P: ISSN No. 0976-8602 RNI No.UPENG/2012/42622 VOL.-7, ISSUE-3, July-2018
E: ISSN No. 2349-9443 Asian Resonance

Foreign Direct Investment (FDI) and Economic Growth in India: An Application of Vector Error Correction Model (VECM)

M.M. Goel
Former Director cum VC,
RGNIYD, Tamil Nadu,
Former PVC, VKSU, Ara
Former Dean of Colleges & Dean of Social Sciences,
Kurukshetra University,
Kurukshetra

Ritu Kang
Research Scholar,
Dept. of Economics,
Kurukshetra University,
Kurukshetra, Haryana

Abstract

Foreign Direct Investment (FDI) is an integral part of development strategies of all the economies of the World including India. There is free movement of multinational companies (MNCs) from developed to developing economies. Foreign capital is considered additional source of finance as it is non- debt creating and non- volatile in nature. In neo-classical models, FDI acts as complement to the domestic investment which promotes capital formation while the endogenous growth model highlights that long run economic growth of an economy is not only effected by the supply of capital but through its efficient utilization. There is no dearth of literature on the issue of FDI and economic growth of the country. Numerous findings support FDI to be an important vehicle for economic growth, while some other confirms that the FDI have growth impact in a host economy only with a strong financial system and human capital. Keeping in above backdrop, the present study is an attempt to analyse the relationship between FDI and economic growth in India by applying Vector Error Correction Model (VECM). Empirical results confirm the long run and short run relationship between FDI and economic growth of India. The policy implications can be drawn from the study that to increase the pace of economic growth in India, there is an economic rationale to attract more FDI which is necessary but not sufficient. To make it sufficient, we need to reduce the coefficient of distrust by strengthening fundamentals of Indian economy including domestic saving rate, controlled population growth and improved business environment.

Keywords: FDI, Cointegration, VECM and Indian Economy.

Introduction

Foreign Direct Investment (FDI) is not a new-fangled notion but it gained significant importance after Second World War. Earlier many developing countries looked FDI with great suspicion, but now the dilemma has changed. It is considered as a catalyst for economic growth and imperative vehicle for transfer of technology from developed to developing economies. Today is the epoch of globalization, reflecting the free movement of multinational companies (MNCs) from developed to developing economies leading to flow of huge amount of FDI flows into developing countries. Now, FDI has been treated as a major source of capital accumulation, which in turn leads to economic growth in a recipient economy; consequently these economies construct all possible policies to attract more and more FDI by removing restrictions on foreign capital, enhancing domestic economic policies and regulations, promoting the development in financial sector, as well as by encouraging domestic business environment for foreign investment.

Review of Literature

There is no dearth of literature on the issue of FDI and economic growth of the country. Some important FDI growth models are neo-classical and endogenous growth models. According to these models, capital plays an implausible role on the economic growth of any economy. In both the models, FDI not only supplement the physical investment but also increases its efficiency thus promotes economic growth (Adegboyega & Odusanya, 2014). In neo-classical model, FDI acts as complement to the

P: ISSN No. 0976-8602 RNI No.UPENG/2012/42622 VOL.-7, ISSUE-3, July-2018

E: ISSN No. 2349-9443 Asian Resonance

domestic investment which promotes capital formation. On the other side, the endogenous growth model highlighted that long run economic growth of an economy is not only effected by the supply of capital but through its efficient utilization.

According to them, the role of FDI is more productive in comparison to domestic investment as FDI promotes the integration of new technologies in the production function (Romer P., 1990 and Mankew et al., 1992) which may be helpful for the economy to progress on the long run growth path.

