A Causal Nexus Between FDI and Economic Growth of India: An Empirical Study

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Abstract

The study investigates the causal relationship between FDI and GDP over the period 1993-2013 using annual data. The study has employed certain econometric tools to analyse the behavior of both the series. Unit root test is applied to test for stationarity of time series data and it is found that the series are stationary at first difference. Johansen's co-integration test has been applied to explore the long-run equilibrium relationship between FDI and GDP. The analysis reveals that FDI and GDP are co-integrated and, hence, a long-run equilibrium relationship exists between them. The Vector Error Correction Model (VECM) has shown that the lagged terms of FDI influence the GDP of India. The Granger causality test exhibits the presence of short run relationship between FDI and GDP and the relationship appears to be bidirectional. It is concluded with the empirical evidences

that economic growth attracts foreign direct investment to India and foreign direct investment in turn, also drives economic growth.

Keywords: *FDI, GDP, Cointegration, VECM, Granger Causality*

Introduction

The significance of Foreign Direct Investment (FDI) in developing economies like India has been viewed as an important factor contributing to economic growth. The need for foreign capital in such countries arises on account of inadequate domestic resource availability. It may be difficult to mobilize domestic savings for financing of the projects that are badly needed for economic development; the capital market is itself underdeveloped. During the period in which the capital market is in the process of development, foreign capital is essential as a temporary measure. Foreign capital brings with it other scarce productive factors, such as technical know-how, business experience and knowledge which are equally essential for economic development (Ibrahim & Muthusamy, 2014). Of course, it should also be acknowledged that, potential drawbacks do exist, such as deterioration of the balance of payments as profits are repatriated.

During the late 1980s and 1990s, the inflow of FDI increased rapidly in developing economies. In India, introduction

of economic reforms in 1991 accelerated the inflow of FDI. Since then, over the period, India has adopted liberalised FDI policy, which in turn has attracted the attention of global investors towards India. Over the years foreign direct investment in different sectors grew at a phenomenal rate. According to the World Development Indicator Data Base of World Bank (2012), net foreign direct investment in India, in 2012 was $23,996 million, having a share of 1.3 percent of GDP, while the global net inflow of FDI was $ 1,562,277 million. During the reforms period not only FDI inflow has increased but also the economic growth has improved. The GDP has recorded an impressive growth rate of more than 7 percent on an average per annum during the last two decades.

Undoubtedly, amidst the agreements and disagreements on the utility of FDI in Indian economy, inflow of FDI and GDP are growing rapidly. At present, there is a consensus among the scholars to some extent that FDI inflows and economic growth rate are positively associated. The presence of positive relationship between FDI and economic growth has led to the emergence of a question on much debated issue of causality. Does increasing inflow of foreign direct investment drive economic growth in the long run or do rapidly growing domestic economy attracts more foreign direct funding in different sectors. Theoretically, neither of the possibilities can be ruled out. Therefore, empirical studies are increasingly focusing on the issue of causal relationship between FDI and economic growth.

Review of Literature

During the last two decades a large number of researches focused on the relationship between inflow of foreign direct investment and economic growth in developing countries. But there is no consensus with regard to the direction of causality. Some of the studies found the presence of unidirectional causality between FDI and economic growth, while some others revealed the existence of bidirectional relations. There are few studies explored the absence of cointegration and causal relationship between these variables. And again, the studies which have noticed the presence of unidirectional causality are not unanimous in the direction of causality as in some findings causality runs from FDI to economic growth while in others from economic growth to FDI.

Rudra, et.all (2009) investigated the relationship between FDI and economic growth of ASEAN countries over the period of 1970-2007 using co-integration and causality test. Their results suggested that FDI and economic growth are co-integrated. The study explored that there was bidirectional causality between FDI and economic growth for all countries except Malaysia.

Samad (2014) empirically tests the direction of causality between the domestic economic product (GDP) growth and foreign direct investment (FDI) in twelve South East Asian countries using the vector error correction (VEC) model and the Granger causality test. The structural break test and the Johansen Co-integration test are performed before

applying VEC. The study finds that inflow of FDI is more likely to promote GDP growth. In eight countries, causality runs from GDP growth to FDI. In two countries, FDI Granger causes GDP growth.

