

Chapter II

Review of Literature

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2.1 INTRODUCTION

Indian foreign exchange market is the decentralised market in the Indian economy. It is the stronghold to the players of foreign exchange market for conversion of one nation currency into other nation currency. The regulatory role of foreign exchange market enlighten the nation's trade a competitive one and determines the growth of the economy. The trading volume of the market has increased rapidly due to raise in foreign exchange transactions with trading in multinational currencies. The regulatory act has been amended to govern the foreign exchange transactions and to maintain the market. In this backdrop, this chapter chronologically presents the earlier studies on the concepts of exchange rate volatility, macroeconomic determinants affecting exchange rate, exchange rate and trade balance, which are classified into Indian and foreign reviews.

2.2 INDIAN REVIEWS

i) Reviews on exchange rate

*Sumanjeet Singh (2009)*¹ in his paper on, “Depreciation of the Indian currency implications for the Indian economy” has investigated the causes of the depreciation of the Indian rupee on the Indian economy with a theoretical background. He has also stated that the rupee depreciation would increase the exports and makes imported goods as costlier one, which has resulted a trade deficit in the Indian economy. The fall in the value of rupee has affected the economic growth with high interest rate, decrease in foreign investment inflows, made Indian companies to borrow loans in terms of dollar, which has resulted in an increase in the foreign debt. He has suggested that Reserve Bank of India should intervene in the market to strengthen the value of rupee by taking an effective measure and by attracting more foreign investments.

*Ritanjali Majhi and Panda (2009)*² in their paper entitled on “Efficient prediction of exchange rates with low complexity artificial neural network models” have predicted the exchange rate of US dollar against three currencies, such as, British pounds, Indian rupee and Japanese yen by developing forecasting models. They have developed two

models i.e Functional Link Artificial Neural Network (FLANN) and Cascaded Functional Artificial Neural Network (CFLANN) with the parameters of nonlinear inputs and simple ANN structure with neurons to forecast the exchange rate. The results of developed models have been compared with the performance of LMS forecasting model. It is concluded that CFLANN model is the best model in forecasting the exchange rate rather than FLANN and LMS forecasting models.

*Nagaraju (2009)*³ in his research paper on “A measure of exchange rate volatility: scenario analysis of the effect of RBI’s Intervention in the Indian forex market” has observed the effect of RBI’s intervention on the volatility of USD/INR exchange rate by applying scenario analysis. The variables, such as, volumes of transactions in the foreign exchange market, volume of intervention by RBI and exchange rate have been taken for the study. Monthly and daily observations have been collected from RBI monthly bulletin. Scenario analysis has been applied to study the exchange rate, based on the demand and supply market conditions prevailing in the market. The results of the study have shown that there exists a contribution of Reserve Bank of India intervention in the foreign exchange market to reduce the volatility of the exchange rate.

*Neeti Khullar and Upasna Joshi Sethi (2011)*⁴ in their paper on “Measuring the volatility of foreign exchange market” have analysed the behaviour of foreign exchange rates in the foreign exchange market in India. They have used the daily observations to analyse the volatility on spot exchange rates of Indian rupee against US dollar, Euro and Japanese yen for the period of 13 years from January 1, 1996 to December 31, 2008. Skewness, Kurtosis, Jarque bera test and Correlation analysis have been used in the study. The study has resulted that the exchange rate of Euro is highly volatile than the other foreign exchange rates, namely, Yen and US dollar in the Indian foreign exchange market. They have concluded that the movement of Indian rupee against Yen and US dollar was positively correlated during the study period.

*Ashima Goyal and Sanchit Arora (2012)*⁵ undertook a study on, “The Indian exchange rate and central bank action : An EGARCH analysis” They have analysed the exchange rate volatility with the impact of monetary policy measures and dummy variables of central bank communication by estimating Generalised Autoregressive

Heteroscedastic (GARCH) models. Exchange rate of Euro / dollar, Rupee / dollar and the policy measures, such as, interest rate, intervention, news and speeches have been taken to study the exchange rate volatility. GARCH models have been applied to the daily data for the period from November 2005 to December 2008 and monthly data for the period from January 2002 to December 2008. The dummy variables of central bank communication and effect of policy measures have been considered to analyse whether the measures control the exchange rate level and volatility. The results of the study have shown that, the variations in exchange rate of euro against dollar have affected the exchange rate of rupee against dollar at its level and volatility. Among the variables taken under monetary policy measures, the interest rate has strong effects on exchange rate, it increases the volatility and depreciate the currency while other variables affect the exchange rate both at the level and volatility. They have suggested that Central Bank communication measures have to be used and developed effectively to control the exchange rate volatility in the foreign exchange market.

*Satyananda Sahoo (2012)*⁶ has made a research on, “volatility transmission in the exchange rate of the Indian rupee”. The closing exchange rates of major foreign currencies, such as, Russian Ruble, Brazilian Real, South Korean won, Singapore dollar, Japanese yen, Swiss franc, British pound sterling, euro against Indian rupee for the period from January 2005 to December 2011 have been taken for the study. To investigate the effect of spillover on volatility of exchange rate, two - step multivariate GARCH models and pair-wise granger causality test have been applied. The results of the study have shown that there is a presence of conditional autocorrelation and persistent level of volatility in all the currencies taken for the study. He has concluded that, the effect of volatility of foreign currencies have affected the daily exchange rate of Indian rupee.

*Yusuf Perwej and Asif Perwej (2012)*⁷ in their study on, “Forecasting of Indian rupee/US dollar currency exchange rate using artificial neural network” have examined the effects of neural network factors on model and have forecasted the behaviour of Indian rupee (INR) against US dollar (USD). They have used three factors of artificial neural network model for forecasting the daily observations of exchange rate of INR/USD for the period from 1989 - 2009. To forecast the exchange rate, the artificial neural network model with the parameters of the effect of number of inputs nodes, hidden

nodes and the size of training sample on the in-sample and out-of-sample of exchange rates have been applied. The results of the study have shown that the number of input nodes has played an important role in neural network time series model in forecasting of exchange rate.

*Samsudheen and Shanmugasundaram (2012)*⁸ have conducted a study on “Foreign exchange volatility of Indian rupee against US dollar”. They have analysed the behaviour of foreign exchange rate of Indian rupee against US dollar and its volatility characteristics. Daily observations of exchange rate INR/USD for the period of 40 years from April 1, 1973 to March 31, 2012 have been collected. To analyse the volatility of exchange rate the ARCH family models (symmetric and asymmetric), such as, ARCH (1,1), GARCH(1,1), EGARCH(1,1) and TGARCH (1,1) have been applied. The study period from 1973 – 2012 has been sub divided into pre and post Liberalised Exchange Rate Management System (LERMS) period i.e from 1973 - 1993 as pre LERMS period and 1993 – 2012 as post LERMS period in order to assess the changes in the India exchange rate system from pegged exchange rate system to liberalised exchange rate management system and to determine the market exchange rate system. The results of GARCH (1,1), EGARCH and TGARCH models exist a presence of volatility for the three sample period and a presence of higher volatility in the exchange rate in post LERMS period than pre LERMS period.

*Shelly Singhal (2012)*⁹ have discussed the reasons for the currency depreciation and its effects in her study on, “An analytical study on Indian currency rupee depreciation against the US dollar and its economic impact”. She has stated that there was a huge depreciation in the value of rupee after the year 1991 and has resulted a great effect on balance of payments. A rise in imports in the economy has remained current account deficit for a longer period despite of dramatic rise in exports. She also pointed out that the policy measures taken by Reserve Bank of India, such as, raising policy rates, adequate foreign exchange reserves, easing capital control and administrative measures to prevent the fall in value of rupee. The researcher has suggested that rise in exports and increased inflows may reduce the current account deficit.

*Anshu Grewal (2013)*¹⁰ in her study on, “Impact of rupee - dollar fluctuations on Indian economy: Challenges for RBI and Indian government” has explored the implications of depreciation of rupee against dollar in the Indian economy. She has conceptually discussed the movement of rupee, the reasons behind the currency fluctuations in the Indian economy and the steps taken by Reserve Bank of India for the effect of currency depreciation. She has suggested that the Government of India should take necessary measures to have control on the currency fluctuations and for the economic development of the country.

*Biswajit Maitra. et al (2013)*¹¹ have conducted a study on, “ARIMA forecasting of exchange rate in India”. The purpose of the study is to predict the exchange rate of rupee / dollar by applying ARIMA forecasting model and GARCH model. The monthly series of exchange rate of an Indian rupee against US dollar covering the period from 1994 to 2013 have been collected from Reserve Bank of India. The exchange rate of rupee against dollar has been forecasted by applying ARIMA model and then GARCH model has been estimated for the forecasted residuals of exchange rate to measure the volatility. From the analysis it was found that GARCH (1,1) and ARIMA(1,1,6) were the better fit models in forecasting the exchange rate of rupee against dollar.

*Nand Kishor Soni and Ajay Parashar (2013)*¹² have made a study on, “Fluctuationing value of rupee and impact on economy”. They have discussed the exchange rate relationship in terms on appreciation and depreciation of rupee against dollar and the various reasons for the impact of changes in currency relations on various sectors of the economy. They have suggested that the country has to focus on investment pattern, innovative driven economy, effective reform process and also to take prominent policy measures to develop the economy.

