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Abstract

Predicting currency movements is perhaps one of the hardest exercises in economics as it has many variables affecting its market movement. This study concerns with some of the usual macroeconomic variables which, in theory, are expected to affect the exchange rate between two countries. Indian Rupee is currently losing its value to the Dollar which could certainly be seen to affect the Indian economy adversely. This paper attempts to investigate the interactions between the foreign exchange and stock market in India as well as determine some of the economic factors which could have influenced the Indian rupee vis-à-vis the US Dollar over the period 1990-2011. This paper studies the effect of exchange rate on three market indices; BSE Sensex index, BSE IT sector index and BSE Oil & Gas sector index for the period January 2006 to March 2012. No significant interactions were found between foreign exchange rate [USD/INR] and stock returns. Economic variables like inflation differential, lending interest rates and current account deficit (as a percentage of GDP) are found to significantly affect the exchange rate [USD/INR]. This study also analyzes how the real GDP of India is currently behaving with respect to the exchange rate. It is found that they share a negative relationship which is highly statistically significant.

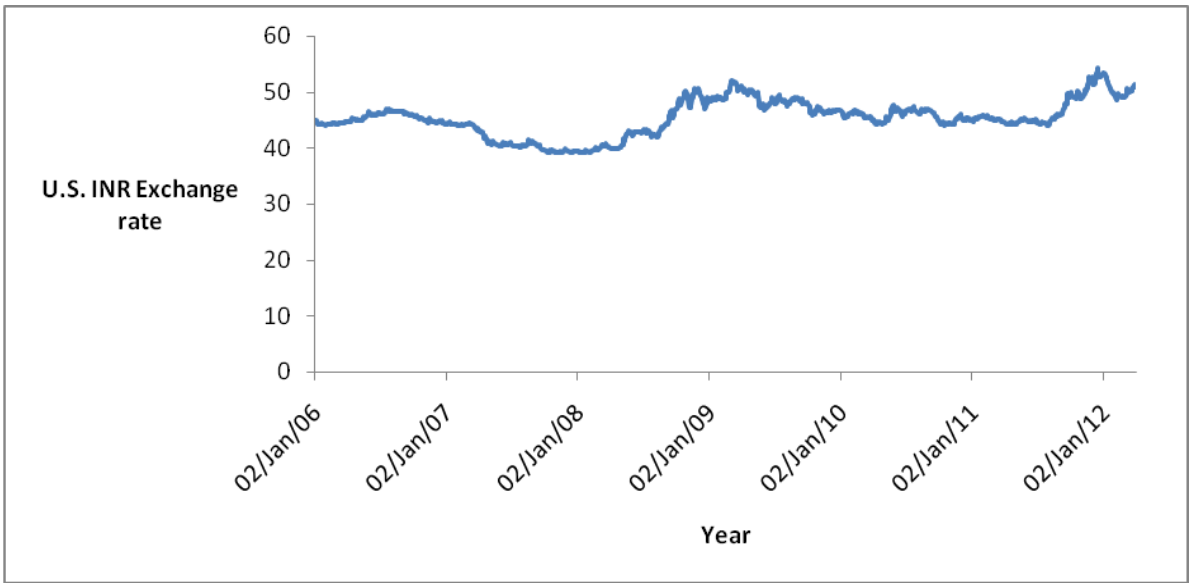
Keywords: current account deficit as a percentage of GDP, exchange rate, GDP, inflation differential, IT, lending interest rates, Oil & Gas, public debt, stock price index, Sensex

JEL Codes: E58, F31, F43, G10

1. Introduction

Many macroeconomic variables like inflation rate, stock prices, interest rates etc. are said to have an impact on the exchange rates (Singhal, 2012). Especially with the rise in the world trade and capital movements, exchange rate has become the most vital determinant of a country's relative economic health. In the past few months, the Indian Rupee has depreciated significantly against the U.S.D marking a new risk for the Indian economy. In 2009-10, the exchange rate was around 43-45 Rupees per Dollar and now it is around 55-56 Rupees per Dollar. Many probable reasons for the depreciation of the Rupee include problems of persistent inflation, high fiscal deficit, lack of reforms, global uncertainties etc. All these factors combined have made the foreign and domestic investors jittery about the current state of the Indian economy. Figure 1 below shows the variation of daily exchange rate over the period January'06 to March'12:

