A Study of Foreign Exchange Rate Volatility on Nifty

Abburi Venkata Sasi Rekha¹ & Stella Mary²
¹Student, Christ University
²Assistant Professor, Department of Management Studies, Christ University Bangalore.

Abstract: This paper studies the relationship between the foreign exchange rate volatility on Indian stock market. Daily average closing prices are taken for the study. Period of study is 10 years from January, 2006 to December, 2015. Foreign exchange rates like INR/USD, INR/Euro, INR/JPY and INR/Euro are taken and the NIFTY index is taken to study the relationship, dependent variable being Nifty and independent variables being foreign exchange rates. Study of impact of foreign exchange rate on Nifty is done by following tests. Normality test check of the variables revealed that they are not normally distributed and the variables are stationary using Augmented Dickey fuller test. The results obtained from the GRACH (1,1) revealed that there is a high percentage of foreign exchange rate volatility on Nifty.

Keyword: Volatility, Exchange rate, Stationary, GARCH and Stock Returns

Introduction

Stock market return is one of the most appropriate and most imperative metric for the organization and the shareholders of the organizations. The learning on the factors that influence the share prices is collecting the research databases mostly because the theorist and the applicants want to improve the management processes and thus provide a definite and alleviated performance of the stock. One feature that impacts the return on stocks in the stock is the foreign exchange rate.

Foreign exchange return is also vital in the framework of macroeconomic management of a country meaning to say that if a connection between the foreign exchange rate and the stock market return is found to happen, then the government has the prospect to manage the exchange rate and thus the return on the stock market. Moreover, through the formation of this association, the investors will be able to get another component of likelihood in the variations of stock market returns.

Samparit & Grace in his paper had examined the effect of changes of foreign exchange rate on stock market fluctuations. Various tests like correlation test using MS-Excel and t-test were conducted between dependent and independent variable to know the impact of FOREX on stock market. The main aim of this paper was to analyze the correlation between SENSEX with Indian Rupee to the other currencies like Euro, Great Britain Pound, Japanese Yen and US Dollar and also to study the reasons for the currency fluctuations. The results of the author’s analysis showed that INR-JPY is highly correlated depicting a similar movement in SENSEX. Likewise, the INR-CAD is least correlated with the movement of SENSEX. So from their research it is clear that the Japanese Yen has high impact on the fluctuations in SENSEX movements. Agrawal, Srivastav, & Srivastava study was done to extract the information needed regarding to fluctuation changes in the stock market especially Indian stock market with foreign exchange rate. The tests like Normal distribution test, Unit root test, Correlation test and Granger Causality tests were conducted to analyze the scenario. The investigation found that NIFTY returns as well exchange rates are not normally distributed. It was also found that the NIFTY returns and exchange rates were stationary at the level form. And also correlation is negative between both of them and causal relationship highlighted the unidirectional relationship between Nifty returns and Exchange rates. Jamil & Ullah had examined the analysis of foreign exchange rates during the period of 1998-2009. The data of Pakistan stock prices were collected to analyze. The researcher used the PP test of stationary and correlation and co-integration tests. Mainly, the impact of USD to PKR exchange rate on the stock market return in Pakistan was analyzed. The results showed that the two variables are stationary at level form. And it was also analyzed that the co-integration exists between the two variables in case of short run period. Y.S & Dash aimed his study to find the impact of FOREX on IT companies and also relating this FOREX exposure to the profitability of IT companies and its impact. The research period entitled was 2005-06 and 2006-07 and the companies were selected on random basis based on registration with NASSCOM. Descriptive statistics and t-tests were performed. The results found out that there the exposure of small-cap IT companies to FOREX is very high i.e. alarming. Mid-cap and Large-cap IT companies has very low/moderate levels of FOREX exposure. The results also found out that the large-cap IT companies had already hedged their FOREX risk, so showing low levels of FOREX risk. The gap in this literature is that authors found only analyzed one risk
Bilawal, et al., in their research had investigated the impact of foreign exchange rates on Pakistan’s foreign direct investment i.e. macro-economic factor. The study was based on secondary data and time series data. The data was taken from 1982-2013 which was 32-years old data to carry out the analysis. Correlation and regression tests were carried to check the relationship. It was found that there is a positive relationship between both of them and in regression analysis it was found that value of correlation determination is 0.679 indicating that 69.9 percent of the impact on foreign direct investment is due to the foreign exchange rate. Thus the research model is accurate.

