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Impact of Exchange Rate Volatility on the Foreign Direct Investment in India in the Post Liberalization Period

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Abstract

Trade deficits and surpluses are sometimes attributed to intentionally low or high exchange rate levels. The impact of exchange rate levels on trade has been much debated but the large body of existing empirical literature does not suggest an unequivocally clear picture of the trade impacts of changes in exchange rates. Similarly relationship between Real Effective Exchange Rate (REER) and foreign direct investment is not much discussed in the current time. The present study tries to establish a causal relationship between the real effective exchange rate and foreign direct investment in India using a time series data between 1992 and 2013. It tries to understand whether the fluctuation in the exchange rate in turn causes the change in the quantum of foreign direct investments inflows and vice-versa which is of enormous importance in the wake of unprecedented depreciation of Indian Rupee against US dollar. Under this analysis unit root test and Johenson co-integration test were adopted to show whether the variables under consideration exhibit stationarity and a long run association respectively. The test indicates absence of any long term association between the two variables under consideration. The Vector Auto regression (VAR) model depicts that the coefficients do not have any long run association. To establish the possibility of any short run association Wald test is conducted.

***Key Words**: Foreign Direct Investment (FDI), Vector Auto Regression (VAR), Real Effective Exchange Rate (REER), Volatility*

Introduction:

Unprecedented globalization have witnessed tremendous economic growth resulting in fierce competition and accelerated pace of innovation. As a result inflow of Foreign Direct Investments has become important measure of economic development in developing countries like India. FDI become an important parameter as in case of country like Singapore, Hong Kong, Indonesia, China, Korea etc. FDI not only gives access to foreign capital but also provides domestic countries with cutting edge technology, desired skills tools of innovation and other complementary skills. Foreign direct investment not only helps the country by providing additional economic activity and generating employment but it also facilitates flow of sophisticated technology into the country and helps the industry to march into advance technology. A favorable business environment after July 1991 helps India to gather the likes of major industrial nations to move its capital into it. The policies were drafted so that it stimulates the flow of foreign capital into India.

Any Capital which flows from one country into another is known as foreign investment. Inflow of investment from other countries is encouraged since it complements and stimulates domestic investments in capital- scarce economies of developing countries. Since liberalization privatization and globalization in 1991, foreign direct investment and portfolio investment both forms of investment was allowed in the country. This form of investment was preferred in the country and many industries change their policies to gain the share of this form of investment.

Real exchange rate is commonly known as a measure of international competitiveness. It is also known as index of competitiveness of currency of any country and an inverse relationship between this index and competitiveness exists. Lower the value of this index in any country, higher the competitiveness of currency of that country will be.

This study covers the detailed analysis and investigation of some of the macro economic variables which accept the impact of real exchange rate volatility in India. In order to investigate this relationship, a detailed picture of these variables is presented in this study. The general view of the researchers about exchange rate is that if exchange rate of a country is properly valued, it does not substantially affect the macro economic variables and thus macro economic performance of that country. Volatility in exchange rate of a country can affect the investment in that country adversely. It creates an uncertain environment for investment in that country and requires that resources in that country should be reallocated among various sectors of the economy of that country. Also the second noticeable trend that has grappled Indian economy is the volatility of the rupee vis a vis major currencies especially the US Dollar and British Pound. The past year has witnessed a sharp depreciation of Indian Rupee against dollar which stands at over 19% in a single year. There are observations that indicate a strong correlation between the foreign capital inflows and valuation of a rupee. Any aggressive depreciation in the exchange rate creates turmoil in the economy. It increases the firm's debt component on the loan borrowed from the foreign soil. The imports get dearer

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hereby having a cascading effect on the production costs and the product, thereby triggering inflation. The present study tries to understand the correlation between the exchange rate (US $ verses Indian rupee) and foreign direct investment in the Indian economy between 1991 and 2013.