*Chellasamy (2013)*¹³ in his article on, “Depreciation of Indian currency and its impact on Indian economy”. He has analysed the growth of exchange rate in Indian rupee against selected foreign exchange rates and compared between pre and post liberalization period. He has determined the macroeconomic factors affecting exchange rate. He has taken selected exchange rates of an Indian rupee against SDR, US dollar, Japanese yen, Euro and Pound sterling and the macroeconomic factors, such as, Inflation rate, Interest

rate, External debt, Gross Domestic Product and Foreign Direct Investment. Secondary data have been collected for the period from 1989 - 1970 to 2012 - 13 from RBI bulletins. The Statistical tools, such as, mean, standard deviation, coefficient of variance, CAGR (compounded annual growth rate), correlation and paired “t” test have been used in the study. The results of the study have revealed that there was a positive growth in Indian rupee and Japanese yen in pre liberalisation period and the interest rate is highly correlated with Indian currency value.

Partap Singh (2013)¹⁴ in his study on, “Depreciation of rupee in Indian economy: An analysis” has focused on the real implications and causes for depreciation of Indian economy. He has stated that the multiple reasons for fluctuations in the value of Indian rupee. The value of the currency depends on the factors that affect the economy, such as, imports, exports, inflation, interest rate, growth rate and foreign exchange reserves etc. RBI has intervened with key policies for the fall in the value of rupee. He has concluded that, the fluctuations in the value of the rupee/dollar had some effects on the Indian economy.

Anuradha Patnaik (2013)¹⁵ in her study on, “A study of volatility spillover across select foreign exchange rates in India using dynamic conditional correlations” has focused on the volatility spillover among the exchange rates by applying multivariate GARCH framework. The multivariate dynamic conditional correlations model is a model that has been derived from multivariate GARCH framework, which is a tool to measure the volatility spillover and it has been applied to measure the volatilities of exchange rates of Indian rupee against US dollar, Euro, British Pounds and Japanese Yen. A daily observations covering the period from 5. 4. 2010 to 18. 7. 2011 have been collected from RBI Handbook of statistics. The period of the study has been subdivided in to four sub periods in order to measure the volatility spillover and dynamic correlation of exchange rates. The results of the study have shown that there exists a presence of volatility clustering in all the periods among the exchange rates. The volatility of Indian rupee against US dollar was very low while there was high volatility in euro and yen. The study has concluded that the policy interventions can be framed from the dynamic conditional correlation implications to reduce the exchange rate volatility.

Vandana Kotai (2013)¹⁶ has made a research on, “An empirical study on currency volatility in foreign exchange market” to explore the fluctuations of currency pairs, namely, INR / USD, JPY / USD, EURO / USD, GBP / USD and CNY / USD. She has used the close ended exchange rates and collected the data covering the period of three months from July – September 2013. She has concluded that the Indian currency market was found to be more volatile and unstable compared to other countries.

Gautam Kamble and Parmeshwar Honrao (2014)¹⁷ have undertaken a study on, “Time-series Analysis of exchange rate volatility of Indian rupee/US dollar - An empirical Investigation ” for the period from January 2011 to September 2013. They have analysed the consistency of exchange rate volatility on bilateral exchange rate of Indian rupee against US dollar by applying GARCH model. Daily observations of exchange rate have been collected from Reserve Bank of India, International Monetary Fund and US Federal reserve websites. The econometrics tools, such as, unit root test, ARCH effect, correlogram and GARCH models have been used in the study to measure the volatility. The results have shown that there exist a high volatility during the study period from 2011 to 2013, due to rise in capital flows which has affected the revenue and expenditure of the trade and corporates. They have concluded that the foreign exchange transactions in the Indian foreign exchange market are always a transactional one. The conversions of currency from domestic country to foreign countries are controlled by the Government of the country, monetary and fiscal policies in the economy.

Viney Narang (2014)¹⁸ in his article on, “Indian rupee vs Dollar: A Deep insight” has elucidated the current trends of the movement of rupee against US dollar during the period of independence from 1947 to 2013. He has conceptually discussed the long term and short term reasons for the depreciation of Indian rupee and its implications on the Indian economy. The reasons for movement of rupee against dollar have been collected from secondary sources, namely, Annual reports of Reserve Bank of India, news papers, magazines, International Monetary Fund and CRISIL reports. The trend of depreciation of rupee have impacted in the Indian economy with rise in domestic inflation rate and widening of current account deficit. He has concluded that the potential measures can be taken by the Government to have a control over the rupee depreciation and to reduce the current account deficit in the economy.

*Paridhi Saini and Shivali Dhameja (2014)*¹⁹ have entitled a study on, “Rupee dollar value trends: A study of influencing factors”. They have elaborated theoretically the concept of volatility of rupee, the macroeconomic factors influencing the value of Indian rupee and exchange rate management in India. The trend of volatility of Indian rupee has been differed from time to time and it is influenced by global events, economy shocks, speculation activities and other various macroeconomic factors in the economy. They have concluded that Reserve Bank of India intervenes in the foreign exchange market to reduce exchange rate volatility and buying and selling of foreign currencies in the market.

*Sanjeev Gupta and Sachin Kashyap (2014)*²⁰ in their study on, “Modelling exchange rate volatility in Indian foreign exchange market ” have examined the volatility for the exchange rates of US dollar and Euro against Indian rupee and recommended the model to forecast the exchange rate volatility in the foreign exchange market. A daily basis of USD/INR and EUR/INR covering the period from January 1, 2000 to October 30, 2013 have been collected from Reserve Bank of India website to estimate a suitable model to forecast. They have used GARCH family models, such as, GARCH (1, 1), GARCH (1,2), GARCH (2,1) and GARCH (2,2). The results of the study have shown that the models GARCH (2,1) and GARCH (1,1) have confirmed the presence of volatility for the exchange rate of USD and EURO in the foreign exchange market and found to be best fit models to forecast the exchange rate. They have suggested that controlling measures have to be taken by Government of India and Reserve Bank of India on the factors that have impacted a negative variation in the exchange rate movements.

*Narasimhan (2014)*²¹ in his research paper on, “The Recent Depreciation of the INR against the USD: An Analysis of Currency Fluctuations”. He has theoretically stated the effect of post crisis period and factors that pretended for currency depreciation of Indian rupee against US dollar in the Indian economy. Indian rupee depreciated largely against US dollar after crisis and created instability in the economy. He has concluded that policy measures and proper governance are the essential factors for the economy prosperity and to control depreciation of the currency.

*Vaibhav Patni, Nikunj Batheja and Somesh Mathur (2014)*²² have conducted a study on, “Effect of rupee decline on Indian economy”. They have examined the impact of decline of exchange rate on the variables by applying ARDL model and Granger causality test. The variables, such as, Real Effective Exchange rate, Imports, Exports, Forex with RBI, Oil prices, Gold prices, Index of Industrial Production, Consumer Price Index and Oil imports have been taken for the study. The monthly data have been collected from the secondary source of Indian government website and Reserve Bank of India database. Unit root test have been applied to test the stationarity of the variables. The results have revealed that the variables are stationary and with the level of cointegration between the variables. ARDL model has been applied to the variables in the long run. The results have shown that exchange rate has a positive effect on exports and Index of Industrial Production and negative effect on imports. In long run, inflation rate has a negative impact on the exports and industrial production. It also implied that the decline in the exchange rate affects the prices of goods and exports as well, which in turn affects the industrial production in the economy.

*Vandana Kotai (2015)*²³ in her article on, “A study on volatility of the rupee exchange rates against major currencies” has examined the volatile nature of Indian rupee and found which pair of currency of Indian rupee against other currencies are more volatile in the foreign exchange market. The currencies which are mostly traded in the foreign exchange market, such as, Indian rupee against US dollar, Japanese yen, Chinese Yuan, Euro, Pound sterling for the period of 10 years from 2001 – 2010 were taken for the study. The Statistical tools, such as, coefficient of variance and standard deviation have been used to calculate the fluctuations in the currency. The result of the study have shown that the Indian rupee had been depreciating among all the currencies and the currency pair Indian rupee against US dollar were fluctuating widely because India accepted US dollar as intervention currency. She has concluded that Indian foreign exchange market, after globalisation has been more volatile and unstable due to rise in capital flows and cross border trading activities.

*Priyadarshi Dash (2015)*²⁴ has conducted a study on, “Exchange rate volatility on post - floating regime in India”. The researcher has analysed the exchange rate volatility of Indian currency in the post floating period. A daily data of bilateral exchange rate of

Indian rupee against currencies, namely, US dollar, pound sterling, euro and yen covering a period from 1993 - 2009 have been taken for the study. The econometric models, such as, GARCH, VAR and VECM models have been used to identify the existence of volatility in the exchange rates. The result has shown that there is a presence of volatility in the exchange rate of Indian currency with the international currencies, and also found that the volatility of nominal exchange rate of Indian rupee against USD affects the changes in bilateral exchange rate of other currencies. It is also suggested that a better policy measure can be brought to reduce the exchange rate volatility.