In contrast, the empirical study of Herzer, et.all (2008) found no causality between FDI and economic growth. They examined the FDI –GDP growth hypothesis for 28 developing countries. Using Engle-Granger cointegration and error correction model, they fail to find the existence of long run and short run relationship between FDI and economic growth in most of the countries included in the sample.

Miankhel, et.al (2009) studied the relationship between export, FDI and GDP for six emerging countries of China, India, Mexico, Malaysia, Pakistan and Thailand over the period of 1970-2005 using VECM. The result suggests that export drives the economic growth of Pakistan and FDI drives the economic growth of India. The study explores the presence of bidirectional causality between FDI and GDP in Thailand, while no causal relationship is found in Malaysia.

Similar results are obtained by the study conducted by Hossain and Hossain (2012). The study examined the co-integration and causal relationship between FDI and GDP in the short and long run of Bangladesh, Pakistan and India over the period of 1972-2008. Econometric models- Augmented Dickey Fuller (ADF) test, Engle-Granger two step co-integration test, Vector Error Correction

Mechanism (VECM) and Granger causality test have been used. The results suggest that in Indian case there is no co-integration between FDI and GDP in the long and short term. Granger causality test reveals the presence of unidirectional relationship in India which runs from FDI to economic growth.

Besides that, Sridharan, et.al. (2009) examined the causal relationship between FDI and economic growth of the BRICS countries based on Johansen co-integration test and Vector Error Correction Mechanism (VECM). They found that there was bi-directional causality between FDI and GDP for Brazil, Russia and South Africa and unidirectional relationship running from FDI to economic growth for India and China.

Later, even Agarawal (2014) examined the relationship between FDI and economic growth in the BRICS economies over the period 1989-2012 with slightly differentiated results. The empirical methodology employed for the study was co-integration and causality analysis at panel level. The results indicate the presence of long run equilibrium relationship between the two variables and conclude confirming the long term causality running from FDI to economic growth in BRICS economies.

Ibrahim and Muthusamy (2014) empirically tested the role of FDI in Indian economy. The study was conducted for a period of ten years, starting from 2003-04 to 2012-13. It was found that FDI has significant impact on the Indian economic growth. Agarwal and Khan (2011) concluded that 1 percent increase in FDI would result in 0.07 percent increase in GDP of China and 0.02 percent increase in GDP of India.

Gaikwad (2013) analyzed the effects of FDI on the GDP growth in Indian economy using Cobb-Douglas production function and ARDL method during the period 1990-2008. The empirical results show that there exists a long run relationship among the growth of GDP and the real FDI. Findings indicate that FDI has positive effect but small significant on GDP.

The two-way link between foreign direct investment and growth for India is explored by Basu (2002) using a structural co-integration model with vector error correction mechanism. The existence of two co-integrating vectors captures the long run relationship between FDI and GDP. The VECM model reveals the causality running more from GDP to FDI.

Ray (2012) also studied the causal relationship between FDI and economic growth in India, using co-integration approach for the period 1990-91 to 2010-11. Johansen co-integration test indicates the existence of log run equilibrium relationship between the FDI and GDP. The error correction estimates confirm that there is not any problem in the long run equilibrium relation between the independent and dependent variables. The Granger causality test explores the presence of uni-dimensional causality which runs from economic growth to FDI.

Anitha (2012) theoretically overviewed and empirically tested the important role FDI plays in the development of India in the post-liberalisation period. The results show that 1 percent increase in GDP causes 6.17 percent increase in FDI inflow in India.

Verma and Baidhanathan (2014) conducted a study to test empirically the significant role FDI would play as the economic growth engine. The study covered a period of 34 years from 1980 to 2013. The independent sample t-test, multiple regression and ARIMA model are used in the study. Results show significant relationship of GDP with FDI inflows in India. It is also found that GDP growth is the major factor in determining the FDI inflow.

Chakraborty, et.al. (2002) conducted an empirical study on the cointegration between FDI and growth in India. The results explored unidirectional link between FDI and growth in India using a structural cointegration model. A VECM estimate confirms the existence of two co-integrating vectors between FDI and GDP and there is no problem in their relationship.