There is no dearth of literature to understand and analyze the FDI-growth nexus. The FDI-growth nexus has gained importance in the growth literature in its varied dimensions. Some studies support the hypothesis that FDI to be an important vehicle for economic growth (Nair-Reichert & Weinhold, 2001; Yao & Wei, 2007; Vu, Gangnes, & Noy, 2008; Pegkas, 2015, Goel M.M. and Walia Ritu K, 2017), while some other confirms that the FDI have growth impact in a host economy only with a strong financial system (Alfaro, Chanda, Kalemli-Ozcan, & Sayek, 2004; Durham, 2004) and a high level of human capital (Borensztein, De Gregorio, & Lee, 1998; Li & Liu, 2005). And others highlighted that the link between FDI and growth is unclear (Herzer, Klasen, & Nowak-Lehmann, 2008). On contrary to it, some empirical findings do not support the hypothesis that FDI has positive impact on growth (Kholdy, 1995; Duasa, 2007 and Mohamed, Singh, & Liew, 2013).

Although the growth impact of FDI is debatable, still it is strongly believed that FDI have vital role in boosting growth because its benefits are seen in many countries around the globe. Keeping in above view, present study is a humble attempt to test the hypothesis that FDI led to economic growth in India or not by applying various econometrics techniques. Section 2 describes the objective of the paper, sources of data and research methodology. Results to examine the relationship between FDI and economic growth of India and analysis or discussions are presented in section 3 and 4. And lastly, section 5 concludes the study with policy implications.

Objective of the Study & Research Methodology

To analyse the relationship between Foreign Direct Investment (FDI) and economic growth of India is the prime objective of the study. For this, Foreign Direct Investment equity inflow is considered as proxy for Foreign Direct Investment (FDI) and Gross Domestic Product (GDP) of India is taken as proxy for economic growth. The present study is based on secondary data, which has been collected from various sources such as secretariat of industrial approvals newsletters, publications from department of industrial policy and promotion, Ministry of Commerce and Industry, Government of India; Handbook of Statistics on Indian Economy by Reserve Bank of India. The study considers the time period from 1991-92 to 2016-17 that is 26 years.

Unit Root Test

The unit root test is meant to know the stationarity of the variables. The procedure of this test is to regress equation:

$Y_t = \rho Y_{t-1} + U_t$ and $-1 \le \rho \le 1$ ………….. (1)

If $\rho = 1$, then there is unit root problem that is Y is non-stationary. If $|\rho| < 1$, then there is no unit root problem that is Y is stationary. For theoretical reasons subtract Y_{t-1} from both sides of the above equation and we obtain:

$\Delta Y_t = \delta Y_{t-1} + U_t$……………… (2)

In practice, instead of estimating equation (1), the equation (2) is used to test the null hypothesis that H_0: $\delta=0$ against an alternative hypothesis H_A: $\delta \neq 0$. If $\delta = 0$ then $\rho=1$ that is there is unit root in the model which means time series under consideration is non-stationary. But if $\delta < 0$, then time series is stationary. In order to find out whether the estimated coefficient of Y_{t-1} in (2) is zero or not, the Augmented Dickey-Fuller (ADF) test has been used. The ADF test is estimated in three different forms, that is, under three different null hypotheses.

Y_t is random walk without drift: $\Delta Y_t = \delta Y_{t-1} + U_t$………… (3)

Y_t is random walk with drift: $\Delta Y_t = \beta_1 + \delta Y_{t-1} + U_t$………… (4)

Y_t is random walk with drift around a stochastic trend: $\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + U_t$……… (5)

In above three cases, the null hypothesis is that H_0: $\delta=0$ (unit root problem) and the alternative hypothesis is that H_A: $\delta \neq 0$ (no unit root problem). Ordinary Least Square (OLS) has been applied to estimate equation (3), (4) and (5) and τ statistic is computed. If the computed absolute value of τ statistic exceed the Dickey-Fuller critical value, then reject null hypothesis and conclude that time series under consideration is stationary, which is pre requisite condition for the application of any standard test of econometrics. And if the computed absolute value of τ statistic does not exceed the Dickey-Fuller critical value then null hypothesis is accepted. Which implies the time series under consideration is non-stationary. In this case, we cannot apply any standard test.

Cointegration

The existence of long run equilibrium relationship between X and Y is i.e. FDI and GDP referred to, in the literature as cointegration. According to Granger (1988), standard tests for causality are valid only if X_t and Y_t are cointegrated. Therefore, a necessary precondition to causality testing is to check the co-integrating properties of the variable under consideration.