*Miao Wang, Burak Yungucu and Yousuf Sultan (2015)*²⁵ in their paper on, “Exchange rate and volatility of Indian rupee against five currencies” have investigated the economic implications of different periods, which has affected the economy and behaviour of Indian rupee against currencies between different countries. The sample of five selected major currencies of Indian rupee against US dollar, Euro, British pounds, Singaporean dollar and Malaysian ringgit for the period of 13 years from 2001 - 2014 have been collected and analysed by applying mean, standard deviation and correlation. They have examined the behaviour of exchange rates. The study period has been subdivided into three periods, such as, pre crisis period (January 2001 - November 2007), Crisis and post - crisis period (December 2007 – April 2013) and Monetary tightening period (May 2013 - September 2014). The results of the analysis have shown that Indian rupee has been depreciated among all five currencies and it was highly depreciated against Euro, Singaporean dollar. Indian rupee was volatile among the currencies during the study period. Correlation analysis has resulted that there was a positive correlation among the currencies and it has concluded that Indian rupee against US dollar has been appreciated during pre crisis period and depreciated during and after the crisis period. Besides the depreciation of the currency, the Indian economy has maintained a stable economic growth.

*Krishna Murari (2015)*²⁶ in his paper on, “Exchange rate volatility estimation using GARCH models, with special reference to Indian rupee against world currencies” has made an attempt to estimate a model for exchange rate return volatility of an Indian rupee against major currencies, such as, US dollar, Euro, Pound sterling, Japanese yen by applying different univariate specification GARCH models. A sample of daily data for

the period of January 3, 2000 to September 30, 2013 has been collected from Reserve Bank of India online database. The volatility of the Indian rupee exchange rate returns against major currencies have been studied by applying both symmetric GARCH (p,q) and asymmetric models, such as, TGARCH, EGARCH and PGARCH have been used to analyse the most common facts about currency returns, such as, volatility clustering and leverage effect. The results of the study have shown that the rupee exchange rate returns are volatile due to positive shocks than negative shocks and found that exchange rate returns affect the future exchange rate movements in the foreign exchange market. From the study, it has been concluded that the asymmetric models are the better fit models to explain the exchange rate volatility.

*Ayush Singh, Vinaytosh Mishra and Akhilendra Singh (2016)*²⁷ in their study on, “Impact of rupee - dollar fluctuations on Indian economy” have discussed conceptually the concept of Indian currency fluctuation and have stated the real implications for the depreciation of the rupee in Indian economy. They have stated that Reserve Bank of India can ease the capital controls by increasing the Foreign Investment Inflows limit on investment in government and corporate debt instruments and also introduce higher ceilings in External Commercial Borrowings. They have suggested that the Government can create a stable political and economic environment to prevent the depreciation of Indian rupee in future.

ii) Review on Macroeconomic Determinants

*Jorge Canales – Kriljenko and Karl Habermeier (2004)*²⁸ undertook a study on “Structural factors affecting exchange rate volatility: A cross-section study” in developing and transition economies. They have focused on the macroeconomic factors affecting exchange rate volatility. The economic factors, such as, inflation, GDP growth, fiscal deficit and openness of the economy have been selected from the 85 developing and transition economies and the data collected by IMF on Foreign exchange market organisation has been used in the study. They have examined cross sectionally, the exchange rate volatility with the selected macroeconomic factors, exchange rate regimes and with the features of foreign exchange market in the developing and transition

economies by applying regression analysis. It was found that the macroeconomic factors and features of foreign exchange market affect the exchange rate volatility.

Mita Suthar (2006)²⁹ in her article on, “Determinants of exchange rate in India” applied OLS regression to evaluate the determinants in relation to the exchange rate of an Indian rupee and US dollar. A sample of monthly data for the period from 1996 – 2007 has been collected. She has analysed whether the determinants interest yield differentials of India and US securities, bank rate of RBI, forex reserves and money supply that has impacted the exchange rate movements. The results of the study has shown that the monetary policy variable, such as, bank rate of RBI, interest rate differentials and the rate of foreign exchange reserves have a significant influence on the monthly exchange rate of Indian rupee against US dollar.

Sunil Kumar (2010)³⁰ in his study on, “Determinants of Real Exchange Rate in India: An ARDL Approach” has investigated the real exchange rate with its macroeconomic determinants. He has identified theoretically the determinants affecting exchange rate and analysed the short run and long run relationship between exchange rate and macroeconomic determinants using unit root test, Bound test cointegration analysis, Error correction analysis and Autoregressive Distributed Lag (ARDL) Modelling approach. The bilateral real effective exchange rate have been taken as dependent variable and the independent variables, such as, productivity differential, external openness, terms of trade, net foreign assets, government final consumption expenditure have been considered in the study. A Quarterly observation for the period from 1997 to 2009 has been collected from Reserve Bank of India, International Monetary Fund and International Financial Statistics websites. The researcher after checking the stationarity of the variables, have estimated the variables to study the long run cointegration relationship and short run effect. The results of the study have shown that there exists a long run relationship between the exchange rate and the macroeconomic determinants while there exist a negative effect in the short run. Among the determinants taken, productivity differential, external openness, terms of trade, net foreign assets are found to be statistically significant with the exchange rate. He has concluded that the factors determining the appreciation of exchange rate would also improve the economic growth.

*Divyang Joshi (2011)*³¹ has made a study on, “Impact of dollar fluctuation on gold and crude oil prices”. The objective of the study is to analyse the effect of exchange rate volatility on gold and crude oil prices in India using unit root test, correlation and regression analysis. The variables, namely, gold, crude oil and exchange rate INR/USD have been taken. Secondary data for a sample of five years weekly data have been collected from financial websites for the period from 2005 to 2009. The results of the study have shown that there is an inverse relationship between exchange rate of rupee against dollar, crude oil and gold prices. The study has concluded that the change in exchange rate would result in an opposite effect with the prices of gold and crude oil.

*Shylajan and Sreejesh (2011)*³² in their article on, “Rupee-dollar exchange rate and macroeconomic fundamentals: An empirical analysis using flexible-price monetary model” They have evaluated the relationship between Indian rupee - US dollar and macroeconomic fundamentals using flexible-price monetary model. The determinants, such as, spot nominal exchange rate, money supply of USA, Index of Industrial Production of USA and India and interest rate of USA have been taken. A sample of monthly data for the period from 1996 to 2010 have been collected from OECD stat database, Business Beacon data base, Centre for Monitoring Indian Economy and Federal Reserve System website. Due to non availability of monthly data, they have considered Index of Industrial Production as a proxy variable of GDP and call money rate are taken as proxy variable for interest rate for the analysis. Augmented Dickey Fuller test has been applied to test the presence of unit root among the variables. Johanson - Juselius cointegration and Vector error correction model (VECM) analysis have been used to examine the short run and long run relationship between exchange rate and determinants. The results have shown that the exchange rate and the determinants have a long run effect and supported the implications of flexible-price monetary model.

*Sajal Ghosh (2011)*³³ has made a research paper on, “Examining crude oil price - exchange rate nexus for India during the period of extreme oil price volatility” by applying GARCH and EGARCH models. Researcher has examined the volatility of oil price shocks on nominal exchange rate. Daily observations of exchange rate and crude oil prices for the period from July 2, 2007 to November 28, 2008 have been collected from websites of energy information administration and Reserve Bank of India. The results

have shown that oil price shocks have a positive and negative effect on the exchange rate volatility. It also implies that the rise in crude oil prices have depreciated the Indian rupee against US dollar to a large extent.

Maram Srikanth and Braj Kishor (2012)³⁴ have conducted a study on “Exchange rate dynamics in Indian foreign exchange market: An empirical investigation on the movement of USD/INR”. The objective of the study is to determine the factors affecting the movements in exchange rate of USD/INR using multiple regression analysis. Both primary data and secondary data have been used in the study. Primary data have been collected through a questionnaire from 175 professionals. Secondary data have been collected for the period from January 1999 to March 2011 from the websites of Reserve Bank of India and Federal system of the US. Exchange rate of USD/INR was taken as dependent variable and the independent variables, such as, interest rate, inflation rate, current account balance, capital account balance, RBI’s net intervention, foreign currency reserves, foreign exchange market turnover, Index of Industrial Production, money supply and forward premia have been taken in the study. The results have shown that the variables, such as, current account balance, relative money supply, Index of Industrial Production and interest rate differential were the most significant variables in determining the exchange rate. Primary data results have shown that, forward premia influences the movements of exchange rate and they have concluded that foreign exchange market has become deep and liquidity market during the recent period.

Yamini Karmarkar and Muskan Karamchandani (2012)³⁵ made a research on “Exchange Rate and Macro - economic indicators: A Causal Study for India of the Past Decade” have analysed whether the macroeconomic indicators of the economy affect the exchange rate of Indian rupee against US dollar. They have taken variables under each four sectors of the economy, namely, external sector – foreign exchange reserves, financial market - central government outright buy and sale of government securities, repo rates, financial sector- reserve money, RBI open market operations and real sector- whole sale price index. A weekly data have been collected for the variables for the period from January 2001 to June 2009 from Handbook of statistics on Indian economy - RBI, OANDA forex trading and exchange rate services online databases. Statistical tools, such as, unit root test- Augmented Dickey fuller test and Phillips Perron test, multivariate

Vector Auto Regression framework and Granger causality tests have been applied. The results have shown that exchange rate has been affected by the variables of external sector, financial market and financial sector in long run. There exist a bidirectional casual relationship between exchange rate with foreign exchange reserves, Sensex and RBI open market operations. They have suggested that Government of India should take control measures considering the aspects like decline of rupee, control of foreign inflows and outflows, political corruption for a stable economy.