Review of Literature:

The literature pertaining to the correlation between FDI and exchange rate in general is highly contradictory in nature and ambiguous, with some studies exhibiting a positive correlation, while others show negative correlation between the chosen variables. **Cushman (1985)** kicked off the volatility debate investigating the effects of exchange rate risk. He assessed the effects across four schemes; depending upon where inputs were purchased, output was produced, financial capital was acquired and finally where output was sold. He also witnessed that higher exchange rate volatility increased FDI from the US entering Canada, Japan and Europe. **Froot and Stein (1991)** explore the factors that might contribute to correlation between external value of dollar and level of FDI in US. They have found that modeling a link between FDI and exchange rate would require some beliefs in long run and short run deviation from PPP (Purchasing power parity) on cross border investment process. **Caves (1989), Froot and Stein(1991), Harris and Ravenscroft (1991) and Swenson (1993)** has concluded that depreciating dollar is associated with higher flows of FDI in US and a higher foreign takeover premia. **Dewenter (1995)** examined this issue but no statistically significant relationship between the level of exchange rate and FDI. It was found that inflows of FDI will have no significant effects on nominal exchange rates in Sri Lanka. On the other hand Pakistan should take into account the effect of FDI inflows on the nominal exchange rates in short run although inconsequential in long run. **McCulloch(1989)** summarizes that the exchange rate movements should not affect FDI inflows because if an asset in particular country is viewed as a claim to future stream of profits denominated in that country's currency, and if profits will be converted back to domestic currency of the investor at the same exchange rate, the level of exchange rate does not affect the present discounted value of the investment. A random walk characterization for exchange rate evolution process implies that the expected future exchange rate levels should be same as current rate. This implies perfect elasticity of exchange rate expectation to present exchange rate, a notion strongly contradicted by survey evidence like **Franke and Froot (1987). Froot and Stein (1991)** claimed that the level of exchange rate may influence the inward flow of FDI. The depreciation of the host currency makes the asset price cheaper thereby increases the ability of the firms to invest. Thus the depreciation of the host currency should increase the FDI and conversely the appreciation of the host country currency should decrease the FDI. **Campa (1993)** says the firms decision whether or not to invest abroad depends on the expectations of future profitability. **Goldberg and Kolstad (1994)** supported **Cushman (1985, 1988)** distinguishing between the three different risk characteristics of firms; risk averse, neutral and loving. **Goldberg and Kolstad (1994)** employed quarterly bilateral data of US FDI entering the UK, Japan and Canada. Exchange rate uncertainty was found to increase levels foreign direct investment from risk averse multinationals when uncertainty is "correlated with export demand shocks within the foreign market" **(Goldberg and Kolstad 1994).**

An appreciation of host currency will increase FDI in to the host country, ceteris paribus, which is contrary to the prediction of **Froot and Stein (1991).** Thus the literature shows several contradictory facts and thus the issue warrants careful observation in a country specific manner.

Campa (1993) observed trends in the wholesale markets which conflicted with **Cushman (1985 1988) and Goldberg and Kolstad (1994). Campa (1993)** found that exchange rate volatility reduced FDI flows, as an increase in exchange rate volatility suppresses a firms desire to invest abroad. It was suggested that the option value of 'waiting' rises when facing exchange rate uncertainty (and therefore the opportunity cost of investing rises). Industries in which firms obtain large amounts of physical and intangible assets were suggested to have possessed the most volatile responses to volatility. **Benassy, Fontagne and Lahreche (2001)** found a similar trend in FDI stocks from 17 developed countries in developing economies between 1984 and 1986. Benassy et al (2001) obtained quarterly nominal exchange rate variation as a measurement of volatility and employed real FDI stocks data from OECD.

More recent literature has attempted to explain the contradicting results obtained by earlier papers. Heterogeneity theories have been employed in explaining ambiguous results from past empirical analysis guilty of using national aggregated data. **Barrel, Gottschalk and Hall (2007)** employed Tobin's q theory of investment to explain the observed US FDI outflows into Europe. US firms appeared risk averse with volatility suppressing outwards FDI flows. Barrel et al (2007) found that market structure, a proxy of market power held by the MNC, had no significant impact on responsiveness to exchange rate volatility. **Jeanneret (2011)** used heterogeneity of productivity to explain the aggregation issues, building on work by **Melitz (2003) and Bernard et al (2003).** Jeanneret (2011) assessed the tradeoff between direct investment and exporting as methods of supplying the foreign market, using a large panel data set of Outwards FDI for 27

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OECD countries through a 20 year period (1982-2002). Jeanneret (2011) concluded that "less productive firms are more inclined to relocate production (therefore increase FDI) when exchange rate volatility is low, whereas more efficient firms tend to invest abroad when the level of uncertainty is higher" (Jeanneret 2011, pg.11). A 'U-shaped' relationship between FDI and uncertainty was observed.