Figure 1: Daily Exchange Rate [USD/INR] from 2006-2012

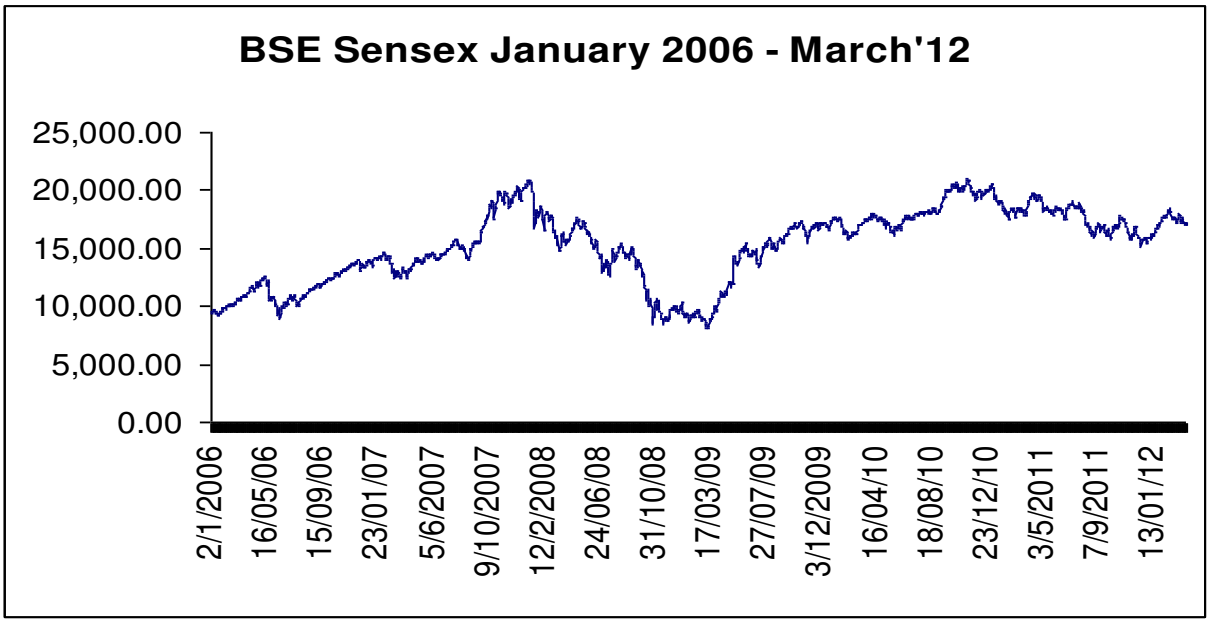


It is believed that the Rupee depreciation will have really unsettling consequences for the Indian economy as it will add further pressure on the overall domestic inflation and India, being an import intensive economy will have to bear the burden of higher domestic costs and higher fiscal and current account deficits. This study is concentrated on two models. The first model is aimed at examining the relationship between India's foreign exchange market and stock market index over the period January 2006 to March 2012. The stock market index has been studied on three fronts which are BSE Sensex, BSE IT sector index and BSE Oil and Gas sector index.

As per NASSCOM, India's IT industry has become a brand among the global countries over the years increasing its share in India's GDP from 1.2% in 1998 to 7.1 % in 2011. It is also expected to bring in revenue to the tune of 68 to 70 billion. This is significant at present with the ongoing debt crisis in European countries like Portugal, Spain and Greece and with the signs of slowing down of US economy. Heavy inflow of Foreign Direct Investment (FDI) in the IT sector in India is also expected to continue for coming years. In recent years, the inflow of large volumes of FDI

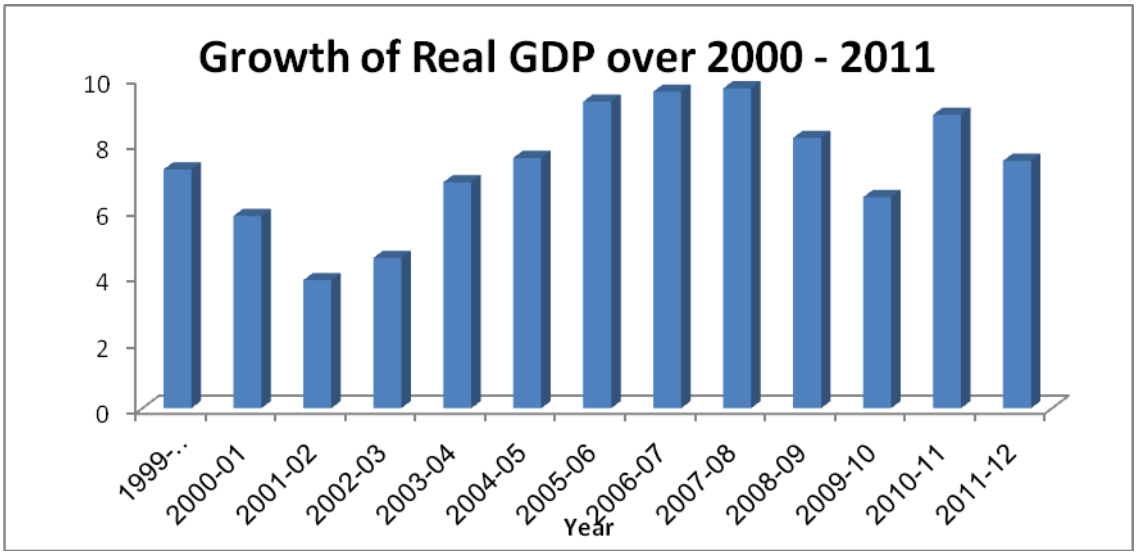
in to the Indian IT markets has not only boosted the industry but also the entire Indian economy. The current depreciation of the Rupee may be a boon for the exporters in the IT sector but according to NASSCOM, the volatility of the currency is a concern which needs to be tackled urgently as it hinders the planning process and prevents long term investments into the economy.