Thus, the empirical evidence on the causal link between FDI and economic growth is mixed and deserves fresh enquiry into this issue.

Objectives

The main objective of this study is to explore the causal nexus between FDI and economic growth in India. The specific objectives are:

- To examine the dynamics of short term linkages between FDI and economic growth.
- To explore the presence of long term equilibrium relationship between FDI and economic growth.
- To capture the linear inter-dependencies among the variables under study.

Methodology

Variables and Data

As the present study aims at exploring the causal relationship between foreign direct investment and economic growth in Indian context, FDI and economic growth form the two main variables. The Gross Domestic Product (GDP) is used as the proxy for economic growth. The study uses the annual data for the period from 1992-93 to 2012-13 which indicates 21 annual observations. All the necessary data for the sample period are obtained from the secondary sources. Data are processed by applying econometric tools and techniques for facilitating further analysis through E-views.

Econometric Specification

The study has employed certain econometric tools and techniques for analysing the relationship between the variables. The study consists of the following steps:

- Test the stationary of data
- Test the co-integration between the variables
- Fitting an error correction model if co-integration is established, and
- Test the causal relationship between the variables

Tests of Stationarity

Empirical work based on time series data assumes that the underlying time series is stationary. Broadly speaking a data series is said to be stationary if its mean and variance are

constant overtime and the value of covariance between two time periods depends only on the distance or lag between the two time periods and not on the actual time at which the covariance is computed (Gujarati and Sangeetha, 2007). The present study checks whether GDP and FDI series are stationary by applying three different levels of tests. They are:

a) Graphical Analysis

b) Auto Correlation Function and Correlogram, and

c) Unit Root Test

Graphical Analysis

A visual plot of the data of the time series is the starting point of more formal tests of stationarity. Such a plot gives an initial clue about the likely nature of the series. The present study also makes preliminary investigation on the stationarity of time series under study i.e. FDI and GDP by plotting them in the line graph.

Auto Correlation Function (ACF) and Correlogram

After getting an initial feel on the possible nature of the time series data, the next test of stationarity adopted in this study is based on Auto Correlation Function (ACF). The ACF at lag k, denoted by pk, is defined as

$$pk = \frac{Yk}{Yo} \quad \text{---------- (1)}$$

Where, Yk is the covariance at lag k and y_0 is the variance.

ACF always ranges between -1 and +1 as any correlation coefficient does. After deriving the results, by plotting the covariance at *lag k (pk)* against variance *k*, a graph called correlogram is obtained. The critical question is how does one choose the lag length. A rule of thumb is to compute ACF up to one-third to one-quarter the length of the time series. Suppose the correlogram of an actual time series resembles the correlogram of a white noise time series, one can say that time series is 'probably' stationary.

Unit Root Test

An empirical way of checking the stationarity of the time series is by applying Unit Root Test. It has become widely popular test of stationarity over the past several years. Stationarity condition has been tested using Augmented Dickey Fuller (ADF) method. ADF test is the modified version of Dickey-Fuller (DF) test. ADF makes a parametric correction in the original DF test for higher order correlation by adding lagged difference terms of the dependent variable to the right hand side of the regression. The ADF test, in the present study, consists of estimating the following regression.

$$Yt = bo + \beta X Yt_{-1} + \mu_1 X Yt_{-1} + \mu_2 X Yt_{-2} + \sum_{i=1}^{m} \mu i X Yt_{-l} + et \quad \text{---------- (2)}$$

Yt represents the series to be tested, *bo* is the intercept term, β is the coefficient of intercept in the unit root test, μ_1 is the parameter of the augmented lagged first difference of the dependent variable *yt*, represents the i^{th} order autoregressive process, et is the white noise error term. The number of lagged difference terms to include is determined empirically, the idea being to include enough terms so that

the error term is serially uncorrelated (Gujarathi and Sangeetha, 2007).

The stationary condition under ADF test requires that: p value is less than 1 (IpI <1). Another way of stating the same is that the computed t value should be more negative than the critical t value (t statistic < critical value). The computed t statistic will have a negative sign and large negative t value is generally an indication of stationarity (Gujarathi and Sangeetha, 2007).

