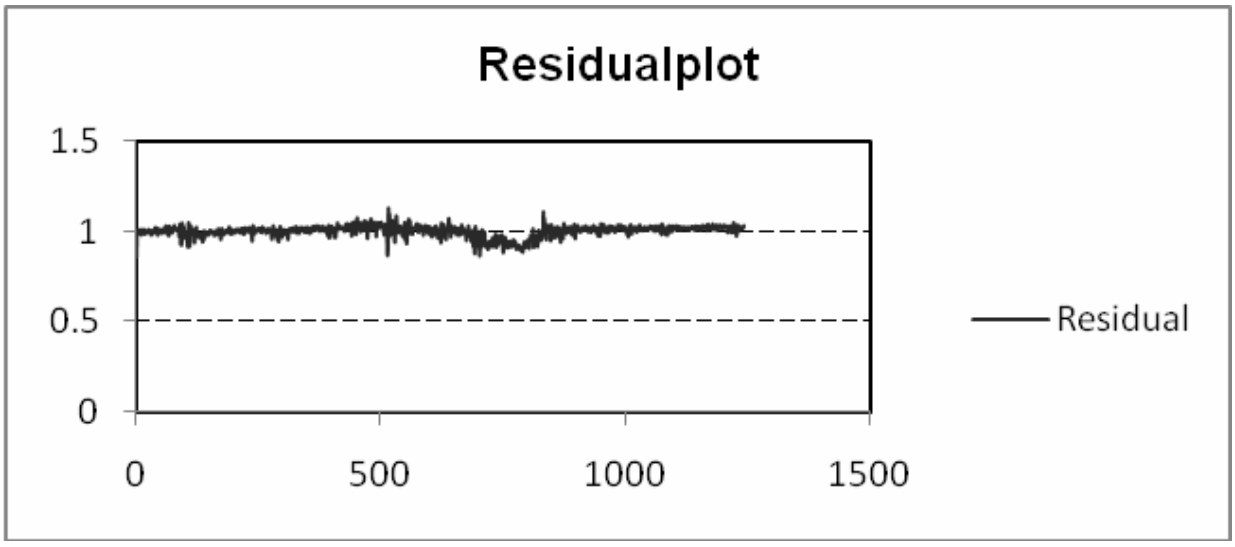


Table 9 Showing Volatility in CNX 500 Indices

Particular	Coefficient	Std. Error	z-Statistic	Prob.
Omega	292405.96	5260414.1	0.0555861	0.955672
alpha_1	0.0109461	14.101599	0.0007762	0.999381
beta_1	0.9241189	13.655957	0.0676715	0.946047

Chart 9 Showing Variation and Prediction of CNX 500 Indices



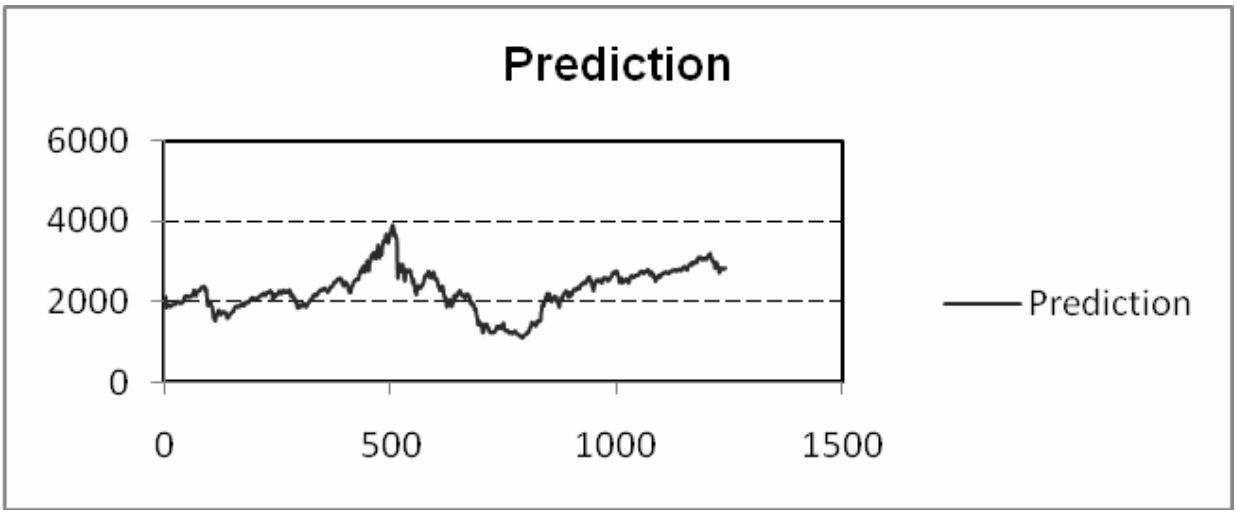
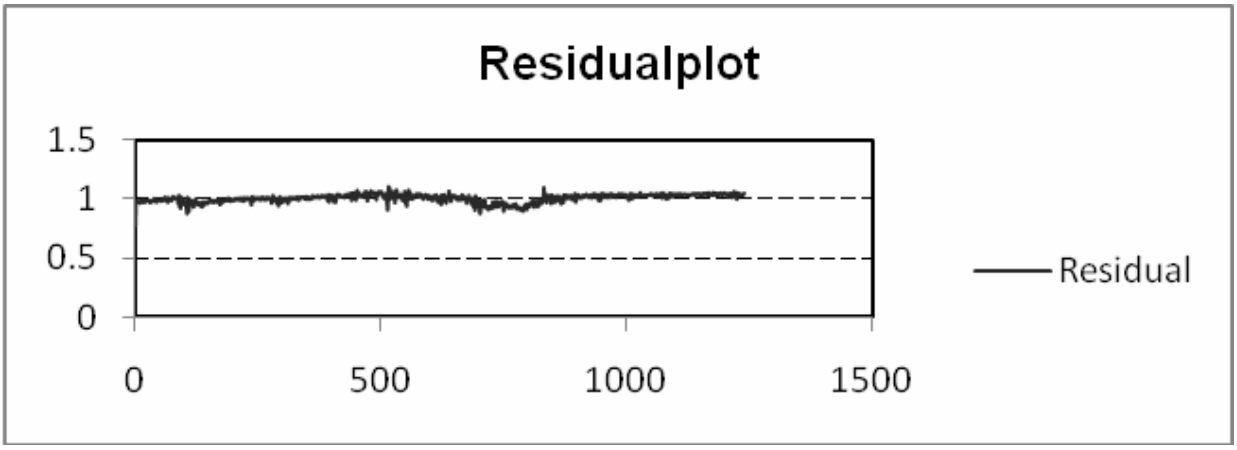