With over 15 percent of the world's population in India, it has become a significant consumer of energy resources. India is dependent on imported crude oil to the extent that recently the US Energy Information Administration (EIA) has observed that India was the world's fifth largest net importer of oil in 2010, importing 70 percent of consumption. India's oil sector is dominated by state-owned enterprises, although the government has taken steps in recent years to deregulate the hydrocarbons industry and encourage greater foreign involvement. FDI up to 49 percent is permitted in petroleum refining by PSUs (Public Sector Units). The government has also eased norms in order to permit companies in the mining, exploration and refineries sectors to bring in external commercial borrowing (ECB) for Rupee expenditure up to USD 500 million. Previously the limit was USD 50 million. Because of these measures, the Oil and Gas sector could be expected to depend on the exchange rate movements. This is the crux of the first model.



The second model of the present study focuses on the factors that might have affected the exchange rate [USD/INR] over the period from 1990-2011. The first factor is the current account deficit as a percentage of GDP of India. Current account deficit (CAD) occurs when a country's total imports of goods, services and transfers are greater than the country's total exports of goods, services and transfers. This means that the country is spending more on foreign trade than it is earning and that it is borrowing capital from foreign sources to make up for the deficit requiring excess foreign currency which would lead to lowering of the exchange rate. According to the Reserve Bank of India (RBI), India's current account deficit widened to a level of 4.5 per cent of GDP in January-March period of 2011-12 due to higher imports of oil and gold. The second factor taken into consideration is the percentage change in public debt. Public debt or the

government debt is a term for all the money owned at any given time by any branch of the government. It encompasses public debt owed by the central government, the state government, and even the municipal and local government. Nations with large public debts are less attractive to foreign investors as a large debt encourages inflation. Moreover, a large debt may prove worrisome to foreigners as they will be less willing to own securities denominated in a currency whose risk of default is great. For this reason, a country's debt rating is a crucial determinant of exchange rate. India's overall public debt increased marginally by 2.8% to Rs 27.77 lakh crore in the first half of 2010. According to a report by ASSOCHAM, India's per capita debt has increased from Rs 13,276.87 in 2005-06 to Rs 27,044.22 in 2011-12. Another factor that has been included in the model is the inflation differential between India and the U.S. For the past couple of years, India is experiencing very high inflation rates. It is known as a general rule that a country with consistently lower inflation rate exhibits a rising currency value, as its purchasing power increases relative to other currencies. Those countries with higher inflation typically see depreciation in their currency in relation to currencies of their trading partners. The fourth factor taken into consideration is the lending interest rate which is defined as the rate charged by banks on loans to primary customers. An unexpected rise in the rate of interest in a country relative to overseas would give the investors a higher return on that country's assets (relative to its foreign-currency equivalents) making them more attractive. This would raise the value of that country's currency, reduce the price of imports, and reduce demand for its goods and services abroad. Another part of model two in this paper is concerned with studying the relationship between real GDP of India and exchange rate [USD/INR] over the period 2000-2011. The graph below shows how India's real GDP has grown over 2000-2011. It can be seen that real GDP was decreasing from 1999 to 2001 but increased from 2002-07 to 9.2. It increased again in 2010 to 8.9 but reduced to 7.5 in 2011. The International Monetary Fund (IMF) lowered the real GDP forecast from 6.3 percent in July 2012 to 4.9 percent. So this study aims to check whether there is any significant relationship between exchange rate [USD/INR] and India's real GDP.



This study is entirely based on the two models described above. The paper is divided as follows: Section 2 contains a brief review of literature. Methodology and empirical results are presented in Section 3 and 4 respectively. Section 5 discusses some recent policy options used by the Reserve Bank of India (RBI) to control the current Rupee depreciation. Conclusion is given in Section 6.

2. Literature Review

Rahman and Uddin (2009) examined the relationship between exchange rates and stock prices of three emerging countries of South Asia named as Bangladesh, India and Pakistan. They considered average monthly nominal exchange rates of US Dollar in terms of Bangladeshi Taka, Indian Rupee and Pakistani Rupee and monthly values of Dhaka Stock Exchange General Index, Bombay Stock Exchange Index and Karachi Stock Exchange All Share Price Index for period of January 2003 to June 2008 to conduct the study. They found that there was no co-integrating relationship between stock prices and exchange rates. They also applied Granger causality test which showed there is no casual relationship between stock prices and exchange rates in the countries.

Franck and Young (1972) show that there is no significant interaction between exchange rate and stock price dynamics. Aggarwal (1981) discussed the relationship between exchange rates of US Dollar and changes in the indices of US stock prices and found a positive correlation. Giovannini and Jorion (1987) also considered the exchange rates and stock prices of USA and supported the conclusions of Aggarwal (1981). Soenen and Hennigar (1988) studied the same market but considered a different time period and in contrast with prior studies, they observed a significant negative relationship between the stock prices and the exchange rates.

Nath and Samanta (2003) studied the dynamic relation between exchange rates and stock prices for India. They used the daily stock market index (S&P CNX NIFTY of National Stock Exchange (NSE) and exchange rate (expressed in Indian Rupee per U.S. Dollar) for the period March 1993 to December 2002. Their empirical results suggest that returns in the foreign exchange and stock markets are not inter-related; although in the years 1993, 2001 and 2002, a unidirectional causal influence from stock index returns to returns in foreign exchange market is detected. Also very mild causal influence in reverse direction is found in the years 1997 and 2002. Phylaktis and Ravazzolo (2005) studied the long-run and short-run dynamics between stock prices and exchange rates and the channels through which exogenous shocks impact on these markets by using co-integration methodology and multivariate Granger causality tests. They also applied the analysis to a group of Pacific Basin countries over the period 1980 to 1998. Their analysis indicates a close association between stock and foreign exchange markets, which has implications for exchange rate policies. The positive association between the stock market and the real exchange rate implies that the degree of exchange rate flexibility has a role to play in that relationship.