Kiyota and Urata (2002) followed the framework of Froot and Stein (1991) and Benassy et al (2001). By disaggregating FDI down to its industry components, Kiyota and Urata (2002) tested for individual characteristics across industries which influence firms' reactions to exchange rate volatility. Kiyota and Urata (2002) observed FDI outflows leaving the US and Japan across eleven different industries from 1990-2000. A negative significant relationship with volatility was observed across aggregated FDI, with 10 /11 industries providing significant coefficients on volatility for Japanese FDI and 8/11 for the US. The largest magnitude was measured on heavy machinery and transport equipment, finance and food industries failed to provide significant results in Japan and the US respectively.

Objectives:

We would like to empirically study the long and short run causal relationship between the Real Effective exchange rate and foreign direct investment in India during 1991 -2013 using a time series data. A vector auto-regression model establishes the existence of such correlation.

Methodology:

The method involves time series analysis of the FDI (foreign direct investment) and average Real Effective exchange rate data between 1991 and 2013. We use a unit root test to check stationarity of the time series data, and the Cointegration test for analyzing the long run association of the variables namely the foreign direct investment inflow and the average real effective exchange rate. Since the time series of Exchange rates as well as the corresponding series for FDI do not exhibit stationarity, we go for an optimal lag selection through Akaike Information criterion. Also we use the Vector Auto regression (VAR) model to assess the long and short run correlation between the FDI and the exchange rate.

Mathematically Methodology defined as:

In the present study we are trying to estimate the equations that define for the long run, the dependence of FDI with several macroeconomic variables. The usual procedure adopted for such estimation is Multivariate regression which leads to an equation of the form (1)

$$x_{1t} = g_2 x_{2t} + g_3 x_{3t} + \cdots + g_n x_{nt} + e_t \quad \ldots\ldots (1)$$

The variables that we have considered are current FDI, current exchange rate, the lag values of FDI and the lag values of Exchange rate exhibit autocorrelations meaning that they exhibit dependencies on their lags. Hence autoregressive modeling is being taken up. A typical autoregressive model (AR(p)) of order p is used when the variables concerned are depending on 'p' lags. In (2) below we write the equation that models such an autoregressive process.

$$y_t = c + a_1 y_{t-1} + a_2 y_{t-2} + a_p y_{p-t} + \varepsilon \quad \ldots\ldots (2)$$

The technique of cointegration introduced by Granger develops a more reliable method to look for causality and hence may lead to better forecasting tools. Using the software E-views we estimate the cointegration coefficients so as to check the significance of short term and long term causality ofexchange rate to influence FDI decisions.

Findings

Our research had as it null hypothesis that Foreign direct Investment decisions are not influenced by the host country' real effective exchange rate (REER). Johenson Cointegration test shows that the none of the variables under consideration are cointegrated, the trace statistics shows that the p value is > 5 % indicating that we cannot reject the Null Hypothesis. The Unit root test is a test to show whether the two variables under consideration i.e FDI (Foreign direct investment) and REER (Real Effective Exchange rate) are stationary or not. The Unit root test for Exchange rate ADF at Level for Intercept is 0.1128, trend and Intercept 0.7046 and for None 0.9481 which is > 5% indicating that the data has a unit root or the data is not stationary. The first difference ADF p -values for Intercept 0.0052, Trend and Intercept 0.0127 and None 0.0005 indicating the data does not have a unit root at first difference. Similarly the Unit root test for FDI (Foreign direct investment) with ADF p –values at Level Intercept 0.1514 , Intercept and Trend 0.0704 and None 0.9481 shows that the data has a unit root at Level indicating that it is not stationary. The first difference ADF p- value for Intercept 0.0539, Trend and intercept 0.0396, and None 0.0280. Indicating that the first difference does not have a unit root. As the data is not stationary at Level we use Vector Auto regression model. The Independent variable FDI(-1) with a coefficient C(1) is significant with p value of 0.0000 and the FDI(-2) with coefficient C(2) is significant with p value of 0.0050. All the other coefficients are not significant indicating no long run correlation. Similarly Wald test was conducted to show the influence of two or more variables together on Independent variables i.e. C(3) and C(4) together, C(8) and C (9) together. Here the results we obtained show Chi square value with probability of 0.5246 and 0.4622 respectively indicating that the variables jointly cannot influence the dependent variable.