*Krishna Murari and Rajesh Sharma (2013)*³⁶ undertook a study on, “OLS modelling for Indian rupee fluctuations against US Dollar”. They have examined the dynamics of exchange rate in the Indian economy. The purpose of the study is to analyse the factors of the economy that affect the fluctuation of Indian rupee against US dollar using Ordinary least square analysis. The annual data covering a period of thirteen years from 2001 to 2013 from RBI data base on Indian economy. They have explored the History of exchange rate mechanism after independence, Rupee appreciation and depreciation and factors affecting exchange rate. The variable exchange rate has been taken as a dependent variable, and the independent variables, such as, foreign exchange reserves, foreign investment inflows, interest rate, inflation rate, money supply and trade balance have been taken in the study. The result of analysis have shown that the variables, such as, inflation rate, interest rate, trade balance and money supply are found to be significant and these variables have explained the dynamics of Indian rupee against US dollar to the extent of 94. 8 per cent.

*Anita Mirchandani (2013)*³⁷ in her article “Analysis of Macroeconomic Determinants of Exchange Rate Volatility in India” has probed the reasons for depreciation of Indian currency and has examined the macroeconomic determinants affecting the exchange rate volatility in India using correlation analysis. Secondary data have been used in the study. The annual data have been collected for the period from 1991 – 2010. The variables, namely, exchange rate, external debt, inflation rate, interest rate, Gross domestic product and foreign direct investment were taken and analysed. She has reviewed the probable reasons for the depreciation of the rupee and the results have shown that the variables interest rate, inflation rate, Gross domestic product, growth rate and Foreign direct investment have been correlated positively and negatively with the

exchange rate. She has concluded that low capital inflows, rise in prices of import commodities have caused the Indian rupee depreciation among international currencies.

Vadivel and Ramachandran (2013)³⁸ in their research paper on, “Does exchange rate intervention trigger volatility” have aimed to investigate on the two concepts, whether the intervention of Reserve Bank of India policies on exchange rate has controlled the volatility and the presence of asymmetric in the intervention by applying GARCH and A-PARCH models. Reserve Bank of India has intervened in the market to reduce the fluctuations of exchange rate. They have taken percentage change in exchange rate as a dependent variable and percentage change in size of intervention as an explanatory variable for the study. A weekly observations for the sample period from December 1996 to April 2013 have been collected. The results of GARCH and A-PARCH have shown that Reserve Bank of India intervened in the exchange rate volatility and found there is a asymmetric effect on selling of foreign exchange which has a higher volatility than the purchase of foreign exchange in the foreign exchange market.

Adhiraj Arora and Somesh Mathur et al. (2014)³⁹ made a study on, “What determines US Dollar - Indian Rupee exchange rate movements?”. The purpose of the study is to analyse the Indian rupee fluctuations against US dollar and the variables that influence the exchange rate movements for the period of 21 years from January 1993 to December 2013. They have used quarterly observations and secondary data have been collected from Reserve Bank of India’s database on Indian economy, Economic research of Federal Bank of St. Louis, IMF’s e-Library data, trading economics. com and World Bank Development. The study has considered the eight variables, such as, exchange rate of Indian rupee against US dollar, Differential interest rate, differential inflation rate, differential money supply, differential output growth rates, exchange rate of Pound - rupee, Euro - rupee and Yen - rupee. The statistical tools, such as, unit root test, cointegration test, ordinary least square and feasible generalised least square have been applied for the study. The results of unit root test have shown that the variables are stationary and found there is no cointegration between the variables. It is found that the variables differential interest rate, differential inflation rate, differential money supply, differential output growth rates, exchange rate of Pounds and Euro have a large extent on

influencing the exchange rate movements. The results of the study have supported the implications of interest rate parity theory and purchasing power parity theory.

Piyush Sharma and Shivam Rai (2014)⁴⁰ entitled a study on, “Determinants of foreign exchange rate volatility in the Indian economy” for a period of 20 years from 1992 to 2012. They have analysed whether the factors of the economy affect the movements of Indian currency. Two major important currencies in the international market, such as, US Dollar and Great British pounds against Indian rupee have been considered to determine the factors influencing exchange rate volatility. They have applied autocorrelation function to find which currency is frequently used in the market. It was found that INR/USD is the widely used in the foreign exchange market. The statistical tools, such as, Unit root test, Auto correlation function, Pair wise Granger causality test, Correlation and Regression analysis have been employed for the exchange rate of INR/USD, GDP growth rates, Index of Industrial production, Wholesale price Index, BSE-30. The results of the study have shown that BSE-30 is the most significant factor determining the volatility of Indian currency.

Ravi Bhandari (2014)⁴¹ in his study on, “An analytical study on Depreciation of rupee against dollar and Fundamental analysis on the impact of macroeconomic factors on exchange rate of rupee” has explored the reasons for depreciation of Indian currency and its relationship with the economic factors. The period of the study was from 2000 to 2013. Correlation analysis has been applied for Gross domestic product, foreign direct investment, Money supply, Foreign investment inflows, Export growth, Inflation rate and exchange rate to identify the relationship between the variables. He has also forecasted the average exchange rate for the year 2014 by applying forecasting analysis. It was found that the rupee is positively correlated with Inflation and Foreign direct investment. Exchange rate is negatively correlated with the Gross Domestic Product, Export growth, Money supply, Foreign investment inflows. It also implied from the results that the increase or decrease in the economic factors have an impact on the currency depreciation. He has suggested that the country has to increase the exports by correcting economic fundamentals and serious, structural and economic policy reforms have to be brought to make the exchange rate stable.

*Hidayathullai and Mahammad Rafee (2014)*⁴² conducted a study on “Relationship between crude oil price and Rupee, Dollar exchange rate: An Analysis of preliminary evidence” in India for the period from 1972-73 to 2012-13. The purpose of the study is to analyse the impact of crude oil prices on the Indian currency. Secondary data have been collected from the website of Knoea. com and Handbook of Indian Statistics 2012 -13, RBI publications. Multiple linear regression model has been applied to study the relationship between imports of crude oil, world crude oil prices and exchange rate of rupee against USD. They have framed two models to evaluate the impact of imports of crude oil and future crude oil prices. Crude oils are priced in terms of dollar in the international market. The results have shown that exchange rate of rupee is influenced by imports of crude oil. They have concluded that the continuous increase in imports and prices of crude oil would lead rupee to depreciate against dollar. The rupee depreciation can be overcome by the increase in domestic oil production and control of oil demand in the economy.

*Ramana Raju (2015)*⁴³ in his article on, “An econometric analysis pertaining to exchange rate dynamics in India” has evaluated the influence of interest rate and inflation rates on exchange rates by applying Unit root test, Vector Autoregression (VAR) model, Wald test and Regression analysis in long run and short run. Exchange rate of Indian rupee against US dollar has been taken as an independent variable. Inflation and interest rate were taken as dependent variables. Consumer price index was taken as proxy variable for inflation and call rates or money rates have been taken as proxy variable for Interest rate. The period of the study was from 1990 to 2010. Secondary data have been used and collected from RBI website. He has employed the stationarity of the variables, to estimate the variables for VAR analysis and Wald test to study the long run and short run relationship. It was found that in long run the variables, such as, interest rate and inflation rate does not influence the exchange rate while in short run the variables have jointly influenced the exchange rate movements. It is also implied that interest rate and inflation rate affect the exchange rate volatility in India.

*Vincent Bodart and Bertrand Candelon (2015)*⁴⁴ in their research paper on “Real exchange rates, commodity prices and structural factors in developing countries”. They have focused whether the structural factors of the economy, exchange rate regime

of the countries would affect the price of commodities and the exchange rate for the period from 1980 to 2012. So for that, based on International Monetary Fund classification of developing countries and Country's export performance a sample of 33 developing and emerging countries has been selected. They have evaluated the major export commodity and the share of particular commodity to the total export of the countries. They have sorted 12 commodities from the countries. They have considered five structural factors, namely, type of exportable commodity, degree of trade openness, degree of export specialisation and degree of financial openness to find whether exchange rates and market price of commodities dependent on structural factors. Secondary data have been used. The data have been collected from International financial Statistics database of IMF, Annual reports of IMF and World Bank. The tools, such as, cross sectional dependence test, Panel unit root test and cointegration test, Robustness check have been applied for the exchange rate and prices of commodities with the dummy variables. The result have shown that there is no cross sectional dependence between the exchange rate and commodity price. After applying the Panel unit root test of the variables, the Cointegration test results has shown that the factors exchange rate regime, degree of financial and trade openness are statistically significant in the long run. They have suggested that the developing countries can depend relatively less of their exchange rate for the prices of commodity in trade.