Dimitrova (2005) examined the link between the stock market and exchange rates that might explain fluctuations in either market. He asserted that, in the short run, an upward trend in the stock market may cause currency depreciation, whereas weak currency may cause decline in the stock market. To test these assertions, he used a multivariate, open-economy, short-run model that allowed for simultaneous equilibrium in the goods, money, foreign exchange and stock markets in two countries. The focus is specifically on the United States and the United Kingdom over the period January 1990 through August 2004. The empirical results found were weaker than expected. He found support for the hypothesis that a depreciation of the currency may depress the stock market i.e. the stock market will react with a less than one percent decline to a one percent depreciation of the exchange rate. This also implies that an appreciating exchange rate boosts the stock market. As to his other assertion, that a booming stock market would lead to currency depreciation, he did not find support in the data for the US/ UK over 1990-2004. The results were insignificant.

Ayedimir and Demihan (2009) investigated the causal relationship between stock prices and exchange rates for Turkey, using data from 23 February 2001 to 11 January 2008. In this study, 100 services, financials, industrials, and technology indices were taken as stock price indices. The results of the empirical study indicated that there is a bidirectional causal relationship between exchange rate and all stock market indices. While the negative causality exists from services, financial and industrial indices to exchange rate, there is a positive causal relationship from technology indices to exchange rate. On the other hand, negative causal relationship from exchange rate to all stock market indices was determined.

Hatemi-J and Irandoust (2002) studied a possible causal relation between exchange rates and stock prices in Sweden. They used monthly nominal effective exchange rates and stock prices over the period 1993-98. They found that the Granger causality is unidirectional from stock prices to effective exchange rates. Chamberlain, Howe, and Popper (1997) found that the U.S. banking stock returns are very sensitive to exchange rate movements, but not for Japanese firms.

Singhal (2012) tried to identify the reasons which could lead to the Indian Rupee depreciation against the U.S. Dollar by analyzing data for exchange rate, balance of payments, FDI, FII, foreign exchange reserves over the period 2010 to 2011. It is concluded in this paper that persistent fiscal deficits, lack of meaningful reforms, persistent inflation and continued global uncertainty have led to a sharp depreciation of the Rupee.

Nucu (2011) explored the relationship between exchange rates and key macroeconomic indicators like GDP, inflation rate, money supply, interest rate and balance of payments for Romania. It is found in this study that there is an inverse relationship between exchange rate EUR/RON and gross domestic product and a direct relationship between exchange rate EUR/RON, inflation and interest rate. Correlation between exchange rate and balance of payments cannot be validated as the test statistic is not significant.

McMillin and Koray (2002) examined the effects of the market value of privately held U.S. and Canadian government debt on the real Canadian Dollar/U.S. Dollar exchange rate within a small vector autoregressive model that includes, in addition to debt and the exchange rate, output, price level, nominal money, interest rate, and government purchases variables for both the U.S. and Canada. Variance decompositions based on this model indicate significant effects of debt on the exchange rate, while impulse response functions indicate that debt shocks lead to a short-lived depreciation of the U.S. Dollar rather than to an appreciation. Calderon et al (2000) explored the determinants of current account deficit in developing countries. Two models were considered-within country and cross country model. They took 753 annual observations from 44 developing countries over the period 1966-95 and used the real exchange rate as a key variable. In the within country model there is a significant relationship between the real exchange rate and the current account deficit, but not in the cross country model.

3. Data and Methodology

The data used in this study for the first model are daily stock market index and exchange rate (expressed in Indian Rupee per U.S. Dollar) for India for the period January 2006 to March 2012. The stock indices chosen were SENSEX, BSE IT, and BSE Oil & Gas as these are one of the most robust indices available for the Indian stock market. The chosen stock price indices and exchange rate are denoted by SENSEX, BSEIT, BSEOG and EXR. The stock price indices were taken from the website of the Bombay Stock Exchange (BSE) and the exchange rate data was taken from the archives of the International Monetary Fund (IMF) which were available on IMF's

website. The stock prices were first made stationary by taking their natural logarithms and then taking their first difference. This first difference was then used to check whether there is any relationship between change in log of stock prices and exchange rate. The time period was also divided into three periods to get more conclusive results. First period was from 2006-09, second was from 2008-10 and the third from 2009-12.

For the second model, yearly data was taken for exchange rate (expressed in Indian Rupee per U.S. Dollar), percentage change in public debt, current account deficit (as a percentage of India's GDP), lending interest rates and difference in Indian and U.S. inflation rates. Yearly data for exchange rate [USD/INR] was taken from the website of the Reserve Bank of India (RBI) and that of lending interest rates and current account deficit as a percentage of GDP was taken from the website of the World Bank. The data for percentage change in India's public debt and Indian and U.S. inflation rates were taken from the website of the Central Intelligence Agency (CIA). The time period considered for this model was from 1990-2011. The variables for the second model were denoted by EXR, PDEBT, CADG, LRATE and DIFF.

4. Empirical Results

Testing the Data Series for Stationarity.