For this Y_t is regressed on X_t as: $Y_t = \alpha_0 + \alpha_1 X_t + U_t$ …..……. (6)

The above regression is known as the cointegrating regression and slope parameter (α_1) is known as cointegrated parameter. The cointegration test was first introduced by Engel and Granger (1987) and then developed and modified by Stock and Watson (1988), Johanson (1988), and Johanson and Juselius (1990). The test is very useful to examine the long run equilibrium relationships between the variables.

Estimating and Testing for Causality through Vector Error-Correction Model (VECM)

P: ISSN No. 0976-8602 RNI No.UPENG/2012/42622 VOL.-7, ISSUE-3, July-2018

E: ISSN No. 2349-9443 Asian Resonance

According to Engel and Granger (1987), in case variables are cointegrated then there exist related error correction models wherein short term movements of variables are affected by the deviation from the equilibrium. If the variables are cointegrated, VECM is useful for both long-term and short-term (Ratanapakorn and Sharma, 2007). The VAR is in capable of exploring long-term relations as well as it is deficient in discovering short-term relations in presence of cointegration (Mukherjee and Naka, 1995).

VECM is more appropriate to model for several macro-economic variables as it distinguishes between stationary variables with transitory effects and non-stationary variables with permanent effects. The stability of the long run equilibrium (relationship) due to the short-run shocks transmitted through the given variable can also be studied with the VECM estimation. The model also indicates the speed of adjustment towards the long-run equilibrium after a short-run shock.

After applying VECM, Wald test have been used to know the short-run relationship among variables. Breusch-Godfrey Serial Correlation LM Test, Breusch-Pagan-Godfrey Heteroskedasticity test and Jarque-Bera Normality test has been used for residual analysis of VECM estimates. For applying test of obtaining results, software E-View 10 is used.

Results and Discussions

Results

TABLE 1: Unit Root Test for GDP

Augmented Dickey-Fuller Test for GDP						
	At Level					
	Constant		**Constant, Linear Trend**		**None**	
	Critical Values	**ADF T-Stat.**	**Critical Values**	**ADF T-Stat.**	**Critical Values**	**ADF T-Stat.**
1% level 5% level 10%level	-3.724070 -2.986225 -2.632604	2.049081 (0.9998)	-4.498307 -3.658446 -3.268973	4.357651 (1.0000)	-2.660720 -1.955020 -1.609070	4.024251 (0.9999)
	R^2 = 0.15, Adj.R^2 = 0.12 D.W.=2.11		R^2 = 0.72, Adj. R^2 = 0.56 D.W.=2.41		R^2 = 0.15, Adj. R^2 = 0.15 D.W.=2.13	
Decision	Non-Stationary		Non-Stationary		Non-Stationary	
	At First Difference					
	Constant		**Constant, Linear Trend**		**None**	
	Critical Values	**ADF T-Stat.**	**Critical Values**	**ADF T-Stat.**	**Critical Values**	**ADF T-Stat.**
1% level 5% level 10% level	-3.737853 -2.991878 -2.635542	-3.947023 (0.0062)	-4.394309 -3.612199 -3.243079	-4.998912 (0.0027)	-2.664853 -1.955681 -1.608793	-2.992878 (0.0045)
	R^2 = 0.41, Adj.R^2 = 0.39 D.W.=2.05		R^2 = 0.54, Adj. R^2 = 0.50 D.W.=2.02		R^2 = 0.28, Adj. R^2 = 0.28 D.W.=2.21	
Decision	Stationary		Stationary		Stationary	

Source: Authors Computation (2018) using E-Views 10
Figure in parenthesis indicate probability