*Ravindran Ramasamy and Soroush Karimi Abar (2015)*⁴⁵ undertook a study on, "Influence of Macroeconomic Variables on Exchange Rates" by estimating regression models. The annual data of three countries of exchange rates, namely, United States (AUD /USD), Australia (Euro /USD) and Germany (AUD /Euro) have been considered. Multi model technique has been applied to identify the best model by linking the variables in the model. The period of the study is for ten years. Exchange rates are taken as dependent variable and the interest rate, inflation rate, balance of payment, employment rate, corruption index, gross domestic product, deficit / surplus rate, namely, borrowing rate and tax rate have been taken as independent variables in the study. The regression result has shown that model B is the best fit model indicated that the variables borrowing rate, tax rate, interest rate, inflation rate, balance of payment, corruption index, gross domestic product and surplus rate are statistically significant and influenced the exchange rate.

Kanika Khera and Inderpal Singh (2015)⁴⁶ have made a research on, “Effect of macroeconomic factors on rupee” that influenced the fluctuations of Indian rupee value against US dollar during post globalisation period by applying correlation and regression analysis. The variables, such as, inflation rate, lending interest rate, foreign direct investment, gross domestic product and current account deficit have been considered. The period of study covered for 22 years from 1991 to 2013. Secondary data have been collected from RBI bulletin and World Bank website. They have found that GDP is positively correlated with exchange rate and the variables lending interest rate, inflation rates and current account deficit are negatively correlated. The regression results have shown that the exchange rate is 85. 2 per cent dependent on independent variables. They have suggested that the currency depreciation can be controlled by promoting foreign direct investment inflows and decrease in imports.

Poornima and Ganeshwari (2016)⁴⁷ in their article on, “An analysis of macroeconomic determinants of exchange rate volatility in India” have explored the macroeconomic factors that influence the value of Indian currency. Secondary data for 10 years for the period from 2000 to 2015 have been collected and analysed. OLS regression techniques have been applied for the variables exchange rate, inflation rate, trade balance, current account, money supply and Interest rate. The result has shown that these macroeconomic variables have explained the relationship to the exchange rate to a large extent of 92. 4 per cent.

Vidyavathi, Kulkarni Keerti and Ainapur Pooja (2016)⁴⁸ have entitled a study on, “A study on macroeconomic indicators and their impact on exchange rates”. They have analysed the major determinant that affect the exchange rate volatility for the period of 10 years from 2006 to 2016. Correlation analysis have been applied for the variables, such as, interest rate, inflation rate, Foreign Direct Investment, Gross Domestic Product, External debt, Current account deficit to study the interrelationship between the variables. Secondary data have been collected from books, journals and articles. The results of the study have revealed that Gross Domestic Product, Inflation rate, Interest rate, External debt and Current account deficit are negatively correlated with exchange rate and FDI was positively correlated. They have concluded that these are the major determinants that cause the exchange rate volatility and have probed that due to

insufficient of capital inflows and unfavourable trade balance and other economic changes are reasons for the appreciation and depreciation of the currency.

Thilak venkatesan and Ponnamma (2017)⁴⁹ have carried out a research on, “An analysis of macroeconomic factors affecting foreign exchange rate”. The objective of the study was to examine the various macroeconomic factors affecting the exchange rates and to develop a model to forecast the exchange rate. The exchange rates of US dollar, Euro, Yen and Pound sterling and macroeconomic factors, such as, inflation rate, forex reserve, Gross Domestic Product, Money Supply, oil price, Index of Industrial Production, bank rate, current account deficit, Foreign Investment Inflows, Foreign Direct Investment, Wholesale Price Index, exports and imports have been taken for the study. Secondary data have been collected for the period of 15 years for 2000 - 2015 from the reports of Reserve Bank of India. The econometric tools, namely, Unit root test, Vector Autoregression, Autoregression Distributed Lag model and Granger causality test have been applied and forecasted. The results of the study have revealed that among the variables taken Foreign Direct Investment was highly significant in affecting the exchange rate and inflation rate have a negative impact in long run. Inflation rate has a causal relationship with Foreign Direct Investment in short run. They have concluded that the exchange rate volatility is affected by the macroeconomic factors, such as, inflation rate and Foreign Direct Investment. These are the important determinants that predict the movement of exchange rate in future.

Jain Mathew, Suvitha and Rekha (2015)⁵⁰ have made a study on, “Analysis of macroeconomic determinants of exchange rate in India”. They have discussed the probable reasons for fluctuations for Indian currency and analysed the macroeconomic determinants that have direct or indirect impact on exchange rate by employing correlation analysis. The variables, namely, exchange rate of Indian rupee against US dollar, Inflation rate, Interest rate, External debt, Gross Domestic Product and Foreign Direct Investment have been taken. Secondary data have been collected annually from world development indicators and OECD countries website for the period of ten years from 2004 to 2013. The result of the study have shown that the variables, such as, Inflation rate, Interest rate, External debt, Gross Domestic Product and Foreign Direct

Investment have affected significantly. Out of this Gross Domestic Product, External debt and Inflation rate have strongly correlated with the exchange rate.

Rabia Naif (2016)⁵¹ has entitled a paper on, “Analysis of macroeconomic determinants of exchange rate volatility in India” to explore the long run and short run relationship between the macroeconomic variables and exchange rate volatility. The variables, such as, exchange rate, inflation rate, money supply and interest rate have been taken for the study. A monthly data of 109 observations have been collected. The statistical tools, namely, Augmented Dickey Fuller test, Johansen cointegration test, Vector Error Correction Model (VECM) and Granger causality test have been applied. The results of the study have shown that exchange rate was positively related with inflation rate and negatively related with interest rate and money supply. It is also implied that the change in these variables affect the exchange rate fluctuations. She has concluded that high money supply and interest rate would increase the inflation rate and that leads to increase in the exchange rate volatility.

iii) Review on Trade Balance

Tarlok Singh (2002)⁵² in his study on “India’s trade balance: the role of income and exchange rates” has analysed the effects of exchange rate and national income on balance of trade in India by estimating reduce - form balance of trade model. The study has covered a period from 1960 to 1995. He has selected the variables, such as, trade balance, real effective exchange rate, nominal effective exchange rate, exports, imports, domestic income, foreign income and Gross Domestic Product for the study. He has applied Johansen Cointegration and Error Correction model to analyse the long run and short run relationship between the variables. The results of Johansen Cointegration test have shown that there is a significant relationship exists between exchange rate and domestic income with trade balance in long run. He has suggested that the effect of real effective exchange rate on trade balance has to be observed due to the policy changes in the economy. He has concluded that the policies have to be framed to stabilise the domestic price of goods and to control the effects of exchange rate changes on trade balance in India.

*Ozturk and Ilhan (2006)*⁵³ have done a study on “Exchange rate volatility and trade: A literature survey”. They have reviewed the earlier research studies related to the exchange rate volatility and trade. They have examined the study by comparing exchange rate and trade theories and with the results of various empirical studies relating to the trends and changes in exchange rate volatility and trade. It is also found that most of the earlier studies have resulted that the changes in exchange rate volatility have affected the foreign trade.

*Sushanta Mallick and Helena Marques (2010)*⁵⁴ in their study on, “Data frequency and exchange rate pass – through : Evidence from India’s exports” have analysed the Indian export prices to exchange rate changes during short run and long run exchange rate pass through in the sectors. The variables, such as, exchange rate, export prices have been taken for the study. Secondary data have been collected both annually and monthly. The annual data covering the period from 1991 to 2006 have been collected from United Nations COMTRADE database and monthly data for the period from 1996 to 2001 have been taken from India Trades database from CMIE for the study. Panel data unit root test and panel cointegration test have been applied for the study. The results of the study have shown that the variables are stationary. It also indicates that the monthly data have incomplete exchange rate pass through to the destination of market prices in long run. They have concluded that the price competitiveness and policy impact relating to export should be improved to increase exports.

*Srinivasan and Kalaiyani (2012)*⁵⁵ in their study on, “Exchange rate volatility and export growth in India: An empirical Investigation” have examined the impact of exchange rate volatility on Indian exports using Autoregression Distribution Lag (ARDL) model. Secondary data have been collected for the study covering the period of 1970 to 2011 from Handbook statistics of Indian economy, RBI and central statistical organisation. The variables, namely, India’s exports, Gross domestic product, real exchange rate, real exchange rate volatility and the world GDP have been taken. Augmented Dickey Fuller test have been applied to test the stationarity of the variables. The results of unit root test have shown that the variables are stationary. ARDL model has been applied to evaluate the cointegration between the variables in long run and short run. The results have revealed that exchange rate volatility has a significant negative

impact on real exports both in long run and short run where as real exchange rates has a negative effect in short run and positive effect in long run on real exports. It is also found that GDP has a positive impact on India's exports. They have concluded that exchange rate fluctuations would affect the exports in the Indian economy.

*Mehernosh Mehta and Hatim Kayumi (2013)*⁵⁶ have determined the impact of current account deficit on India's external debt and the selected foreign exchange rates such as - US dollar, Pound Sterling, Japanese Yen and Euro for the period of two decades from 1990 - 91 to 2012 - 13. Secondary data have been taken from Reserve Bank of India web pages. The Statistical tools, such as, Percentage analysis, CAGR and correlation have been used in the study. Percentage analysis and CAGR have been applied to analyse the trend of India's current account deficit and the components of total external debt. Correlation has been used to determine the relationship between current account deficit on external debts and the selected foreign exchange rates. They have concluded that current account balance has a positively correlation with external debts and negatively correlation with the exchange rates of Japanese Yen and Euro among the selected foreign exchange rates.