The results for the ADF tests for stationarity of all the time series indicate that the first differences of all price series namely DLOG (SENPRICES), DLOG (ITPRICES) and DLOG (OGPRICES) were found to be stationary.

Least Square Regression for Model 1

OLS (Ordinary Least Square) regression was run on exchange rate series (EXR) and first difference of IT prices, Oil & Gas prices and Sensex prices. The results which are given in the appendix (see Tables 1, 2 and 3 from the appendix), indicate that in India, stock returns for the IT sector, Oil and Gas sector and Sensex did not have any significant effect on the exchange rate [USD/INR] for the period 2006-12.

The time period was also divided into three sub-periods to get more conclusive results. The results are provided in the appendix at the end of the paper (see Tables 4.1 to 6.3). Results for the three separate sub-periods 2006-09, 2008-10 and 2009- March 2012 show that none of the stock price indices had a statistically significant impact on the exchange rate [USD/INR] in any sub-period. In another OLS regression, exchange rate [USD/INR] series was taken to be the independent variable and Sensex stock price series as the dependent variable over the same time period. The regression was repeated for each IT and Oil & Gas stock price series as the dependent variables. This was done to check if exchange rate affected stock price indices. The empirical findings showed that Indian Rupee vis-à-vis U.S. Dollar had an insignificant impact on each of the price indices. Thus the impact of the foreign exchange rate on stock market returns is not significant (see Tables 7, 8 and 9 from the appendix).

These empirical findings lead us to the conclusion that a significant interaction between the foreign exchange and stock market does not exist for India over the period January 2006 – March 2012. The results remained insignificant even when the period in consideration was divided into

three sub periods. So, it can be said that the stock prices do not influence exchange rates and past values of stock prices cannot be used to improve the forecast of future exchange rates.

Least Square Regression for Model 2

For model 2, simple OLS regression model was used with exchange rate [USD/INR] as the dependent variable and percentage change in debt, current account deficit as percentage of GDP, inflation differential and lending interest rates as the explanatory variables. The period in consideration is 1990-2011.

Variable	Coefficients	t-Statistic	Prob.
C (constant)	78.19572*	17.41922	0.0000
PDEBT (percentage change in debt)	0.399070***	1.690894	0.1091
DIFF (difference in India – U.S. inflation rates)	0.872599**	2.610361	0.0183
CADG (India's current account deficit as a percentage of GDP)	1.889250**	2.900101	0.0100
LRATE (lending interest rates)	-3.060247*	-9.256523	0.0000

*significant at 1% level
**significant at 5% level
***significant at 20% level

The empirical results provide an insight as to which of the considered factors had an impact on the exchange rate [USD/INR] over the time period 1990-2011 (refer Table 10 from the appendix). All the considered factors except PDEBT have a highly significant impact on the exchange rate [USD/INR] (PDEBT is significant only at the 20% level). The R-squared for the model is also high (84.07%). From these results, it can be said that as the lending rate increases, the Rupee will tend to appreciate. Also, when India experiences a higher inflation rate than the U.S. (which leads to an increase in the India- U.S. inflation differential) depreciation of the Rupee occurs. Finally it can be seen that as India's current account deficit (as a percentage of GDP) increases, it will lead to a depreciation of the Rupee vis-a-vis the U.S. Dollar.

Moving over to the relationship between real GDP and the exchange rate [USD/INR], it is seen that they share a negative relationship over the period 2000-11 (see Table 11 from the appendix). The coefficient of GDP is negative and significant at the 1% level. Here, the R-squared is 52%. This means that an increase in the real GDP would lead to an appreciation of the exchange rate [USD/INR] and a fall in the growth of the economy (measured by real GDP) would lead to a depreciation of the Rupee against the dollar. This is quite compatible with today's Indian scenario as the growth in real GDP is much lower and the depreciation in Rupee against the dollar is on a high.

5. Policy Options

Some suggested policy options for the RBI (Reserve Bank of India) to curb Rupee depreciation would be to raise policy rates to prevent sudden capital outflows. But RBI has already tightened

policy rates significantly since March 2010 to tame inflation. Higher interest rates along with domestic and global factors have pushed growth to much lower levels. RBI has mentioned that India's interest rates are already higher than most countries but this has not led to higher capital inflows. So, there is a possibility that lower policy rates in future lead to further capital outflows. RBI can also sell foreign exchange reserves and buy Indian Rupees leading to an increase in the demand for Rupee. But using them up in large quantities to prevent depreciation may result in a deterioration of confidence in the economy's ability to meet even its short-term external obligations.