Table 2: Unit Root Test For FDI

Augmented Dickey-Fuller Test for FDI						
	At Level					
	Constant		**Constant, Linear Trend**		**None**	
	Critical Values	**ADF T-Stat.**	**Critical Values**	**ADF T-Stat.**	**Critical Values**	**ADF T-Stat.**
1% level 5% level 10%level	-3.724070 -2.986225 -2.632604	1.433512 (0.9985)	-4.374307 -3.603202 -3.238054	-0.725403 (0.9597)	-2.660720 -1.955020 -1.609070	2.536805 (0.9960)
	R^2 = 0.08, Adj.R^2 = 0.04 D.W.=2.32		R^2 = 0.18, Adj. R^2 = 0.11 D.W.=2.12		R^2 = 0.06, Adj. R^2 = 0.06 D.W.=2.34	
Decision	Non-Stationary		Non-Stationary		Non-Stationary	
	At First Difference					
	Constant		**Constant, Linear Trend**		**None**	
	Critical Values	**ADF T-Stat.**	**Critical Values**	**ADF T-Stat.**	**Critical Values**	**ADF T-Stat.**

1% level 5% level 10% level	-3.737853 -2.991878 -2.635542	-4.532995 (0.0016)	-4.394309 -3.612199 -3.243079	-5.344298 (0.0013)	-2.664853 -1.955681 -1.608793	-3.909468 (0.0004)
	R^2 = 0.48, Adj.R^2 = 0.45 D.W.=1.99		R^2 = 0.58, Adj. R^2 = 0.54 D.W.=2.03		R^2 = 0.40, Adj. R^2 = 0.40 D.W.=2.21	
Decision	Stationary		Stationary		Stationary	

Source: Authors Computation (2018) using E-Views 10
Figure in parenthesis indicate probability

Table 3: VAR Lag Order Selection Criteria

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-435.8196	NA	1.17e+14	38.07127	38.17001	38.09610
1	-389.8245	79.99159	3.05e+12	34.71573	34.71573	34.49401
2	-374.8697	23.40739	1.19e+12	33.96063	33.96063	33.59110
3	-364.5527	14.35416*	7.05e+11*	33.60879*	33.60879*	33.09145*

Source: Authors Computation (2018) using E-Views 10
* Indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 4: Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No of CE(s)	Eigen Value	Trace Statistic	0.05 Critical Value	Prob**
None*	0.908519	55.75182	15.49471	0.000
At most 1*	0.132855	3.136079	3.841466	0.0766

Source: Authors Computation (2018) using E-Views 10
Trace test in dictates 2 cointegrating eqn (s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigen value)

Hypothesized No of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob**
None	0.908519	52.61574	14.26460	0.0000
At Most 1*	0.132855	3.136079	3.841466	0.0766

Source: Authors Computation (2018) using E-Views 10
Max-eigen value test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values

Table 5: Vector Error Correction Estimates

Cointegrating Eq:	CointEq1	
GDP(-1)	1.000000	
FDI(-1)	-89.67319(4.08939) [-21.9283]	
C	16505.90	
Error Correction:	**D(GDP)**	**D(FDI)**
D(GDP(-1))	-0.802590 (0.17239) [-4.65559]	-0.058430(0.01421) [-4.11232]
D(GDP(-2))	0.717006 (0.17882) [4.00959]	0.028514 (0.01474) [1.93466]
D(GDP(-3))	-0.791711 (0.15579) [-5.08184]	-0.005390 (0.01284) [-0.41974]
D(FDI(-1))	-17.91535 (4.21474) [-4.25064]	-0.065924 (0.34737) [-0.18978]

D(FDI(-2))	-51.89800(6.24167) [-8.31477]	-1.716171 (0.51443) [-3.33606]
D(FDI(-3))	-4.535463 (4.83854) [-0.93736]	-0.883291 (0.39879) [-2.21494]
C	15213.32 (1657.78) [9.17712]	506.8483 (136.630) [3.70965]
R-squared	0.902410	0.600737
Adj. R-squared	0.853616	0.401106
Sum sq. Resids	1.02E+08	694152.9
S.E. equation	2701.697	222.6709
F-statistic	18.49398	3.009233
Log likelihood	-200.0808	-145.1701
Akaike AIC	18.91644	13.92455
Schwarz SC	19.31318	14.32130
Mean dependent	4735.524	130.7136
S.D. dependent	7061.373	287.7323
Determinant resid covariance (dof adj.)		9.20E+10
Determinant resid covariance		3.73E+10
Log likelihood		-330.1897
Akaike information criterion		31.65361
Schwarz criterion		32.54628