Johansen's Co - integration Test

If ADF test results exhibit the stationarity of the time series data and all the data sets are integrated at the same order, then we have to examine whether or not there exists a long run relationship between FDI and GDP. To investigate the co-integration between FDI and GDP, Johansen's Co-integration Test is administered. The Johansen method of co-integration applied in the study is as the follows:

$$Xt = a + \sum_{j=1}^{p} \beta j \, Xt - j + et \text{ ---------- (3)}$$

where, Xt is an n×1 vector of non-stationary I(1) variables, $\boldsymbol{a}$ is an n×1 vector of constants, p is the maximum lag length, βj is an n×n matrix of coefficient and $_{et}$ is a n×1 vector of white noise terms. The coefficient value indicates the degree of co-integration or relationship, while the sign preceding to the coefficient indicates whether the long run relationship between the variables is positive or negative.

Vector Error Correction Model (VECM)

Johansen's co-integration test reflects only the long term balanced relations between BSE Sensex and macroeconomic variables. Of course, in the short run there may be disequilibrium. In order to cover the shortage, correcting mechanism of short term deviation from long term balance could be adopted. Therefore, under the circumstances of long term causality, short term causalities should be further tested (Ray, 2012). Hence, the Vector Error Correction Model (VECM) is used to analyse whether error correction mechanism takes place if some disturbance comes in the equilibrium relationship. In other words, it is to measure the speed of convergence to the long run steady state of equilibrium. Thus the Johansen co-integration equation (3) has to be turned into a vector error correction equation as follows.

$$\Delta Xt = a + \sum_{j=1}^{p-1} \Gamma j \, \Delta Xt - j + \Pi Xt - p + et \text{ --------- (4)}$$

Where Δis the first difference operator,
Γj is $-\sum_{j=1+1}^{p} \beta j$ and Π is equal to$-1 + \sum_{j=1+1}^{p} \beta j$
and is an identity metrics.

Granger Causality Test

Upon confirmation of variables being co-integrated, study will proceed towards testing the presence of casual relationship between FDI and GDP administering the Granger causality test. Causality is a kind of statistical feedback concept which is widely used in the building of forecasting models (Ray, 2012). The Granger causality Test (1969, 1988) seeks to determine whether past values of a variable

help to predict changes in another variable. The Granger causality technique measures the information given by one variable in explaining the latest value of another variable. Inaddition, it also says that variable is Granger caused by variable if variable assists in predicting the value of variable If this is the case, it means that the lagged values of variable are statistically significant in explaining the variable (Ray, 2012).

FDI and GDP are interlinked and co-related. However, co-integration test provides no theoretical or empirical evidence that could conclusively indicate sequencing from either direction. For this reason, in the present study, Granger causality test was carried out on FDI and GDP. The causality test will see the reaction between FDI and GDP such as, if variable FDI has Granger cause to GDP and GDP also has Granger cause to FDI, it means that the value after GDP can help us to expect the value for the next period of FDI and also the value after FDI can help us to expect the value for the next period of GDP respectively. The Granger method involves the estimation of the regression equations. In this study of two-way variables (FDI & GDP) the following two equations are the formula for Granger causality regression test.

If the causality runs from FDI to GDP, then the Granger causality regression equation is;

$$GDPt = n + \sum_{a11} GDPt - 1 + \sum_{\beta 11} FDIt - 1 + \varepsilon_1 t \quad \text{-------} (5)$$

If the causality runs from GDP to FDI, then the Granger causality regression equation is;

$$FDIt = n + \sum_{a12} FDIt - 1 + \sum_{\beta 12} GDPt - 1 + \varepsilon_2 t \quad \text{-------} (6)$$

From the equation (5), *FDIt - 1* Granger causes *GDPt* if the coefficient of the lagged values of FDI as a group $\beta 11$ is significantly different from the zero based on F-test. Similarly, from equation (6), *GDPt-1* Granger causes *FDIt* if $\beta 12$ is statistically significant.

Hypotheses

The following hypotheses are developed to meet the objectives of the present study.