Kotai in his research had investigated the impact of currency fluctuations and volatility on the stock market. He used the data from July 2013 to September 2013. He studied the intraday effects of a group using five exchange rates such as INR/USD, JPY/USD, EURO/USD, GBP/USD and CNY/USD. This paper studied the exchange rate volatility. The results found showed that the Indian currency market had more volatility and its standard deviation is more than 2 compared to the other markets and also Indian currency market is more sensitive due to the external factors.

Bhowmik, in his had evaluated the framework of stock market volatility in multidimensional form. The author had examined the reasons for the cause of volatility between the variables. The results showcased that the country’s depression and recession had turned the stock market in to severe volatility which is reducing growth rate.it was also found that there was causality between the two variables. They found the positive relation between the monetary policy stock market volatility and also between many other macro-economic factors. The analytical reports of the author showed that there is a negative correlation between the stock market returns and variance of trading volume. Political turmoil is also one of the factor affecting the stock market volatility and international trade showed an asymmetric nature with the stock market volatility. Francis, Hasan, & M.Hunter in this paper, the researchers had examined critically

the bivariate inter-equity and inter-currency relations and their specific role in the currency and equity markets. This was done by the information spillover via the mechanism of currency order flow. They used tri-variate GARCH framework to find the relationship between equity and currency. The finding of the study revealed that there is a strong evidence of spillovers from equity to currency markets. The further results found that the significant decrease in the market also decreased the US Dollar but there is a gain in Canadian Dollar. And it was also found that there was no predictive movement with regard to German equity market but a decreased Canadian dollar caused changes in the German equity market. There are also bidirectional effects between US and German equity markets. Further Canadian market causes changes in both US and German equity returns and likewise the Japanese stock returns causes a change in the German equity returns. Further it was also detected that there is no effect of Canadian Dollar, Japanese Yen and British Pound on UD Dollar mark.

Mohan & Mrs.N.Chitradevi in their paper had studied the impact of inflation and stock exchange rate on the performance of Indian Stock Exchange. Here the independent variables are inflation and exchange rate and the dependent variable is NSE NIFTY price returns. The period of study taken by the authors was 2003 to 2013 and econometric tools like multiple correlations and multiple regressions were applied to know the relationship between dependent and independent variables. The results showcased that CNX NIFTY Price return is normally distributed and so also inflation. And also there exists a significant relationship between exchange rate and inflation rate in this study. The multiple regression analysis had proved that the model is not to fit but it was observed that the inflation has negative impact on the price return of NIFTY and exchange rate has positive impact on the price return of NIFTY. The model also had a problem of negative serial correlation.

Khan, Khan, Rukh, Imdadullah, & Rehman had done was extensive research to find the impact of interest rate, exchange rate and inflation on the stock returns of the index, and all these were major macro-economic variables having the effect on the economy of the country. Ten years of monthly average prices were taken for the study from 31st July, 2001 to June 30th 2010. Models like multiple regressions model is adopted for the study to know the relationship between dependent and independent variables. The results of the study are that there exists a negative relation between the exchange rate and the stock returns and also it was found that there is insignificant relationship between inflation and stock returns and also interest rate and stock returns.

Mlambo, Maredza, & Shibanda assessed the information regarding the impact of currency volatility on Johannesburg Stock exchange. The
authors conducted the Generalized Autoregressive Conditional heteroskedascity (GARCH) (1, 1) models to find out the volatility of currency on stock exchange. This study observed the data which is monthly from South Africa’s stock exchange from the period of 2000-2010. The results found out revealed that there exists a very weak relationship between currency volatility and the stock market. This study recommended that as there is negative relationship between both the variables, Government can use exchange rate as a policy tool to attract foreign portfolio investment. The weak relationship can be used as a tool to market JSE as a safe market and the investors can invest in South Africa need to monitor the developments between these two variables.

Research Design
Secondary data is gathered from various bases like RBI website, nseindia.in, yahoo finance; investing.com website etc. the period of data taken is 2006 to 2015. The average daily prices of NIFTY stock returns and exchange rates are taken to analyze the study.

Objectives of the Study
Following are the objectives of the study:
- To analyse the factors affecting the stock market of India
- To establish an association between stock returns and exchange rates in India
- To discover the impact of exchange rate variations on stock returns.

Methodology
To test the hypothesis, daily average prices of nifty are taken from NSE website for a period 2006 to 2015 and their returns are calculated using by

\[ n_{ret} = \ln \left( \frac{n_{ret_t}}{n_{ret_{t-1}}} \right) \]

Foreign exchange rates are taken from RBI website for the same period i.e. from 2006 to 2015. As the data taken is time series, the normality test is checked using JarqueBera statistics and stationary test is done using Augmented Dickey fuller test. After confirming the stationarity of the data, I further proceed to check the impact of foreign exchange volatility on Nifty using GARCH (1,1) model.

