

## **Relationship of Foreign Direct Investment (FDI) Inflows and Exchange Rate in the Context of India: A Two Way Analysis Approach**

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*Abstract*— This paper analyses interdependency of Foreign Direct Investment (FDI) inflow and exchange rate from the perspective of Indian economy. To determine the relationship between these two time series data, Granger Causality Test (GC Test) is applied. Before applying GC test, time series data are subjected through Augmented Dicky Fuller Test (ADF) to achieve stationarity of the variables. From the GC test, it is observed that the FDI inflow with lag period 1 and 2 jointly show causality on exchange rate with a probability value: 49.57%. Similarly, exchange rate with lag period 1 and 2 jointly show causality on FDI inflow with a probability value: an 8% .The probability value shows that there is insignificant effect of FDI inflow on currency exchange rate. However, it can be interpreted as the existence of a causal relationship of exchange rate on FDI inflow. This experiment is conducted on twenty five years, time series data from 1991-2016 extracted from secondary data source.

**Key Words:** FDI inflow, Currency, Liberalization, Granger Causality Test, Augmented Dicky Fuller Test, Exchange rate

### **INTRODUCTION**

Foreign Direct Investment (FDI) is a key driver for economic growth of any developing economy. Inflow of FDI depends on several factors- Government policies, openness of an economy to the international market by international trade, the currency exchange rate at which economy exchanges goods and services with another economy, etc. Discussing this issue from the perspective of India, FDI plays a major role in shaping the structure of Indian Economy since 1991. After LIBERALIZATION, PRIVATIZATION and GLOBALIZATION, in 1991, Indian Economic policies were reconstructed for the development of Indian Economy. The economic policies were designed with the aim to create a market oriented economy, an open economy and a foreign investment oriented economy. The strategies taken to achieve this goal of accumulating foreign investment were tax reduction, participation of private sectors in the economy, reduction of tariff, expansion of quota, reduction of imports, expansion of exports and reduction in the value of Indian rupees with respect to dollar (Exchange Rate).

On the other hand, exchange rate is another crucial factor for determining the growth of the economy. Exchange rate determines international trade of a country. A depreciation of currency results in a decrease in the relative price of export. This helps in increasing export volume. At the same time, depreciating exchange rate helps to attract more foreign investment – either through direct investment or through institutional investment. However, from the point of view of maximizing profit out of the existing investment, depreciating currency diminishes it.

Thus, keeping in mind a strong interdependency between FDI and exchange rate, this paper concentrates on the two way impact analysis of FDI and Exchange Rate. To analyse and check a causal relationship between FDI and Exchange Rate mathematically, we have adopted Granger-Causality Test. Test signifies that the exchange rate with lag period 1 and 2 does not granger cause FDI inflow (probability value: 8%) .Similarly, FDI inflow with lag period 1 and 2 does not granger cause exchange rate (probability value: 49.57%). Data taken for 25 years and shown in Graph 1 and Graph 2 examines clearly that there is no significant relationship between FDI and Exchange Rate in the long run.

## REVIEW OF LITERATURE

Standing in the second position to acquire FDI from different countries, India is pushing its growth of development at faster rate. Like India, there are different South Asian Economies where FDI penetration created a positive impact to let the country pursue with higher economic growth. We have discussed these studies related to these stages of development of different economies by assessing few reviews of literature.

Nagesh Kumar (1998), in his article- “Liberalization and Changing Patterns of Foreign Direct Investments: Has India's Relative Attractiveness as a Host of FDI Improved?” , explored the sectoral percentage of the foreign capital inflow as a part of total FDI. In his analysis, he found the major percentage of FDI was channelized to energy and service sectors than manufacturing sector. According to his analysis, having high potential of implementing FDI into profits, India is still facing FDI fund crunch in its economy. MNEs should be encouraged to seek efficient markets for their operations .Employment; labour supply, technical labour source and cheap labour cost are the macroeconomic variables which are to be given importance to promote growth in the Indian Economy apart from FDI regulations in India.

Arindam Banik, (2003) in his research “Foreign Direct Investment Inflows to India and China: Trends, Assessments and Determinants” examined different factors affecting FDI into India and China during a period of 1979-2000.It was found that USA is the major investor in India Result shows Gross National Product (GNP) and its lagged values jointly affect FDI in both India and China. On the other hand, only in India, it is seen that FDI and domestic investment is highly correlated. In terms of OLS estimates, he examined linearity between GNP (as a proxy of increase in market size) and FDI.

Constantinos Alexiou,Persefoni V. Tsaliki ,(2007) in their study “ Foreign Direct Investment-Led Growth Hypothesis: Evidence from the Greek Economy” focused on finding the importance of FDI in the development of the economy of Greece. It was found that in Greece, the adjustment of GDP is followed by the change in FDI.A descriptive analysis of this kind helps us to find out the fluctuation of the macroeconomic variables in reality.