Source: Authors Computation (2018) using E-Views 10 & '( )' shows Standard errors & '[ ]'shows t-statistics

Table 6: Vector Error Correction Model (VECM)

System Equations

D(GDP) = C(1)*(GDP(-1) - 89.6731908993*FDI(-1) + 16505.9049127) + C(2)*D(GDP(-1)) + C(3)*D(GDP(-2)) + C(4)*D(GDP(-3)) + C(5)*D(FDI(-1)) + C(6)*D(FDI(-2)) + C(7)*D(FDI(-3)) + C(8) **[Equation: A]**

D(FDI) = C(9)*(GDP(-1) - 89.6731908993*FDI(-1) + 16505.9049127) + C(10)*D(GDP(-1)) + C(11)*D(GDP(-2)) + C(12)*D(GDP(-3)) + C(13)*D(FDI(-1)) + C(14)*D(FDI(-2)) + C(15)*D(FDI(-3)) + C(16) [**Equation: B]**

Estimation Method: Least Square (Included observations: 22 after adjustments)

	Coefficient	**Standard Error**	**t-Statistic**	**Prob.**
C(1)	-0.347248	0.040908	-8.488535	0.0000
C(2)	-0.802590	0.172393	-4.655587	0.0001
C(3)	0.717006	0.178824	4.009561	0.0004
C(4)	-0.791711	0.155792	-5.081838	0.0000
C(5)	-17.91535	4.214738	-4.250643	0.0002
C(6)	-51.89800	6.241665	-8.314769	0.0000
C(7)	-4.535463	4.838540	-0.937362	0.3566
C(8)	15213.32	1657.745	9.177117	0.0000
C(9)	-0.010799	0.003372	-3.202875	0.0034
C(10)	-0.058430	0.014208	-4.112316	0.0003
C(11)	0.028514	0.014738	1.934661	0.0632
C(12)	-0.005390	0.012840	-0.419740	0.6779
C(13)	0.065924	0.347374	-0.189777	0.8509
C(14)	-1.716171	0.514431	-3.336055	0.0024
C(15)	-0.883291	0.398787	-2.214944	0.0351
C(16)	506.8483	136.6296	3.709653	0.0009

D(GDP) = C(1)*(GDP(-1) - 89.6731908993*FDI(-1) + 16505.9049127) + C(2)*D(GDP(-1)) + C(3)*D(GDP(-2)) + C(4)*D(GDP(-3)) + C(5)*D(FDI(-1)) + C(6)*D(FDI(-2)) + C(7)*D(FDI(-3)) + C(8) **[Equation: A]**

R-squared	0.902410	Mean dependent var	4735.523
Adjusted R-squared	0.853616	S.D. dependent var	7061.373
S.E. of regression	2701.697	Durbin Watson stat	1.02E+08
Sum squared resid	1.02E+08		

D(FDI) = C(9)*(GDP(-1) - 89.6731908993*FDI(-1) + 16505.9049127) + C(10)*D(GDP(-1)) + C(11)*D(GDP(-2)) + C(12)*D(GDP(-3)) + C(13)*D(FDI(-1)) + C(14)*D(FDI(-2)) + C(15)*D(FDI(-3)) + C(16) [**Equation: B]**

R-squared	0.600737	Mean dependent var	130.7136
Adjusted R-squared	0.401106	S.D. dependent var	287.7323
S.E. of regression	222.6709	Durbin Watson stat	694152.9
Sum squared resid	6941152.9		

Source: Authors Computation (2018) using E-Views 10

TABLE 7 (A): Wald Test

Test Statistic	Value	D. F.	Probability
Chi-square	34.93048	3	0.0000

Null Hypothesis: C (2) =C (3) =C (4) = 0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Error
C(2)	-0.802590	0.172393
C(3)	0.717006	0.178824
C(4)	-0.791711	0.155792
Source: Authors Computation (2018) using E-Views 10		