*Jayachandran (2013)*⁵⁷ in his study on, "Impact of exchange rate on trade and GDP for India –A study of last four decade" has analysed the short run and long run relationship between impact of exchange rate volatility on the India's exports and imports. Secondary data have been used. The study has covered a period of 30 years from 1981 to 2010. Variables such as, exchange rate, imports, exports and gross domestic product has been taken for the study. Trend analysis and simple linear model of regression analysis have been used to examine the relationship between export, imports and exchange rate on GDP. The results of the study have revealed that exchange rate has a negative impact on exports and imports and Gross Domestic Product has a positive impact on exports only in the long run. There is no significant relationship exist in short run. The results of the study have implied that the variables taken for the study are cointegrated and higher the exchange rate volatility influenced the trade and reduced the exports. He has suggested that the trade liberalisation and supportive monetary policies would tend to save the tax yield and improves the trade by stabilising exchange rate.

Vijayasri (2013)⁵⁸ in her research paper on, “The importance of international trade in the world” has explained the theoretically the importance of international trade for the economic development. She has discussed the need for international trade, relationship between international trade and economic development and has also stated the disadvantages of international trade in the country. She has concluded that the international trade used as a strategy for the growth of the economy. The economic infrastructure and policy measures have been taken in an efficient manner to adopt the socio economic changes in the economy.

Shubhada Sabade (2014)⁵⁹ has made a study on, “India’s foreign trade and socio-economic development (Trio of WTO compliance, currency depreciation and global crisis)” has analysed the reasons for the fluctuations of exports and imports, depreciation of rupee and risen trade deficit in India. The researcher has selected the variables, such as exports, imports, trade balance and exchange rate for the study. Secondary data have been collected for the period of 23 years from 1991 to 2013 and analysed by using percentage analysis. She has found that India’s trade balance have been negative indicated that it has faced high and continuous trade deficit for a longer period. The trade deficit has affected the Indian currency to depreciate and increased import bills. She has pointed out that the India’s trade WTO agreements; trade barriers, currency depreciation and global crisis are some of the reasons that affect the trade fluctuations. She has concluded that, India has to adopt ‘inward looking approach’ for the economic development which has implied that exports can be increased with rise in production and quality of goods and thereby reducing the imports. This will result in increase of income and employment and would also pave the way for economic development.

Kanda Naknoi (2014)⁶⁰ have conducted a study on “Exchange rate volatility and fluctuations in the extensive margin of trade” He has taken the extensive margin of exports and imports in US that fluctuated over the business cycle. He has used quarterly data of US bilateral trade of more than 10,000 products between 99 countries covering the period from 1990 - 2009. Reasonable model of trade dynamics and correlation have been used for analysis. The results of the study have shown that the extensive margin of exports from the U. S and the extensive margin of imports to the U. S are more volatile than the other trading countries respectively. He has concluded that fixed exchange rates

with U. S dollar, Free Trade Agreement with the U. S and an increase in country size are significantly associated with the stable pattern of trade.

*Chellasamy and Shankar (2014)*⁶¹ have made a research on, “Composition and contribution of current account to Indian economy” to evaluate the impact of elements of current account on Gross Domestic Product in India. They have taken Gross Domestic Product as dependent variable and Merchandise Exports, Imports, Invisibles as independent variables for the study. Secondary data have been collected for the period of 10 years annually from 2004 to 2014 and analysed by applying regression and correlation analysis. The results of the study have shown that current account has a significant impact on Gross domestic product. They have concluded that the current account balance of a nation plays a significant role in the economy growth. India has to enlarge the exports to meet the global demands and to find oil resources in the country to reduce the oil imports.

*Pushpalatha singh (2014)*⁶² in her study on, “Performance of foreign trade in India in the post liberalisation era” has examined the trend, composition of foreign trade and analysed the role of foreign trade on economic growth in India. Secondary data have been used in the study. The annual observations for the variables, such as, Exports, Imports, GDP at factor cost at constant prices and economic openness covering the period of thirteen years from 1991-2013 have been collected. The statistical tools, such as, Growth rate percentage analysis, Augmented dickey fuller (ADF) test and Regression analysis have been applied in the study to examine the impact of foreign trade of the economic growth in India. The results of the study have revealed that exports and economic openness are positively related to economic growth while imports are negatively related to economic growth. She has concluded that there is increase in the growth rate of imports than the growth rate of exports. Among the composition of India’s trade, the major percentage share of exports is the manufactured goods respectively. The crude and petroleum products have contributed as major imported goods in India’s imports.

*Sushil Kumar Rai and Purvashree Jhala (2015)*⁶³ have undertaken a study on, “Impact of exports and imports on growth rate of India: An empirical study” to find the cause and effect relationship of exports and imports of the Indian economy. The study has covered a period from 2000 to 2013. Secondary data have been collected from websites of United Nations Economic and Social Commission for Asia and Pacific.

The variables taken for the study are exports, imports and average growth rates of GDP. Unit root test has been applied to test the stationarity of the variables. The results of the study have shown that the variables are stationary. Pair wise granger causality test has been applied to test the causal relationship between the exports, imports and growth rate. The results of the study have shown that exports are affected by imports. Cointegration test have been applied to examine the long run relationship and it was found that variables are cointegrated in long run. Regression analysis has been applied in the study to analyse the impact of exports and imports on growth rate. The result of regression analysis has shown that exports and imports are statistically significant and found that growth rate is affected by imports than the exports.

*Abinaya and Jerinabi (2017)*⁶⁴ have made a study on, “Causal relationship between exchange rate and exports of SAARC nations” The purpose of the study is to examine the effect of exchange rate on export performance of SAARC nations using Granger causality test and Vector error correction model. The period of the study was from 2005 to 2015. Secondary data have been collected for exchange rate and value of exports of the SAARC countries, namely, Afghanistan, Bangladesh, Bhutan, Maldives, Nepal, Pakistan, Srilanka, India from International financial statistics, International monetary fund, Yahoo! finance and Oanda. The results of the study has revealed that there is no causal relationship exist between exchange rate and exports of SAARC countries, while the results of Vector error correction model has shown that there is a negative effect between exchange rate and exports.

*Khandare (2017)*⁶⁵ has conducted a study on, “The impact of exchange rate fluctuations on the economic growth of India”. He has found that there is an effect in the economic growth due to the exchange rate fluctuations. For the purpose of the study, secondary data have been collected from 1987 to 2014. The variables, such as, Exchange rate, Gross domestic product, Inflation rate, interest rate have been taken. Correlation and Multiple regression analysis have been applied to analyse the relationship between exchange rate fluctuations on economic growth. The results of the study revealed that Gross domestic product has a positive effect with the exchange rate fluctuation while the other variables, namely, inflation rate and interest rate have revealed that there is an inverse effect with the economic growth of Indian economy.

2.2 FOREIGN REVIEWS

i) Review on Currencies

*Yasir Kamal and Hammad-UI-Haq et al. (2011)*⁶⁶ have made a study on, “Modelling the exchange rate volatility, using generalised autoregressive conditionally heteroscedastic (GARCH) type models: Evidence from Pakistan” They have examined the performance of GARCH models in forecasting the volatility of Pakistan foreign exchange market. Daily and monthly observations of exchange rate of Pakistan rupee against US dollar covering the period from January 2001 to December 2009 have been collected from International financial statistics online website. Unit root test has been applied to test the stationary of the data. GARCH models, such as, symmetric GARCH - M (1,1), and two asymmetric models EGARCH (1,1) and TGARCH (1,1) have been used to forecast the exchange rate volatility in Pakistan foreign exchange market. The results of the study have shown that EGARCH (1,1) model is the best fit model that explains the presence of asymmetric effect in the exchange rate volatility. They have concluded that the results of the study will be helpful in predicting the movements of exchange rate in future period.

*Suliman Zakaria and Suliman Abdalla (2012)*⁶⁷ in their research paper on, “Modelling exchange rate volatility using GARCH models: Empirical evidence from Arab countries” have analysed the volatility of daily returns of nineteen currencies of Arab countries. Daily observations covering a period from January 1, 2000 to November 19, 2011 have been collected from financial web pages of Arab countries. Both asymmetric and symmetric GARCH models specifications have been used in the study to capture common facts, such as, volatility clustering and leverage effect in the exchange rate returns. The result of GARCH model has shown that only for ten currencies, the sum of coefficients have exceeded one, which implied that exchange rate volatility is high and whereas for seven currencies, it has resulted that there exist a moderate level of exchange rate volatility. The result of asymmetric model EGARCH (1,1) has shown that there exist a presence of leverage effect in all the currencies. They have concluded that the level of exchange rate volatility is increased due to the negative shocks of the economy than the positive shocks.