Hypothesis
H0: There is no impact of foreign exchange volatility on Nifty
H1: There is an impact of foreign exchange volatility of Nifty.

Results and Discussions
First descriptive statistics like Skewness, Kurtosis, JarqueBera and probability values are calculated for all four foreign exchange rates and nifty. Results of these are presented in the following table.

### Table 1: Descriptive statistics of the variables

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.039</td>
<td>0.190</td>
<td>0.024</td>
<td>-0.47</td>
</tr>
<tr>
<td>2</td>
<td>11.86</td>
<td>7.49</td>
<td>6.023</td>
<td>8.099</td>
</tr>
<tr>
<td>3</td>
<td>7877</td>
<td>2033</td>
<td>915</td>
<td>2692</td>
</tr>
<tr>
<td>4</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

A-Nifty Returns, B-Dollar Exchange Rate ,C-Euro exchange rate, D-Pound Exchange Rate, E-Yen exchange rate

From the table 1, it is evident that all the variables are positively skewed except pound exchange rate. All the probability variables are less than 5%, leading to the rejection of the null hypothesis. So, the variables are not normally distributed showing the randomness and inefficiency of the market.

### Table 2: Correlation between the variables

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>-0.083</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>-0.318</td>
<td>0.341</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>-0.313</td>
<td>0.463</td>
<td>0.664</td>
<td>1</td>
</tr>
<tr>
<td>E</td>
<td>-0.101</td>
<td>0.636</td>
<td>0.407</td>
<td>0.407</td>
</tr>
</tbody>
</table>

A-Nifty Returns, B-Dollar Exchange Rate ,C-Euro exchange rate, D-Pound Exchange Rate, E-Yen exchange rate

From the table 2, it can be interpreted that all the foreign exchange rates are negatively correlated with nifty and with a very low level of correlation coefficient indicating that there are very less changes in nifty for a change in foreign exchange rates.

The unit root test statistics are calculated using Augmented Dickey Fuller test for all the assumptions i.e. with intercept, without intercept but trend and with intercept and trend. The results are summarized in the following table.

### Table 3: Unit root test statistics

<table>
<thead>
<tr>
<th></th>
<th>ADF test statistics</th>
<th>Critical Values</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-34.65</td>
<td>-3.96</td>
<td>-3.4</td>
<td>-3.1</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>-11.34</td>
<td>-3.96</td>
<td>-3.4</td>
<td>-3.1</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>-24.17</td>
<td>-3.96</td>
<td>-3.4</td>
<td>-3.1</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>-10.58</td>
<td>-3.96</td>
<td>-3.4</td>
<td>-3.1</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>-10.72</td>
<td>-3.96</td>
<td>-3.4</td>
<td>-3.1</td>
<td></td>
</tr>
</tbody>
</table>

A-Nifty Returns, B-Dollar Exchange Rate ,C-Euro exchange rate, D-Pound Exchange Rate, E-Yen exchange rate

From the table 3, it can be found that all the variables have their t-statistic absolute values greater than the
absolute values of significance. This is leading to the rejection of the null hypothesis i.e. variables have unit root (non-stationary). The variables thus tested are stationary as the null hypothesis is rejected.

Table 4: GARCH (1,1) of variables

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptance of Hypothesis</td>
<td>Reject</td>
<td>Reject</td>
<td>Reject</td>
<td>Reject</td>
</tr>
<tr>
<td>GARCH value</td>
<td>88.93%</td>
<td>90.00%</td>
<td>89.61%</td>
<td>90.53%</td>
</tr>
<tr>
<td>Volatility</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>

A-Nifty Returns, B-Dollar Exchange Rate, C-Euro exchange rate, D-Pound Exchange Rate, E-Yen exchange rate

From the table 4, it can be clearly seen that there exists a high degree of volatility between nifty and other variables. So, the degree of variation over a period on these time series data is high. All the probability values are less than 5% significance level, leading to the rejection of the null hypothesis as stated in the methodology. So, the alternative hypothesis is accepted i.e. there is a foreign exchange rate impact on the Indian stock market index, Nifty.

Conclusion

The study was conducted to understand the impact of exchange rate on stock market of India. The purpose of the study was to understand the volatility impact of foreign exchange rate on Nifty. GARCH (1, 1) analysis was conducted to know the degree of volatility of foreign exchange rates on Nifty. The results indicate there is a very high degree of volatility of exchange rates on Nifty telling that currency fluctuations forms one of the important factor influencing the Indian stock market.

References