Table 7 (B): Wald Test

Test Statistic	Value	D. F.	Probability
Chi-square	112.1483	3	0.0000

Null Hypothesis: C (5) =C (6) =C (7) = 0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Error
C(5)	-17.91535	4.214738
C(6)	-51.89800	6.241665
C(7)	-4.535463	4.838540
Source: Authors Computation (2018) using E-Views 10		

Table 7 (C): Wald Test

Test Statistic	Value	D. F.	Probability
Chi-square	19.10144	3	0.0002

Null Hypothesis: C (10) =C (11) =C (12) = 0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Error
C(10)	-0.058430	0.014208
C(11)	0.028514	0.014738
C(12)	-0.005390	0.012840
Source: Authors Computation (2018) using E-Views 10		

Table 7(D): Wald Test

Test Statistic	Value	D. F.	Probability
Chi-square	13.61179	3	0.0035

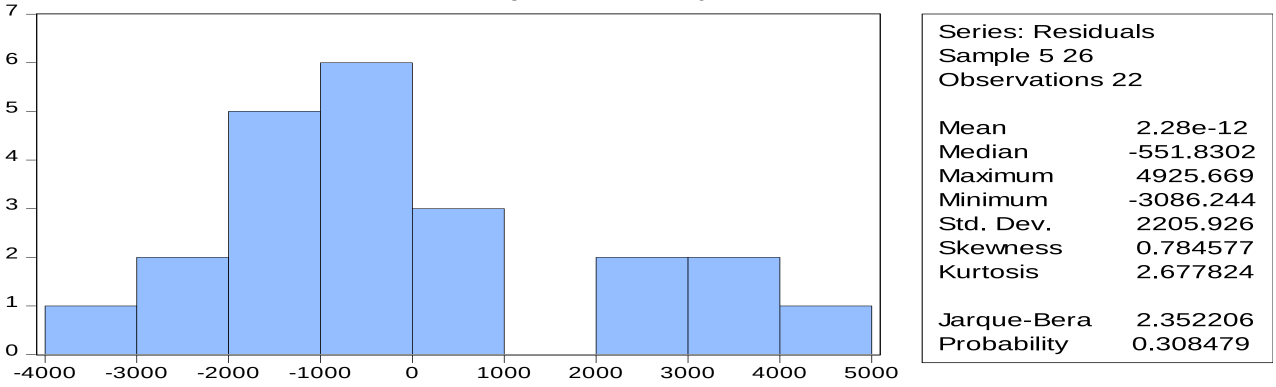
Null Hypothesis: C (13) =C (14) =C (15) = 0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Error
C(13)	-0.065924	0.347374
C(14)	-1.716171	0.514431
C(15)	-0.883291	0.398787
Source: Authors Computation (2018) using E-Views 10		

Table 8: Residual Analysis [Equation: A]

Tests	Values	P-Values
Breusch-Godfrey Serial Correlation LM Test	1.283332	0.3284
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.389739	0.9072
Jarque-Bera Normality	2.352206	0.308479
Source: Authors Computation (2018) using E-Views 10		