H_1: FDI has a unit root

H_2: GDP has a unit root

H_3: There is no co-integration between FDI and GDP

H_4: GDP does not Granger cause FDI

H_5: FDI does not Granger cause GDP

Results and Discussions

The empirical results of the study will be discussed and interpreted in four steps.

Tests of Stationarity

Graphical Analysis: As noted earlier, a visual plot of the data is usually the first step in the analysis of any time series. The first impression that we get from Figure.1 and Figure.2 is that both GDP and FDI seem to be trending upward. The upward trending lines suggest perhaps that the mean of the GDP and FDI has been changing. This perhaps indicates that the GDP and FDI are not stationary.

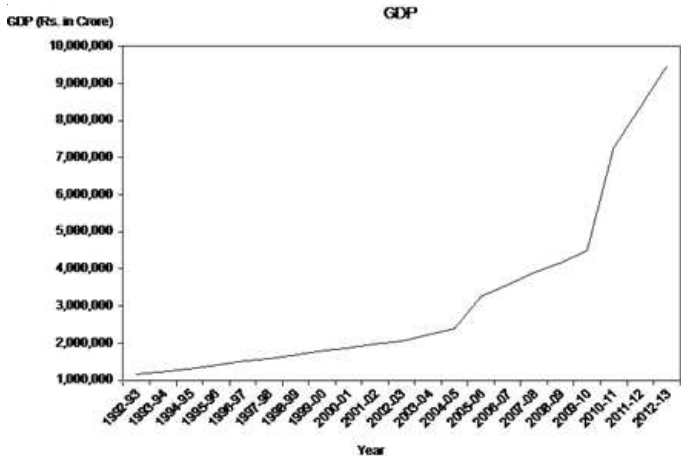

Figure-1. GDP in India - 1992-93 to 2012-13 (in Rs. crores)

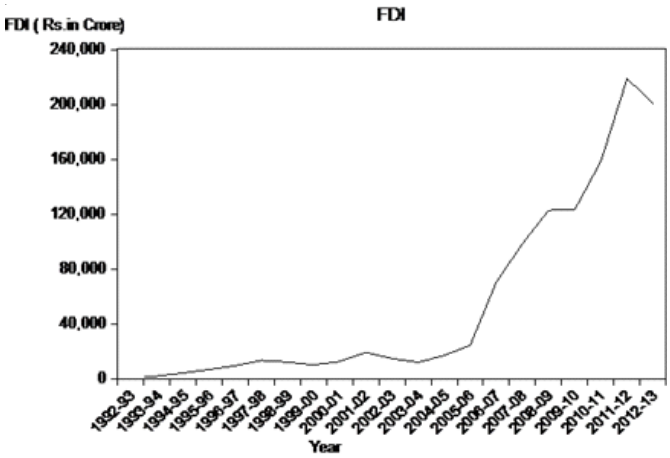

Figure- 2. Inflow of FDI to India - 1992-93 to 212-13 (in Rs. crores)

ACF and Correlogram: Another simple test of stationarity is correlogram which is based on autocorrelation function (ACF). The correlogram of 21 random error terms is obtained for FDI and GDP series using E-views software and they are shown in Table-1 and Table-2.

Table-1. Correlogram of FDI Time Series 1992-93 to 2012-13 (at level)

Sample: 1 21

Included observations: 21

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |****** |	. |****** |	1	0.830	0.830	16.656	0.000
. |**** |	.**| . |	2	0.99	-0.293	25.775	0.000
. |*** |	. |* . |	3	0.441	0.145	30.998	0.000
. |**. |	. *| . |	4	0.310	-0.123	33.732	0.000
. |* . |	. *| . |	5	0.153	-0.161	34.434	0.000

AC= autocorrelation, PAC= partial correlation, Q-stat= Q statistic, Prob=probability.

Table-2. Correlogram of GDP Time Series 1992-93 to 2012-13 (at level)

Sample: 1 21

Included observations: 21

Autocorrelation	Partial Correlation		AC	PA	Q-Stat	Prob
. |****** |	. |****** |	1	0.764	0.764	14.094	0.000
. |**** |	. *| . |	2	0.538	-0.110	21.447	0.000
. |**. |	. *| . |	3	0.329	-0.104	24.356	0.000
. |**. |	. |* . |	4	0.253	0.170	26.181	0.000
. |* . |	. *| . |	5	0.179	-0.072	27.153	0.000

AC= autocorrelation, PAC= partial correlation, Q-stat= Q statistic, Prob=probability.