Muhammad Tariq Majeed, Eatzaz Ahmad (2007), in their analysis -”FDI and Exports in Developing Countries: Theory and Evidence” proved that GDP, economic growth, domestic absorption in an economy positively affects FDI, whereas, external debt and BOP deficit has a negative relation with FDI. In this analysis, it is proved that domestic investment outweighs the effects of FDI. It has a negative impact with FDI creating a limiting capacity oriented investment in the 49 developing countries. In this study, it was mentioned that developing countries cannot face growth in their developments with penetration of FDI being a complementary to domestic investment.

Erdal Demirhan, Mahmut Mascain (2008), in their article - “Determinants of Foreign Direct Investment Flows to Developing Countries: A Cross Sectional Analysis” examined the factors determining FDI for developing countries’ Infrastructure and GDP (reflecting the size of population and income). This study concludes with the direction of analysis that foreign investors go for large economies rather growing economies.

Zafar Mueen Nasir, Arshad Hassan (2011), in “Economic Freedom, Exchange Rates Stability and FDI in South Asia” explored that economic freedom and attraction of FDI in South Asia. They proved that with an economic freedom present in an economy, FDI is attracted towards the developing countries. He also suggested improving infrastructure and technical skill of the labour source as these are the basic requirements of FDI inflow in an economy.

Aekapol Chongvilaivan (2012), in ”From Inward to Outward: An Assessment of FDI Performance in Thailand” analyzed inward FDI is the key driver of economic growth for the developing economies like India, Thailand, China and Malaysia. FDI is the main factor of growth for the development of an economy. But due to 2008 global recession, the amount of FDI was low and for this, the growth of world economy hampered.

B.K. Loksha, D.S. Leelavathy (2012), in their study “Determinants of Foreign Direct Investment: A Macro Perspective” discussed about the performance of the policy measures to boost an economy by attracting FDI into India. They specify on competitiveness and economic stability of a country to attract FDI and there by choosing a way to reach higher economic development.

## **RESEARCH GAP**

Conferring the past reviews of literature, it is evident that FDI is the prior macroeconomic variable to determine a long run growth of an economy irrespective of its structure of development. The major concentration was given either to determine factors affecting to FDI or the performance of FDI in developing economies like India, China, and Pakistan.

The need to carry out a two way analysis to find the effect of FDI and Currency in India—which is thus the research gap of this paper.

This paper focuses on the following objectives:

- a. To know the relationship of FDI and currency (INR/\$) graphically for a span of 25 years.
- b. To measure the impact of FDI inflow on currency and the effect of currency on FDI inflow for 25 years.
- c. To discuss about probable policy measures for Indian Economy.

## **METHODOLOGY**

To measure this two way impact, we have tested the dataset with Granger Causality Test. To run this test, we have to check whether data taken here are stationary or not. In this range of data, FDI inflow and currency all are non-stationary. To make these variables stationary, we have taken First Difference of the variables. To make the dataset stationary, we have performed Augmented Dicky Fuller Test (ADF). The results of the tests are shown in Appendix 1-Appendix 4. After taking the data as stationary, we have run the Ganger Causality Test and the results are

shown below.,

## ANALYSIS AND INTERPRETATION

Figure 1 and 2 show year wise pattern of FDI inflow and Currency (INR/\$) in India.

Figure:1:

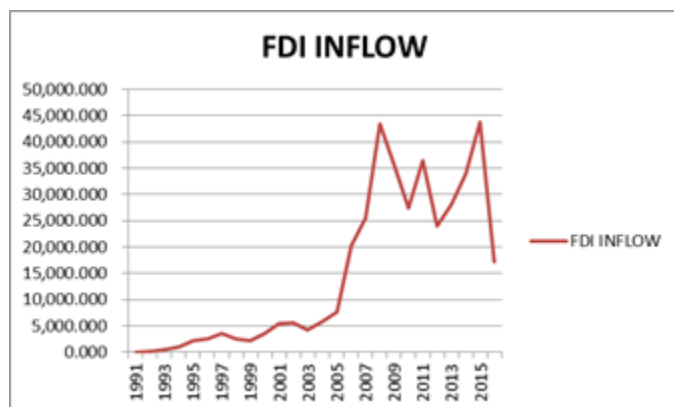


Figure: 2:

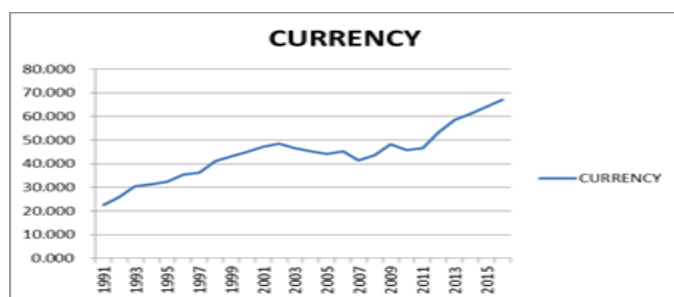


Figure 2 shows there is a clear pattern of depreciation of Indian currency during these years, but, Figure 1 has no deterministic trend giving an ambiguous relation between FDI inflow and currency into India.