*Milton Abdul Thorlie et al. (2014)*⁶⁸ have conducted a study on, “Modelling exchange rate volatility using asymmetric GARCH models (Evidence from Sierra Leone)”. They have forecasted the exchange rate returns of Sierra Leone against US dollar using volatility models, such as, ARMA, GJR-GARCH and asymmetric GARCH models with normal and non normal (student-t and skewed student-t) distributions. The monthly observations of exchange rate returns of Leone against US dollar for the period of January 2004 to December 2013 have been collected. The result of asymmetric model has shown that there is a presence of leverage effect in the returns of exchange rate. GJR-GARCH model was the better forecasting model to forecast the Sierra Leone exchange rate volatility. They have suggested that the prediction of exchange rate volatility would provide better information to the investors and policy makers for decision making regarding investing strategies and also to enhance the exchange market stability in an emerging economy.

ii) Reviews on Macroeconomic Determinants

*Golan Benita and Beni Lauterbach (2007)*⁶⁹ in their paper on, “Policy factors and exchange rate volatility: Panel Data versus a specific country analysis” have examined the policy implications and macroeconomic variables that affect the daily exchange rate volatility. A sample of daily exchange rate of US dollar against 43 currencies has been selected for the study. They have used policy and macroeconomic variables, such as, exchange rate volatility, real interest rate, central bank intervention, exchange rate regimes, capital flows, domestic stock market volatility, gross domestic product, real and financial openness. Secondary data have been collected for the period 1990 – 2001. Panel data analysis has been applied to study between countries and a specific country, namely Israel. The results of cross country analysis have shown that there exist a positive correlation between exchange rate volatility, interest rate and central bank intervention which reveals that the countries with high exchange rate volatility would have high interest rate and more central bank intervention. The results of specific country analysis have shown that the exchange rate volatility is negatively correlated with interest rate and central bank interventions.

Iqbal Mahmood and Major Ehsanullah (2010)⁷⁰ undertook a study on “Exchange Rate Volatility & Macroeconomic Variables in Pakistan”. The purpose of the study was to analyse whether the exchange rate volatility affect the macroeconomic variables in Pakistan. The annual observations for the period from 1975 to 2005 have been used. As, GARCH model is the measure of volatility which has been applied to calculate the volatility of Pakistan real exchange rate. Unit root test and regression analysis have been applied to investigate whether the exchange rate fluctuations affect the macroeconomic variables. The volatility of real exchange rate has been taken as an independent variable and the variables, such as, foreign direct investment, gross domestic product and trade openness are as dependent variables. The results of the study have shown that exchange rate volatility have a positive impact on Gross Domestic Product and Growth rate, while it has negative impact on the variables trade openness and foreign direct investment. They have suggested that the policy makers of Pakistan should consider the exchange rate volatility in framing the trade policies to improve the level of trade and attract foreign inflows in to the country.

Anca Elena Nucu (2011)⁷¹ in her study on, “The relationship between exchange rate and key macroeconomic indicators case study: Romania”. The purpose of the study was to analyse the macroeconomic variables on the exchange rate of Romania leu against Euro and US dollar for the period 2000 - 2010. Secondary data have been used in the study. Correlation and Regression analysis have been employed for exchange rate of Romania leu against Euro and US dollar, inflation rate, interest rate, Gross Domestic Product, money supply and balance of payments to examine the relationship between the variables. The results of the study have shown that exchange rate of Romania leu against Euro is directly related to inflation and interest rate, while it is inversely related to Gross Domestic Product and money supply. It is found that these are the variables that determine the exchange rate of Romania leu against Euro in Romania.

Rasaq Akonji Danmola (2013)⁷² in his study on, “The impact of exchange rate volatility on the macroeconomic variables in Nigeria” elucidated the selected macroeconomic variables affecting the exchange rate volatility. Secondary data have been collected for the period 1980 - 2010 from the financial websites of Nigeria. The exchange rate of Nigeria has been taken as dependent variable and Gross Domestic Product,

Inflation rates, foreign direct investment and trade openness are taken as independent variables in the study. The Statistical tools, such as, Unit root test - Augmented dickey fuller test and Phillips Perron test, Granger Causality test, Correlation and Regression analysis have been employed in the study. The results of unit root test have shown that the selected variables are stationarity. Regression analysis of the study have shown that the exchange rate volatility has a positive influence on the variables Gross domestic product, foreign direct investment, trade openness and negatively related with inflation rates. It is found that these are the variables that cause the exchange rate volatility and make currency depreciation. He has suggested that Nigeria has to improve the export performance and thereby reducing the import of petroleum products through increase in the domestic production to maintain a favourable balance the trade.

*Kazi Mohammed Kamal Uddin and Azmal Ali Quosar (2013)*⁷³ in their study entitled on “Factors affecting the exchange rate of the Bangladesh: A co-integration approach” have evaluated the exchange rate of the Bangladesh in short run and long run. To examine the exchange rate movements, the exchange rate of Bangladesh Taka against US dollar (BDT/USD) and the factors relative money, foreign exchange reserve and total debts of Bangladesh have been considered. Political instability is taken as dummy variable to determine the exchange rate. A sample of monthly data for the period from January 1984 to April 2012 have been collected from International Financial Statistics, Handbook of statistics published by Bangladesh Bureau of statistics, Central Bank of Bangladesh and US Treasury direct website of Government of United States. The econometric tools, such as, Augmented Dickey Fuller test (ADF) and Autoregressive distributive lag (ARDL) approach have been applied to cointegrate the relationship between exchange rate and variables. The results of the study have revealed that the variables are found stationary at first difference and the variables relative money and debt service are found to be correlated and significant in determining the exchange rate. Political instability has a negative relationship with the exchange rate of Bangladesh. These are the factors that impact the currency depreciation in Bangladesh. They have concluded that the policy makers should focus on efficient policy measures considering the factors control of inflation and exchange rate stability.

*Katarzyna Twarowska and Magdalena Kakol (2014)*⁷⁴ have made a research on “Analysis of factors affecting fluctuations in the exchange rate of Polish Zloty against Euro” in Poland. The aim of the study was to find out the factor, which has played an important role in affecting the exchange rate of Polish Zloty for the period from 2000 to 2013. Regression analysis has been used for the six variables, such as, rate of economic growth, interest rate, inflation rate, Government deficit, balance of payment, level of foreign exchange market and speculative capital inflows to identify the factors that determine the exchange rate fluctuations. Secondary data have been used in the study. The study has shown that financial account balance, interest rate and inflation rate are the most important factor affecting exchange rate of Polish Zloty against Euro in Poland. They have concluded that effective monetary, fiscal policies and trade policies should be implemented in Poland exchange rate system in order to reduce high inflation rate and to enhance economic growth of the country.

*Wan Mohd Yaser Mohd Abdoh, Noor Hafizha Yusuf, Shaliza Azreen Mohd (2016)*⁷⁵ in their study on, “Macroeconomic factors that influence exchange rate fluctuation in ASEAN countries” have determined the macroeconomic factors affecting the exchange rate in ASEAN countries by using panel data analysis. The variables, namely, exports, inflation rate, interest rate have been taken for the study. Secondary data have been collected covering the period 2005 - 2014 from World Bank and IMF websites. They have applied random walk model and correlation for analysing the variables. The results of the study have shown that export is significant with the exchange rate. They have concluded that the policy makers should be aware of control of macroeconomic variables in the economy.

iii) Reviews on Trade Balance

*Satis Chandra Devkota (2004)*⁷⁶ in his research paper on, “Impact of exchange rate change on foreign trade balance in Nepal”. The purpose of the study is to investigate the impact of exchange rate on trade and the trade policies that have been taken to reduce the trade deficit in Nepal. Secondary data have been collected for the variables exports, imports and trade balance and analysed by applying regression analysis. He has found that, historically Nepal has faced the scenario of trade deficit and exchange rate has

influenced the trade balance in Nepal. He has concluded that trade deficit has been reduced with the rise in exports than the imports and by adopting efficient tax administration in the economy.

*Abba Abubakar Shehu (2007)*⁷⁷ in his paper on, “Impact of foreign exchange volatility on Imports: A case of Nigerian foreign exchange market (1987-2008)” has analysed the impact of foreign exchange rate volatility on Nigerian imports under three foreign exchange market regime for a period of 22 years from 1987 - 2008. Daily observations have been collected from central bank of Nigerian statistical bulletins. Linear regression has been applied to analyse the relationship between exchange rate volatility and change in the value of imports under three foreign exchange market regimes (i. e) in second - tier foreign exchange market, autonomous foreign exchange market and Inter-bank foreign exchange market. The results of the study have shown that there was a positive and negative significant relationship exists between the exchange rate shocks and the value of imports under second-tier foreign exchange market and Inter-bank foreign exchange market respectively. He has concluded that flexible exchange rate mechanism can be adopted, so that the exchange rate can fluctuate and fixed exchange rate should be avoided to make convenience of the participants in the foreign exchange market.

*Ng Yuen-Ling and Har Wai-Mun and Tan Geoi-Mei (2008)*⁷⁸ have undertaken a study on, “Real exchange rate and trade balance relationship: An empirical study on Malaysia”. They have investigated the condition of Marshall- Lerner and J-curve exists between the long run and short run relationship of exchange rate on trade balance in Malaysia. The period of the study is from 1955 to 2006. Secondary data have been collected from International monetary fund. The econometric tools such as Unit root test, Co-integration test, Granger causality test, Vector error correction model and impulse response function has been employed to examine the effect of exchange rate on trade balance. After confirming the stationarity of the variables, the long run and short run relationship has been tested among the variables. It was found that there exist a long run relationship between exchange rate and trade balance follows the theory of Marshall-Lerner. There is no short run relationship exist between the variables, does not follow the J-curve effects implied that variables does not influence the trade deficit of Malaysia.