Recently, the RBI took some administrative measures to control the depreciation of the Rupee against the Dollar. The Central Bank directed exporters to convert up to 50 percent of their foreign currency holding with banks into Rupee balances. Exporters were earlier permitted to keep 100 percent of their foreign currency earnings with banks in an Exchange Earner's Foreign Currency (EEFC) account. The rupee rose by 1.6 percent after this announcement. RBI also took steps to encourage more Dollar flows into the country by increasing rates on foreign currency non-resident accounts and giving banks the flexibility to raise overseas funds at any cost to lend to exporters. Apart from these, certain measures were undertaken by the RBI to ease capital controls to allow more capital inflows. These include increasing the limit of overseas investment in government bonds by USD 5 billion to USD 20 billion, thus allowing Indian companies in manufacturing and infrastructure sector to avail of External Commercial Borrowings (ECB) for repayment of outstanding rupee loans towards capital expenditure. The overall ceiling for such ECBs is set at USD 10 billion. The terms and conditions for the scheme for FII (Foreign Institutional Investors) investment in infrastructure debt and the scheme for non-resident investment in Infrastructure Development Funds (IDFs) have also been rationalized. Further, Qualified Foreign Investors (QFIs) can now invest in those mutual funds (MF) schemes that hold at least 25 per cent of their assets (either in debt or in equity or both) in infrastructure sector under the current USD 3 billion sub-limit for investment in mutual funds related to infrastructure. The Government of India also opened up foreign direct investment (FDI) in the retail sector in September 2012. Up to 51% FDI was allowed in the multi-brand retail sector, up to 100% in the single brand retail, 49% in aviation and up to 74% in the broadcast sector. It is being said that this decision has improved the market sentiment and helped the Rupee to rebound to a considerable extent as in June 2012 the Rupee had plummeted to a low of 57.15 to a Dollar but in September 2012 after the implementation of these reforms, it bounced up to 53.57 to a Dollar. Market sentiments also improved as BSE Sensex progressed during this period.

After these recent measures also, both domestic and global conditions are indicating that the downward pressure on the Indian Rupee is likely to remain in the near future. Hence, some strong and bold reforms are needed from the side of the Indian government and RBI which would help to curb Rupee depreciation and help the Indian economy to grow at a better rate

6. Conclusion

Two conclusions can be drawn based on the empirical analysis. Firstly, there is no inter-relation between the daily returns in the foreign exchange and the stock market of India for the period January 2006 to March 2012. The time period was also divided into three sub periods; first from 2006-09, second from 2008-10 and the third from 2009-12. The same conclusion was arrived at for these subsequent periods too. Secondly, factors like India-U.S. inflation differential, lending interest rate, current account deficit (as a percentage of India's GDP) and percentage change in India's public debt were found to be significantly linked to the exchange rate [USD/INR]. So, these factors could be seen as important determinants of the exchange rate movements for the

period 1990-2011. Statistical results also show that there is a significant negative relationship between the real GDP of India and exchange rate [USD/INR] for the period 2000-2011. The paper also discusses what policy options the RBI has taken to control the free fall of the Rupee against the Dollar.

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Appendix: Regression Results for Model 1 and Model 2

Results for Model 1:

Table 1 Results of OLS run on EXR and SENSEX

Dependent Variable: EXR				
Method: Least Squares				
Date: 07/08/12 Time: 13:02				
Sample(adjusted): 2 1511				
Included observations: 1510 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	45.77293	0.284346	160.9759	0.0000
D(LOG(SENSEX))	-2.805305	15.36484	-0.182579	0.8552
R-squared	0.000022	Mean dependent var		45.77174
Adjusted R-squared	-0.000641	S.D. dependent var		11.04292
S.E. of regression	11.04646	Akaike info criterion		7.643420
Sum squared resid	184012.5	Schwarz criterion		7.650466
Log likelihood	-5768.782	F-statistic		0.033335
Durbin-Watson stat	1.818157	Prob(F-statistic)		0.855153

Table 2 Results of OLS run on EXR and BSEIT

Dependent Variable: EXR				
Method: Least Squares				
Date: 07/08/12 Time: 12:31				
Sample(adjusted): 2 1512				
Included observations: 1511 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	45.77692	0.284195	161.0757	0.0000
D(LOG(BSEIT))	5.834260	14.17723	0.411523	0.6807
R-squared	0.000112	Mean dependent var		45.77879
Adjusted R-squared	-0.000550	S.D. dependent var		11.04266
S.E. of regression	11.04570	Akaike info criterion		7.643282
Sum squared resid	184109.2	Schwarz criterion		7.650324
Log likelihood	-5772.499	F-statistic		0.169351
Durbin-Watson stat	1.817475	Prob(F-statistic)		0.680747

Table 3 Results of OLS run on EXR and BSEOG

Dependent Variable: EXR				
Method: Least Squares				
Date: 07/08/12 Time: 12:43				
Sample(adjusted): 2 1512				
Included observations: 1511 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	45.78082	0.284228	161.0707	0.0000
D(LOG(BSEOG))	-4.528726	13.44252	-0.336896	0.7362
R-squared	0.000075	Mean dependent var		45.77879
Adjusted R-squared	-0.000587	S.D. dependent var		11.04266
S.E. of regression	11.04590	Akaike info criterion		7.643319
Sum squared resid	184116.0	Schwarz criterion		7.650361
Log likelihood	-5772.527	F-statistic		0.113499
Durbin-Watson stat	1.817436	Prob(F-statistic)		0.736242

Table 4.1 Results of OLS run on EXR and SENSEX, 2006-09

Dependent Variable: EXR				
Method: Least Squares				
Date: 07/08/12 Time: 16:53				
Sample(adjusted): 2 954				
Included observations: 953 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	44.58965	0.108363	411.4832	0.0000
D(LOG(SENSEX))	-0.080272	5.034315	-0.015945	0.9873
R-squared	0.000000	Mean dependent var		44.58960
Adjusted R-squared	-0.001051	S.D. dependent var		3.342078
S.E. of regression	3.343834	Akaike info criterion		5.254210
Sum squared resid	10633.35	Schwarz criterion		5.264408
Log likelihood	-2501.631	F-statistic		0.000254
Durbin-Watson stat	0.005018	Prob(F-statistic)		0.987282