To test this graphical analysis mathematically, we have run Granger Causality Test.

The generic equation of Granger Causality (Whether variable x granger causes y) is:

$$Y_t = a_0 + \sum_{i=1}^n (a_i \times y_{t-i}) + \sum_{j=p}^q (b_j \times x_{t-j}) + \text{Error}_t$$

The result of our test is analyzed below:

### **Granger Causality Test Results:**

As FDI inflow and currency have unit roots, we have taken First Difference of FDI inflow and currency and renamed the variables as DFDI\_INFLOW( $\Delta$ FDI\_INFLOW) and DCURRENCY( $\Delta$ Curr), where  $\text{DFDI\_INFLOW} = d(\text{FDI\_INFLOW})$  and  $\text{DCURRENCY} = d(\text{CURRENCY})$ . To check Granger Causality, we have taken Null Hypothesis as

$H_{01}$  :  $\Delta$ FDI\_INFLOW does not create an impact (granger cause) on  $\Delta$ Curr

$H_{02}$  :  $\Delta$ Curr does not create an impact (granger cause) on  $\Delta$ FDI\_INFLOW

Against

$H_{11}$  :  $\Delta FDI\_INFLOW$  creates an impact (granger cause) on  $\Delta Curr$

$H_{12}$  :  $\Delta Curr$  creates an impact (granger cause) on  $\Delta FDI\_INFLOW$

VAR-Granger Causality/Block Exogeneity Wald Tests

Date: 12/29/16 Time: 18:15

Sample: 1991 2016

Included observations: 23

Dependent variable: DCURRENCY

Excluded	Chi-sq	df	Prob.
DFDI_INFLOW	1.403582	2	0.4957
All	1.403582	2	0.4957

Dependent variable: DFDI\_INFLOW

Excluded	Chi-sq	df	Prob.
DCURRENCY	4.961137	2	0.0837
All	4.961137	2	0.0837

The above result shows that  $\Delta FDI\_INFLOW$ , being an independent variable does not create any impact on  $\Delta Curr$  as the probabilistic value is 49.57%(more than 5%). Hence, here, we accept Null Hypothesis and reject a causal relationship between them.

On the other hand,  $\Delta Curr$ , being an independent variable does not create any impact on  $\Delta FDI\_INFLOW$  as the probabilistic value is 8.37%(more than 5%). Hence, here, we accept Null Hypothesis and reject a causal relationship between them.

The second result gives still better analysis because if we consider 90% confidence interval, this result is the next best solution giving an indication of a causal relationship between Currency(Independent variable) and FDI inflow(Dependent variable).

Now, to check the result through Wald Statistics, we take the two Structural Equations as:

$$\Delta Curr_t = a_0 + \sum_{i=1}^n (C_i \times \Delta Curr_{t-i}) + \sum_{j=p}^q (C_j \times \Delta FDI\_INFLOW_{t-j}) + Error_t$$

.....Eq 1

$$\Delta FDI\_INFLOW_t = a_1 + \sum_{i=1}^n (C_i \times \Delta Curr_{t-i}) + \sum_{j=p}^q (C_j \times \Delta FDI\_INFLOW_{t-j}) + Error_t$$

.....Eq 2

Here,

$a_0$  and  $a_1$  is the constants for two equations and  $C_j$  ,  $C_j$  are the respective coefficients of the equations.

Through Structural Equations, we are able to prove the joint effects (past two years) of one variable on the other.

The tables (Table 1, and Table 2) shown below explain that FDI inflow (jointly with two period past values) cannot create an impact on currency and vice versa.

### **Table 1:**

Wald Test:  
System: {%system}

Test Statistic	Value	df	Probability
Chi-square	1.403582	2	0.4957

Null Hypothesis:  $C(3)=C(4)=0$   
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(3)	5.45E-05	9.93E-05
C(4)	-8.74E-05	9.66E-05

Restrictions are linear in coefficients.

**Table 2:**

Wald Test:  
System: {%system}

Test Statistic	Value	df	Probability
Chi-square	4.961137	2	0.0837

Null Hypothesis:  $C(6)=C(7)=0$   
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(6)	-1512.990	688.3691
C(7)	560.8531	772.0288

Restrictions are linear in coefficients.

The above Table 1 and Table 2 show the respective probabilistic values related to the causality.