Table 10 Showing Volatility in Midcap Indices

Particulars	Coefficient	Std. Error	z-Statistic	Prob.
Omega	2633130.3	59248557.3	0.0444421	0.964552
alpha_1	0.0024525	18.2766579	0.0001342	0.999893
beta_1	0.9032068	16.6025085	0.0544018	0.956615

Chart 10 Showing Variation and Prediction of Midcap Indices



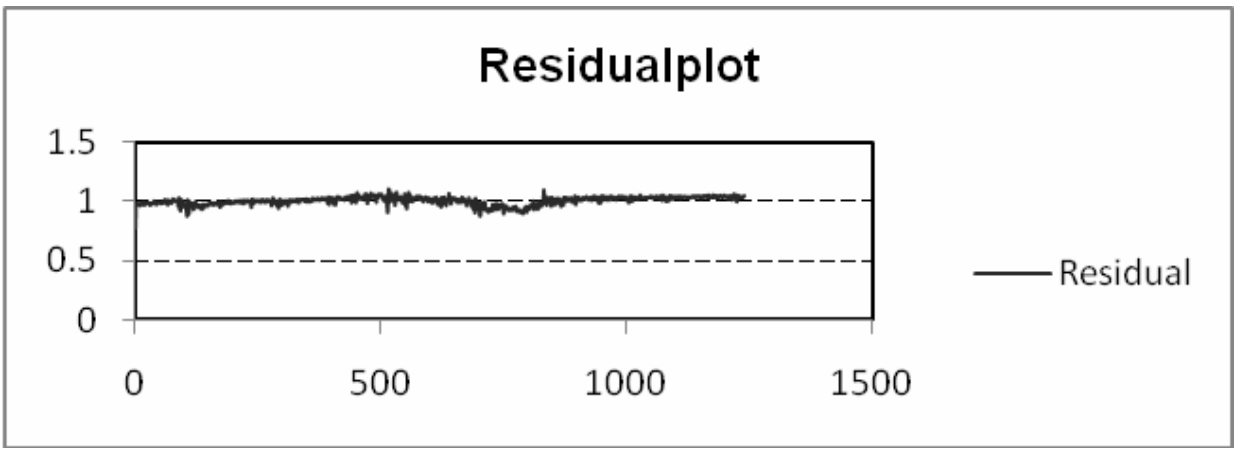


Table 11 Showing Volatility in Infrastructure Indices

Particular	Coefficient	Std. Error	z-Statistic	Prob.
Omega	669156.37	18292656.5	0.0365806	0.970819
alpha_1	0.01270901	10.4339682	0.00121804	0.999028
beta_1	0.92161045	9.84620768	0.09360055	0.925426

Chart 11 Showing Variation and Prediction of Infrastructure Indices