Table 4.2 Results of OLS run on EXR and BSEIT, 2006-09

Dependent Variable: EXR				
Method: Least Squares				
Date: 07/08/12 Time: 16:44				
Sample(adjusted): 2 954				
Included observations: 953 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	44.58857	0.108283	411.7785	0.0000
D(LOG(BSEIT))	4.061066	4.764073	0.852436	0.3942
R-squared	0.000764	Mean dependent var		44.58960
Adjusted R-squared	-0.000287	S.D. dependent var		3.342078
S.E. of regression	3.342558	Akaike info criterion		5.253446
Sum squared resid	10625.23	Schwarz criterion		5.263645
Log likelihood	-2501.267	F-statistic		0.726646
Durbin-Watson stat	0.006562	Prob(F-statistic)		0.394187

Table 4.3 Results of OLS run on EXR and BSEOG, 2006-09

Dependent Variable: EXR				
Method: Least Squares				
Date: 07/08/12 Time: 16:50				
Sample(adjusted): 2 954				
Included observations: 953 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	44.59217	0.108359	411.5209	0.0000
D(LOG(BSEOG))	-2.952980	4.396818	-0.671618	0.5020
R-squared	0.000474	Mean dependent var		44.58960
Adjusted R-squared	-0.000577	S.D. dependent var		3.342078
S.E. of regression	3.343042	Akaike info criterion		5.253736
Sum squared resid	10628.31	Schwarz criterion		5.263934
Log likelihood	-2501.405	F-statistic		0.451070
Durbin-Watson stat	0.005939	Prob(F-statistic)		0.501990

Table 5.1 Results of OLS run on EXR and SENSEX, 2008-10

Dependent Variable: EXR				
Method: Least Squares				
Date: 07/08/12 Time: 17:07				
Sample(adjusted): 2 707				
Included observations: 706 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	45.82964	0.113131	405.1035	0.0000
D(LOG(SENSEX))	2.842843	5.152989	0.551688	0.5813
R-squared	0.000432	Mean dependent var		45.82965
Adjusted R-squared	-0.000988	S.D. dependent var		3.004474
S.E. of regression	3.005958	Akaike info criterion		5.041898
Sum squared resid	6361.191	Schwarz criterion		5.054815
Log likelihood	-1777.790	F-statistic		0.304360
Durbin-Watson stat	0.009769	Prob(F-statistic)		0.581337

Table 5.2 Results of OLS run on EXR and BSEIT, 2008-10

Dependent Variable: EXR				
Method: Least Squares				
Date: 07/08/12 Time: 17:01				
Sample(adjusted): 2 707				
Included observations: 706 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	45.82884	0.113164	404.9759	0.0000
D(LOG(BSEIT))	1.823505	4.887432	0.373101	0.7092
R-squared	0.000198	Mean dependent var		45.82965
Adjusted R-squared	-0.001222	S.D. dependent var		3.004474
S.E. of regression	3.006310	Akaike info criterion		5.042133
Sum squared resid	6362.683	Schwarz criterion		5.055050
Log likelihood	-1777.873	F-statistic		0.139204
Durbin-Watson stat	0.009556	Prob(F-statistic)		0.709186

Table 5.3 Results of OLS run on EXR and BSEOG, 2008-10

Dependent Variable: EXR				
Method: Least Squares				
Date: 07/08/12 Time: 17:03				
Sample(adjusted): 2 707				
Included observations: 706 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	45.83022	0.113149	405.0434	0.0000
D(LOG(BSEOG))	1.898950	4.479678	0.423903	0.6718
R-squared	0.000255	Mean dependent var		45.82965
Adjusted R-squared	-0.001165	S.D. dependent var		3.004474
S.E. of regression	3.006224	Akaike info criterion		5.042075
Sum squared resid	6362.317	Schwarz criterion		5.054992
Log likelihood	-1777.853	F-statistic		0.179694
Durbin-Watson stat	0.009396	Prob(F-statistic)		0.671766

Table 6.1 Results of OLS run on EXR and SENSEX, Jan'09-March'12

Dependent Variable: EXR				
Method: Least Squares				
Date: 07/08/12 Time: 17:36				
Sample(adjusted): 2 792				
Included observations: 791 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	47.99163	0.522735	91.80873	0.0000
D(LOG(SENSEX))	-32.45290	33.57903	-0.966463	0.3341
R-squared	0.001182	Mean dependent var		47.96786
Adjusted R-squared	-0.000083	S.D. dependent var		14.68488
S.E. of regression	14.68550	Akaike info criterion		8.214123
Sum squared resid	170158.7	Schwarz criterion		8.225939
Log likelihood	-3246.686	F-statistic		0.934051
Durbin-Watson stat	1.967311	Prob(F-statistic)		0.334109