$H_{01}$  : There is no impact of FDI inflow(joint effect-lag period 1 and 2) on currency [ $c(3)=c(4)=0$ ],Where C(3) is coefficient of FDI\_INFLOW(lag 1) and C(4) is coefficient of FDI\_INFLOW(lag 2).

$H_{02}$  : There is no impact of currency (joint effect-lag period 1 and 2) on FDI inflow [ $c(6)=c(7)=0$ ] Where C(6) is coefficient of Currency(lag 1) and C(4) is coefficient of Currency(lag 2).

Table 1and Table 2 show that the probability values are respectively 49.57% and 8.37%, which are more than 5 %. Therefore, we can accept Null hypothesis which says

- jointly(with lagged period 1 and 2) cannot affect Currency.
- Currency jointly (with lagged period 1 and 2) cannot affect FDI inflow.

## V.CONCLUSION

The above result clearly explains that there is no causal relationship between FDI and currency in the long run. Erdal Demirhan, Mahmut Masca(2004) mathematically determines the factors affecting to FDI flows to developing economies. In this, it is observed that market size, growth, trade openness , labor cost and productivity, infrastructure and tax are playing the major role in determining the FDI flow in an economy. There is no clear mention of exchange rate being the contributor for the determination of FDI flow in developing economies. However, a nonlinear

relationship between FDI and currency is attained with these variables. Still a proper causal relationship cannot be formed because of the in-deterministic trend pattern of FDI. During a situation of continuous rupee devaluation against dollar, foreign investors will be attracted towards Indian investment if and only if Indian rupee touches too low and it is stabilized. Only then, foreign investors will invest their money into Indian market to get positive return on their investment. FDI inflow has its pros and cons, but still it can be encouraged irrespective of currency fluctuation in a substantial amount to generate more employment, productivity, GDP growth, and to remove poverty which is a target taken by Indian Government by 2032.

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### **Appendix1:**

Null Hypothesis: CURRENCY has a unit root  
Exogenous: Constant  
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

	t-Statistic	Prob.*
<b>Augmented Dickey-Fuller test statistic</b>	<b>-0.367649</b>	<b>0.9005</b>
Test critical values: 1% level	-3.724070	
5% level	-2.986225	
10% level	-2.632604	

$H_0$  : Currency has a Unit Root.

Probabilistic value: 90.05% .

Acceptance of  $H_0$  .Hence, we take the First Difference and Run ADF test and the result is:

### **Appendix 2:**

Null Hypothesis: D(CURRENCY) has a unit root  
Exogenous: Constant  
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

	t-Statistic	Prob.*
<b>Augmented Dickey-Fuller test statistic</b>	<b>-3.867009</b>	<b>0.0075</b>
Test critical values: 1% level	-3.737853	
5% level	-2.991878	
10% level	-2.635542	

$H_0$  : DCurrency has a Unit Root.

Probabilistic value: 0.075% .

Rejection of  $H_0$ .

### **Appendix 3:**

Null Hypothesis: FDI\_INFLOW has a unit root  
Exogenous: Constant  
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

	t-Statistic	Prob.*
<b>Augmented Dickey-Fuller test statistic</b>	<b>-1.582044</b>	<b>0.4766</b>
Test critical values: 1% level	-3.724070	
5% level	-2.986225	
10% level	-2.632604	

$H_0$  : FDI inflow has a Unit Root.

Probabilistic value: 47.66% .

Acceptance of  $H_0$  .Hence, we take the First Difference and Run ADF test and the result is:

### **Appendix 4:**

Null Hypothesis: D(FDI\_INFLOW) has a unit root  
Exogenous: Constant  
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

	t-Statistic	Prob.*
<b>Augmented Dickey-Fuller test statistic</b>	<b>-4.931194</b>	<b>0.0006</b>
Test critical values: 1% level	-3.737853	
5% level	-2.991878	
10% level	-2.635542	

$H_0$  : D CURRENCY has a Unit Root.

Probabilistic value: 0.06% .



Rejection of  $H_0$  .

**Dataset:**

YEAR	FDI INFLOW	CURRENCY
1991	75.000	22.742
1992	252.000	25.918
1993	532.000	30.493
1994	974.000	31.374
1995	2,145.000	32.427
1996	2,523.000	35.433
1997	3,619.000	36.313
1998	2,633.000	41.259
1999	2,168.000	43.055
2000	3,585.000	44.942
2001	5,472.000	47.186
2002	5,627.000	48.610
2003	4,323.000	46.583
2004	5,771.000	45.316
2005	7,606.000	44.100
2006	20,336.000	45.307
2007	25483.000	41.349
2008	43407.000	43.505
2009	35597.000	48.405
2010	27396.000	45.726
2011	36498.000	46.67

2012	23996.000	53.437
2013	28153.000	58.598
2014	33870.000	61.03
2015	43857.000	64.152
2016	17281.000	67.197

[Data Source: The Organisation for Economic Co-operation and Development (OECD)]