The correlograms are mapped up to 5 lags. The major observation of Table-1 is that the Autocorrelation Coefficient (AC) starts at a very high value and declines very slowly toward zero as the lag lengthens. Thus, it seems that the FDI time series might be non-stationary. Plotting the correlogram of the GDP time series (Table-2) gives us similar pattern, leading to the conclusion that even GDP may not be stationary in mean or variance or both. After obtaining initial impression of non-stationarity of both the time series data as shown in the correlograms 'at level' (I (0)) (refer Table-1 & Table-2), further investigations are made. Another set of correlograms is formed at '1st difference' (I(1)). The results of correlograms, as presented in Table-3 & Table-4 show that the autocorrelation coefficient (AC) of both GDP and FDI, at '1st difference' (I(1)) appears to be very low and hover around zero at various lag length. Since the correlograms of the actual time series of GDP and FDI resemble the correlograms of the white noise time series, one can say that both the time series are 'probably' stationary.

Table-3. Correlogram of FDI Time Series 1992-93 to 2012-13 (at 1st difference)

Sample: 1 21

Included observations: 20

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |* . |	. |* . |	1	0.163	0.163	0.6143	0.433
. | . |	. | . |	2	-0.003	-0.030	0.6144	0.735
. |* . |	. |* . |	3	0.174	0.184	1.3959	0.706
. |* . |	. |* . |	4	0.185	0.133	2.3346	0.674
. |* . |	. |* . |	5	0.189	0.161	3.3771	0.642

AC= autocorrelation, PAC= partial correlation, Q-stat= Q statistic, Prob=probability.

Table-4. Correlogram of GDP Time Series 1992-93 to 2012-13 (at 1st difference)

Sample: 1 21

Included observations: 20

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*** |	. |*** |	1	0.355	0.355	2.9118	0.088
. |**. |	. |*. |	2	0.268	0.162	4.6626	0.097
. | . |	. *| . |	3	0.047	-0.106	4.7192	0.194
. | . |	. | . |	4	0.039	0.012	4.7616	0.313
. |*. |	. |**. |	5	0.200	0.242	5.9321	0.313

AC= autocorrelation, PAC= partial correlation, Q-stat= Q statistic, Prob=probability.

Unit Root Test: Table-5 presents the results of unit root test. The results of ADF Unit Root Test show that both variables under study, namely GDP and FDI did not attain stationarity 'at level' (I (0)). However, after first differencing (I(1)) both the variables become stationary. The results indicate that the null hypotheses-

H_1: FDI has a unit root; and

H_2: GDP has a unit root

-can be rejected as the critical t value is smaller than the ADF critical value at first difference (I(1)) at 5% level of significance. That is, in case of FDI the t-value is -3.920, which is lower than calculated ADF critical value (-3.6736), at 5% level of significance. Even in respect of GDP the t-value (-3.9910) is smaller to the computed ADF critical value (-3.6736) at 5 % level of significance. Hence, one can conclude that GDP and FDI time series are stationary at first difference (I(1)) in ADF test. In other words, GDP and FDI time series data do not have any unit root problem and hence, they can be taken up for testing the presence of co-integration.

Table- 5. ADF Unit Root Test for FDI and GDP

Particulars	FDI				GDP			
	t-statistic	Critical Value		P- value	t-statistic	Critical Value		P-value
At level	-0.8639	1%	-4.4983	0.9408	0.7474	1%	-4.4983	0.9992
		5%	-3.6584			5%	-3.6584	
		10%	-3.2689			10%	-3.269	
At 1st difference	-3.92	1%	-4.5326	0.0319	-3.9910	1%	-4.5326	0.0279
		5%	-3.6736			5%	-3.6736	
		10%	-3.2774			10%	-3.2774	

Table-6. Results of Johansen Co-integration test

Cointegration Test	Level	Max. Eigen Value	Statistic	C.V at 5%	Prob
Trace Test	H_0: r=0 (none)*	0.994	86.753	15.4947	0
	H_1: r=1 (at most 1)	0.2629	4.8813	3.8414	0.027
Max.Eigen	H_0: r=0 (none)*	0.994	81.8767	14.2646	0
	H_1: r=1 (at most 1)	0.2629	4.8813	3.8415	0.0271

Max-eigenvalue test indicates 1 co-integrating eqn(s) at the 0.05 level.