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Hence we see that there is no statistical evidence for the quantum of FDI investments into India to be dictated by the trends in Real Effective Exchange rate.

Conclusion:

The exchange rate fluctuation essentially does not impair the quantum of foreign direct investment. It can be assumed that inward flow of direct investment is independent of exchange rate volatility. But the first lag and second lag of the foreign direct investment exhibits a significant relationship between the foreign direct investments indicating that the lagged FDI could be responsible for attracting FDI in the subsequent year.

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Appendix: Tables:

Table :1

Date: 09/04/13 Time: 14:42
3 Sample (adjusted): 1992 2013
Included observations: 27 after adjustments
Trend assumption: Linear deterministic trend
Series: REER FDI
Lags interval (in first differences): 1 to 1 Unrestricted Cointegration Rank Test

(Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value
None	0.352542	10.57599	15.49471
At most 1	0.170901	3.186073	3.841466

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table:2 Tabulation indicating Unit root test for the variables(REER and FDI) under Intercept , Intercept and trend and None for level and first difference.

Unit Root Test For REER	
Intercept	p-value
At Level ADF	0.1128
At 1st Difference	0.0052

Table2 (a) : Unit root Test (REER) under Trend and Intercept and None

	p-value (Trend Intercept)	p-value (None)
At level ADF	0.7046	0.9481
At first difference ADF	0.0127	0.0005

Table 3: Unit root Test (FDI) under Intercept, Intercept and trend and None for level and first difference.

Unit Root Test For FDI Intercept p-value	
At Level ADF	0.1514
At First Difference ADF	0.0539

Table 3 (a)Unit root test (FDI) under Trend and Intercept and None

	p-value (Trend Intercept)	p-value (None)
At level ADF	0.7046	0.9481
At first difference ADF	0.0396	0.0280

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VAR Model FDI as dependent variable and REER as independent variable
Long run correlation

System: UNTITLED
Estimation Method: Least Squares
Date: 09/05/13 Time: 20:46
Sample: 1992 2013
Included observations: 27
Total system (balanced) observations 44

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	1.697534	0.251837	6.740620	0.0000
C(2)	-0.905518	0.292621	-3.094508	0.0050
C(3)	-149.2891	471.0752	-0.316911	0.7541
C(4)	281.6353	410.0798	0.686782	0.4988
C(5)	-3133.282	7066.626	-0.443391	0.6615
C(6)	-0.000174	0.000166	-1.048213	0.3050
C(7)	0.000232	0.000193	1.197992	0.2426
C(8)	0.525049	0.311384	1.686180	0.1047
C(9)	0.257073	0.271066	0.948378	0.3524
C(10)	10.12907	4.671090	2.168460	0.0403
Determinant residual covariance	39499313			

Equation: FDI = C(1)*FDI(-1) + C(2)*FDI(-2) + C(3)*REER(-1) + C(4)*REER(-2) + C(5)

Equation: REER = C(6)*FDI(-1) + C(7)*FDI(-2) + C(8)*REER(-1) + C(9)*REER(-2) + C(10)

Table 4: Wald Test to check the shortrun association between the coefficients

C(3)=C(4)=0 Together influence FDI

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	1.290161	2	0.5246
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(3)		-149.2891	471.0752
C(4)		281.6353	410.0798

Restrictions are linear in coefficients.
Wald Test: C(6)=C(7)=0
together influence REER System: Untitled

Test Statistic	Value	df	Probability
Chi-square	1 543471	2	0 4622
Normalized Restriction (= 0)		Value	Std. Err.
C(6)		-0.000174	0.000166
C(7)		0.000232	0.000193