Table 6.2 Results of OLS run on EXR and BSEIT, Jan'09-March'12

Dependent Variable: EXR				
Method: Least Squares				
Date: 07/08/12 Time: 17:32				
Sample(adjusted): 2 792				
Included observations: 791 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	47.99021	0.523632	91.64882	0.0000
D(LOG(BSEIT))	-18.29112	30.05084	-0.608672	0.5429
R-squared	0.000469	Mean dependent var		47.96786
Adjusted R-squared	-0.000797	S.D. dependent var		14.68488
S.E. of regression	14.69074	Akaike info criterion		8.214837
Sum squared resid	170280.2	Schwarz criterion		8.226653
Log likelihood	-3246.968	F-statistic		0.370482
Durbin-Watson stat	1.964809	Prob(F-statistic)		0.542917

Table 6.3 Results of OLS run on EXR and BSEOG, Jan'09-March'12

Dependent Variable: EXR				
Method: Least Squares				
Date: 07/08/12 Time: 17:34				
Sample(adjusted): 2 792				
Included observations: 791 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	47.97799	0.522382	91.84468	0.0000
D(LOG(BSEOG))	-24.65519	29.79462	-0.827505	0.4082
R-squared	0.000867	Mean dependent var		47.96786
Adjusted R-squared	-0.000399	S.D. dependent var		14.68488
S.E. of regression	14.68781	Akaike info criterion		8.214439
Sum squared resid	170212.4	Schwarz criterion		8.226255
Log likelihood	-3246.810	F-statistic		0.684764
Durbin-Watson stat	1.965723	Prob(F-statistic)		0.408201

Table 7 Results of OLS run on SENSEX and EXR

Dependent Variable: D(LOG(SENSEX))				
Method: Least Squares				
Date: 07/20/12 Time: 19:46				
Sample(adjusted): 2 1511				
Included observations: 1510 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000783	0.002032	0.385420	0.7000
EXR	-7.88E-06	4.32E-05	-0.182579	0.8552
R-squared	0.000022	Mean dependent var		0.000423
Adjusted R-squared	-0.000641	S.D. dependent var		0.018508
S.E. of regression	0.018514	Akaike info criterion		-5.139306
Sum squared resid	0.516868	Schwarz criterion		-5.132260
Log likelihood	3882.176	F-statistic		0.033335
Durbin-Watson stat	1.857520	Prob(F-statistic)		0.855153

Table 8 Results of OLS run on BSEIT and EXR

Dependent Variable: D(LOG(BSEIT))				
Method: Least Squares				
Date: 07/20/12 Time: 19:39				
Sample(adjusted): 2 1512				
Included observations: 1511 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000560	0.002201	-0.254248	0.7993
EXR	1.92E-05	4.67E-05	0.411523	0.6807
R-squared	0.000112	Mean dependent var		0.000321
Adjusted R-squared	-0.000550	S.D. dependent var		0.020050
S.E. of regression	0.020055	Akaike info criterion		-4.979308
Sum squared resid	0.606952	Schwarz criterion		-4.972265
Log likelihood	3763.867	F-statistic		0.169351
Durbin-Watson stat	1.960706	Prob(F-statistic)		0.680747

Table 9 Results of OLS run on BSEOG and EXR

Dependent Variable: D(LOG(BSEOG))				
Method: Least Squares				
Date: 07/20/12 Time: 19:42				
Sample(adjusted): 2 1512				
Included observations: 1511 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001210	0.002321	0.521067	0.6024
EXR	-1.66E-05	4.93E-05	-0.336896	0.7362
R-squared	0.000075	Mean dependent var		0.000449
Adjusted R-squared	-0.000587	S.D. dependent var		0.021146
S.E. of regression	0.021152	Akaike info criterion		-4.872804
Sum squared resid	0.675163	Schwarz criterion		-4.865762
Log likelihood	3683.403	F-statistic		0.113499
Durbin-Watson stat	1.873623	Prob(F-statistic)		0.736242

Results for Model 2:

Table 10 Results of OLS run on EXR, PDEBT, DIFF, CADG and LRATE

Dependent Variable: EXR				
Method: Least Squares				
Date: 01/10/13 Time: 19:02				
Sample(adjusted): 1 22				
Included observations: 22 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	78.19572	4.489048	17.41922	0.0000
PDEBT	0.399070	0.236011	1.690894	0.1091
DIFF	0.872599	0.334283	2.610361	0.0183
CADG	1.889250	0.651443	2.900101	0.0100
LRATE	-3.060247	0.330604	-9.256523	0.0000
R-squared	0.840796	Mean dependent var		39.31591
Adjusted R-squared	0.803336	S.D. dependent var		8.702612
S.E. of regression	3.859335	Akaike info criterion		5.735583
Sum squared resid	253.2059	Schwarz criterion		5.983547
Log likelihood	-58.09141	F-statistic		22.44523
Durbin-Watson stat	1.613599	Prob(F-statistic)		0.000001

Table 11 Results of OLS run on EXR and GDP

Dependent Variable: EXR				
Method: Least Squares				
Date: 01/10/13 Time: 16:31				
Sample(adjusted): 2 13				
Included observations: 12 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	51.18594	1.796950	28.48491	0.0000
GDP	-0.781187	0.236832	-3.298482	0.0080
R-squared	0.521072	Mean dependent var		45.43667
Adjusted R-squared	0.473180	S.D. dependent var		2.085588
S.E. of regression	1.513770	Akaike info criterion		3.818095
Sum squared resid	22.91499	Schwarz criterion		3.898913
Log likelihood	-20.90857	F-statistic		10.87998
Durbin-Watson stat	2.389617	Prob(F-statistic)		0.008034