* denotes rejection of the hypothesis at the 0.05 level.

Johansen's Co-Integration Test

After ensuring the stationarity of the time series data of FDI and GDP, a co-integration test is carried out by using Johansen method to identify whether there exists any long run equilibrium relationship between the variables. The results of this test are presented in Table-6.

The result shows that at null hypothesis, the trace statistic for the calculated Eigen value (86.7530) is more than the critical value (15.4947) and hence, the null hypothesis (H_3): there is no co-integration between FDI and GDP- is rejected at 5% level of significance. This, in turn, leads to the acceptance of alternative hypothesis that there is co-integration between FDI and GDP. Even the Max-Eigen test confirms the existence of long run co-integration between the two variables, since Max-Eigen statistic value (81.8767) is greater than its critical value (14.2646) at 5% level of significance.

Vector Error Correction Model (VECM)

As co-integration is established between GDP and FDI, fitting the data in an error correction model is essential. Vector Error Correction Model is employed and the results are presented in Table-7 and Table-8. The estimated co-integrating coefficient for the GDP based on the first normalized Eigen vector is as follows; which is derived from the results shown in Table-7.

$$LGDP = -5201730 + 156.015LFDI$$
[6.74476]

The variables are converted into log transformation and these values represent long term elasticity measures. The t-statistic of the co-integrating coefficient of FDI is given in the bracket. The coefficient for FDI is positive, which implies that increase in inflow of foreign direct investment enhances the economic growth of India. And this positive impact of FDI appears to be statistically significant. Thus the result is in line with the theoretical predictions.

Table-7. Co-integrating Vector

One Co-integration Equation		
GDP	**FDI**	**Constant**
1.0000	-156.015 [-6.74476]	5201730

Table-8. Vector Error Correction Estimates (VECE)

Error Correction	D(GDP)	D(FDI)
ECM	-0.138044 (-0.044) [-3.13755]	0.000285 (-0.00129) [0.22163]
D(GDP(-1))	-0.155329 (-0.3327) [-0.46683]	0.022624 (-0.00972) [2.32686]
D(GDP(-2))	0.007039 (-0.3582) [0.01965]	-0.024265 (-0.01047) [-2.31767]
D(FDI(-1))	-30.33568 (-13.3557) [-2.27136]	0.366489 (-0.39027) [0.93906]
D(FDI(-2))	-17.47348 (-16.4742) [-1.06066]	0.317534 (-0.4814) [0.65960]
C	1030845 (-308121) [3.34559]	2972.839 (-9003.73) [0.33018]

( ) error term

[ ] t-value

The coefficient of Error Correction Term (ECT), as shown in Table-8, is negative (-0.13804) and statistically significant at 1 percent level of significance, indicated by greater t statistic value (3.1376) than critical value (1.96) at 5 percent level. This implies that GDP do respond significantly to re-establish the equilibrium relationship once deviation occurs. Thus the statistically significant negative ECT confirms the long run equilibrium relation between GDP and FDI. The significant negative sign of relative price of GDP and FDI -0.13804 reflects a healthy convergence rate to equilibrium point per period. This could be inferred that GDP will converge towards its long run equilibrium after the change in FDI at lag 1. Thus, the value of next year's GDP is influenced to a higher degree by the current year's FDI and this prediction appears to be accurate by 95 percent.

The results also show that the change in the FDI is not influenced much by the lagged value of GDP. This inference is made by citing the positive error coefficient term (0.0003). Therefore, VECM results, confirm that GDP converges towards its long run equilibrium after the change in FDI at lag 1. Thus, from this it found that inflow of foreign direct investment has significant positive impact on economic growth process of Indian economy.

Granger Causality Test

As the Johansen co-integration test exhibits only the presence of long run equilibrium relationship between FDI and GDP, pairwise Granger causality test is applied to capture the degree and direction of relationship between the two variables under study. The results of granger causality test are presented in Table-9.