They have concluded that effective policy measures can be taken related to production of import goods and improving the domestic income of the country to reduce the trade deficit.

*Nusrate Aziz (2008)*⁷⁹ has made a study on, “The role of exchange rate in Trade balance: Empirics from Bangladesh”. He has focused on the impact of exchange rate on balance of trade in Bangladesh in long run and short run. Secondary data have been collected for the period from 1972 to 2005. The variables, such as, real effective exchange rate, nominal effective exchange rate, trade balance, domestic income and foreign income have been considered. He has taken 22 trading countries of Bangladesh to identify the effect of exchange rate on trade. The econometric tools, namely, unit root test, granger causality test, Johansen cointegration test, error correction method have been applied. The results of the study have shown that real effective exchange rate has a significant positive influence on Bangladeshi trade balance both in short and long run.

*Carmen Sandul and Nicolae Ghiba (2011)*⁸⁰ in their study on, “The relationship between exchange rate and exports in Romania using a vector autoregressive model” have analysed the influence of exchange rate on Romania exports. The quarterly observations have been collected for the period from 2003 – 2011 from financial websites of Romania. The variables, namely, export volume and exchange rate of EUR/RON were taken. Unit root test, Vector Autoregression and Impulse responsive function have been applied. The results of Unit root test have shown that the variables are stationary. The result of Vector Autoregression analysis have shown that at the first lag of the model there exist a positive relationship between exchange rate and exports, at the second lag there was a negative relationship between exchange rate and exports value, which implied that change in exchange rate has influenced the exports.

*Anli Suresh (2012)*⁸¹ in his article on, “Exchange rate Impact on bilateral trade between India and China” has identified whether the appreciation of China currency affects the trade relationship between India and China. Secondary data have been used in the study. A quarterly observations for the period from 2001 - 2010 have been collected from Direction of trade statistics of the IMF and DGCI&S, Ministry of Commerce, Government of India and Reserve Bank of India websites. The variables, such as, exchange rate of Chinese Renminbi, value of bilateral trade of India and China and Gross

domestic product have been taken for the study. Unit root test has been applied to check the stationarity of the variables. The results have shown that the variables are stationary. To find the cointegration of the variables Johansen cointegration and Vector error correction test have been applied. The results have shown that the exchange rate has a cointegration relationship between exports and imports. She has concluded that the appreciation of exchange rate of Chinese Renminbi has affected the exports and imports of India and China.

*Mehmet Yaya and Xiaoxia Lu (2012)*⁸² have made a study on, “The short-run relationship between real effective exchange rate and balance of trade in China”. They have analysed the short term relationship between exchange rate and the balance of trade in China by applying granger causality test. A monthly observations have been collected for the period of January 1994 – August 2009. The results have shown that in short run there exist a casual relationship between balance of trade and exchange rate. Transform function estimation has been applied to test whether the shock in balance of trade has affected the exchange rate. It is found that the trade performance affects the exchange rate in China.

*Ing. Lucie Tomanova (2013)*⁸³ in her study on, “Exchange rate volatility and foreign trade in CEEC” has examined the impact of exchange rate volatility on export performance of Central and Eastern European countries for a period from January 1999 to March 2013. A sample of four Central and Eastern European countries – Czech Republic, Poland, Hungary, Slovakia and the variables binominal exchange rate of Euro and exports have been considered. Secondary data have been collected from European Central Bank and Eurostat Statistical databases. The econometric tools, namely, Unit root test, Error Correction Model, Autoregressive Distributed Lag Model and GARCH models have been applied to analyse the data. It is revealed from the analysis that the variables are stationary and the exchange rate volatility has no significant relationship between export performance of Central and Eastern European countries.

*Mohammad Reza Lotfalipour and Bhre Bazargan (2014)*⁸⁴ in their study on “The impact of exchange rate volatility on trade balance of Iran” have evaluated the effect of real effective exchange rate volatility on balance of trade of Iran during the

period from 1993 - 2001 by applying GARCH models and Panel data approach. The variables, namely, export, import, trade balance and 11 trading partners of Iran (Germany, United Arab Emirates, Japan, France, Brazil, Korea, Italy, Russia, China, Britain and India) have been taken for the study. Secondary data have been collected from World Bank website, Islamic Republic of Iran's Customs website and Chamber of Commerce. The results of the study have shown that the real effective exchange rate volatility has no significant effect on trade balance. They have found that the import has a significant effect on trade balance than exports. They have also suggested that the government should take policy implementations to enhance the production of import goods.

*Elif Guner Genc and Oksan Kibritci Artar (2014)*⁸⁵ have made a research on, "The effect of exchange rate on exports and imports of emerging countries". They have focused on the relationship between exchange rate on exports and imports of selected countries. A sample of 22 countries has been taken. Secondary data have been collected for the period from 1985 to 2012 from World Bank. Panel cointegration model have been applied to test the long run relationship between exchange rate with exports and imports. The results of the study have revealed that there exist a cointegration relationship between exchange rate of exports and imports of five countries, namely, Bolivia, Cameroon, Dominica, Gabon, and Mexican among the sample of 22 countries in long run.

*Khaled Alotaibi (2016)*⁸⁶ in his research titled on, "How exchange rate influence a country's import and export" has conceptually discussed the currency fluctuation affecting the export and import. Appreciation and depreciation of the currency affect the business persons, government, imports and exports throughout the globe. The change in supply and demand of the currency affects the value of the currency. If the domestic country's currency is stronger than the other nation currency the imported goods are found to be cheaper causes a trade deficit and there is a contra effect for the exports. He has concluded that currency fluctuations are influenced by several factors, namely, interest rate, inflation rate and capital gains. The currency crisis of foreign countries affects the domestic country's currency as well.

*Ghulam Mujtaba Chaudhray and Shujahat Haider Hashmi. et al. (2016)*⁸⁷ have conducted a study on, Exchange Rate and Foreign Trade: A Comparative Study of Major

South Asian and South-East Asian Countries” have investigated the relationship between exchange rate with exports and imports of the countries for the period from 1979 to 2010. They have stated that exports and imports are the major contributors of the development of the economies. The variables such as, exchange rate, value of exports and imports of Pakistan, India, Bangladesh, Sri Lanka, Malaysia, Indonesia, Singapore and Thailand have been taken for the study. Secondary data have been collected from the database of World Bank. The econometric tools, such as, Autoregressive Distribution Lag model and Vector error correction model have been employed to study the short run and long run relationship between exchange rate and trade of countries. The results have shown that in long run, the relationship exist between exchange rate and exports of Pakistan, India, Sri Lanka, Bangladesh and Indonesia and also the relationship exists between exchange rate and imports of Sri Lanka. In short run relationship the variables are not related with the countries. In short run, the relationship exists between exchange rate with Sri Lanka and Bangladesh.

*Kedir Bekeru Genemo (2017)*⁸⁸ made a study on, “Effect of exchange rate on trade balance in major east African countries: Evidence from panel cointegration”. He has analysed whether the depreciation of the currency affects the trade balance of five east African countries, such as, Ethiopia, Kenya, Tanzania, Rwanda and Uganda in long run by using panel data analysis. Secondary data have been collected for the period from 1990 to 2014 for the selected east African counties and also for the variables imports, exports, real gross domestic product, real effective exchange rate and real world income from United Nation Statistic Database, United Nation Conference on trade development database. Panel unit root test has been applied to test the stationarity of the variables. The researcher after confirming the stationarity of the variables has applied the panel cointegration and FMLOS panel approach for the cross sectional data to examine the cointegration between the variables in the long run. The results have shown that there is an inelastic relationship between exchange rate and trade balance, real domestic income is negatively related with trade balance in long run. He has concluded that currency depreciation worsens that trade balance and where as rise in income increases the purchasing power of the people that in turn will rise the imports and results in trade

deficit. He has suggested the policy makers not to devalue the exchange rate and to select countries of trading partners with high income to increase the exports in long run.

Hicham Sadok (2018) ⁸⁹ has conducted a study on, “The effect of exchange rates on Trade Balance: An empirical study of Morocco”. He has examined whether the Marshall- Lerner condition and J-curve exist between the exchange rates and trade balance in Morocco. The variables, such as, exchange rates, exports and imports have been taken. Secondary data have been collected for the period from 2000 to 2015. Growth rate have been calculated for the exchange rate, exports and imports. The results of the study have shown that there is an impact of exchange rate fluctuations on trade.

2.4 CONCLUSION

There are a number of studies conducted by researchers discretely on the topics ‘Movements of exchange rate’, ‘factors affecting the exchange rate movement’ and ‘Role of exchange rate in trade’ in developed and developing economies. There are barely few studies which have been taken up by the researchers by combining these aspects with the Indian currency in respect of the Indian economy. This has elucidated the need for studying the exchange rate volatility of Indian rupee against major currencies, macroeconomic determinants influencing the exchange rate and the impact of exchange rate fluctuations of currencies on trade balance in India. The research in different dimensions of foreign exchange market will guide and assist the policy makers and economists to take economic and monetary measures for the sustainable economic development and to maintain stability in the foreign exchange market. The research in this particular area is a phenomenal one among the academicians, fellow researchers, economists, policy makers and a common man and those who deal with the foreign exchange transactions.

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