Table-9. Results of Granger Causality Test

Null Hypotheses	Observations	F-statistic	Probability	Decision
GDP does not Granger cause FDI	19	5.3042	0.0193	Reject
FDI does not Granger cause GDP	19	5.9516	0.0135	Reject

From the results it appears that there exists causality between FDI and GDP. The test explores bidirectional causality between the two variables. The causality runs from FDI to GDP and from GDP to FDI. It means that the value after FDI can help us to expect the value for the next period of GDP and also the value after GDP can help us to expect the value for the next period of FDI. Hence, GDP is Granger caused by FDI and FDI is Granger caused by GDP. Based on the results of Granger causality test, F-statistic values are significant and hence, null hypotheses (H_4: GDP does not Granger cause FDI and H_5: FDI does not Granger cause GDP) are rejected. This leads to the conclusion that foreign direct investment Granger cause economic growth and

economic growth also Granger cause foreign direct investment. Therefore, foreign direct investment and economic growth are mutually correlated in India.

Summary and Findings

The paper examines the relationship between FDI and economic growth in India using annual data over the period 1992-93 to 2012-13. The unit root properties of the time series data were assessed using graphical analysis, ACF & Correlogram and ADF test after which the co-integration and causality tests were conducted. The Vector Error Correction Model was also estimated in order to examine the short run dynamics. The major findings of this study are the following;

- Based on the results of unit root test, the null hypotheses that there exist unit root problem in FDI and GDP time series data are rejected. The unit root test ensured that both FDI & GDP are stationary at first difference [I(1)] in case of Augmented Dickey Fuller (ADF) test.

- The Johansen co-integration test confirmed that economic growth and foreign direct investment are co-integrated, indicating an existence of long run equilibrium relationship between the two. The trace test under Johansen co-integration method indicates one co-integrating equation at 5 percent level of significance.

- The normalized co-integrating equation derived from the VECM indicates that FDI has positive impact on GDP. This long run positive relationship is tested statistically significant by a negative coefficient of ECT.

- The Granger causality test results revealed the presence of bidirectional causality. It suggests that GDP does Granger cause FDI and FDI does Granger cause GDP. Thus, the causality runs from FDI to GDP and from GDP to FDI indicating that, in Indian economy, economic growth attracts foreign investment and in turn, foreign investment drives economic growth.

- Hence, with adequate empirical support, it is statistically proved that inflow of foreign direct investment at lag length 1 significantly impacts the economic growth (GDP) of India.

The results of the study show that FDI and GDP are mutually correlated. It is noteworthy that our results are not quite similar to the results of many other studies. Studies of Sreedhar et.al (2009), Hossain and Hossain (2012), Agarawal (2014) found the presence of unidirectional causality running from FDI to economic growth. While, studies conducted by Basu (2002), Ray (2012), Samad (2014), Verma and Baidhanathan (2014) inferred that there exists unidirectional long run causal relationship between FDI and economic growth running from GDP to FDI. This implies that empirical results are not unanimous in the direction of the causality.

Conclusion

Thus, the study reveals bidirectional causality between inflow of foreign direct investment and economic growth in India and these results have significant policy implications. It is imperative for the national government to create pre-conditions for foreign direct investment to flow and gross domestic product to grow. A liberal and competitive investment climate creates the basis for FDI to enter and raise the potential for productivity growth. The onus of providing very conducive environment for foreign investors is on the government. The delivery of social services such as insurance schemes, water supply, power supply, health care, sanitation etc. could be gained from reliance on foreign investors. Therefore, it is imperative for the Government of India to frame a policy for attracting FDI in such areas of economy which would enhance the growth.

As the results of the present study also confirm the causal relationship running from GDP to FDI, key policy measures focusing on developing infrastructure, improving human resource quality, developing native entrepreneurship, creating a stable macroeconomic environment- should be drafted by the government. These steps would speed up the process of development and in turn would attract and absorb more FDI. Hence, the liberalized foreign direct investment policy on the one hand and inclusive growth policy on the other will have profound positive and complimentary effect on each other to augment the process of wellbeing.

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