Figure 1: Normality Test

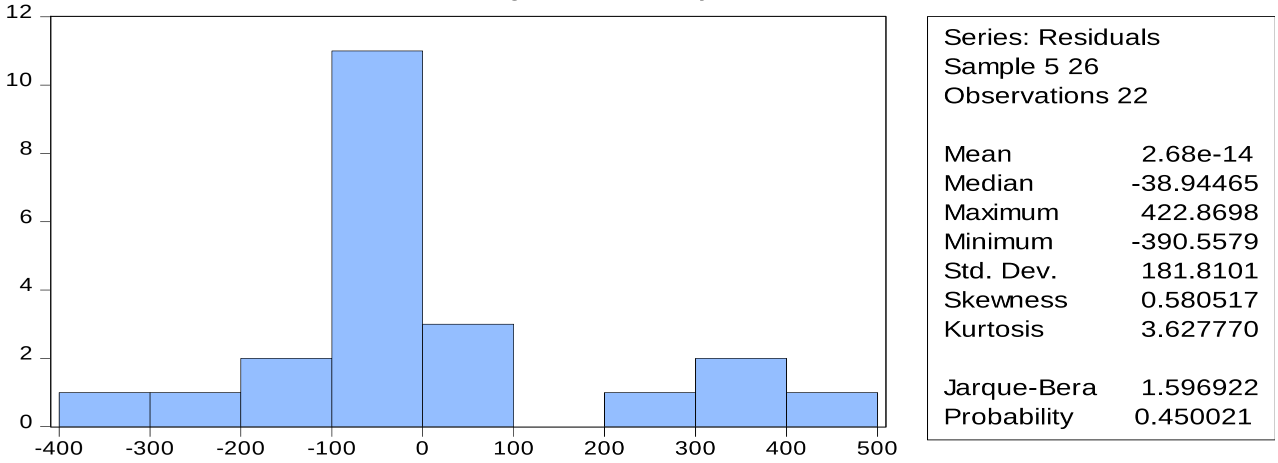


Source: Authors Computation (2018) using E-Views 10

Table 9: Residual Analysis [Equation: B]

Tests	Values	P-Values
Breusch-Godfrey Serial Correlation LM Test	0.542246	0.6633
Heteroskedasticity Test: Breusch-Pagan-Godfrey	1.841286	0.1576
Jarque-Bera Normality	1.596922	0.450021
Source: Authors Computation (2018) using E-Views 10		

Figure 2: Normality Test



Source: Authors Computation (2018) using E-Views 10

Discussions

The prime condition for applying any standard test is that variables under consideration must be stationary. Therefore, the first step is to check the stationarity of given data means that to examine variables under consideration has unit root or not. Augmented Dickey-Fuller **(**ADF) is applied to check the stationarity of the data. Result (Table 1 and 2) shows that the variable under consideration that is FDI and GDP are non stationary at level but becomes stationary at first difference (Table 1 and 2) because at all levels ((a) Constant (b) Constant and Linear trend and (c) None) probabilities are more than 0.05 per cent level. But it becomes stationary after taking first difference. It means that we can apply causality test at first difference of GDP and FDI as these are integrated of order one and will not produce spurious results, which further suggest the possibility of a cointegration relationships.

Before testing the existence of a long-term relationship between variables based on the cointegration test, the second step is to determine the optimal lag length based on a VAR model with initial data. The limited number of observations in the model led us to consider only models with a maximum of 3 lags. Based on the results obtained for the criteria LR, FPE, AIC, SC and HQ, the optimal number of lags in the model is 3 as shown. (Table 3)

Since the variables are integrated of order I(1), we applied the Johansen-Juselius cointegration procedure to investigate whether there is a long-term relationship between the two variables (Table 4). The positive result requires the modelling of a VEC model (vector error correction model – VECM) and not a VAR model (Table 4). Table reveals that p value is less than 5 per cent level of significance so we reject null hypothesis and accept alternative hypothesis meaning that there is long run cointegration between the two variables i.e. FDI and economic growth.

Co-integration analysis confirms the existence of long-run equilibrium between GDP and FDI in India during the study period. However, it becomes imperative to analyze GDP dynamics following variation in FDI. The variables GDP and FDI are I(1) and co-integrated at level, therefore, the estimation of Vector Error Correction Model (VECM) is pertinent. Further, the stability of the long run equilibrium (relationship) due to the short-run shocks transmitted through FDI_t or GDP_t can also be studied with the VECM estimation. The result of VECM is shown in table 5 and 6. Table 6 contains the results of VECM and its coefficients as well as their t-statistics and p-value after estimating the equations (equation: A and equation: B) by using Ordinary Least Square (OLS) method. Here, C (1) is the coefficient of the cointegrated model (long run) with GDP as the dependent variable while C (2), C (3) and C (4) are short run coefficients. C (1) is the speed of adjustment towards long run equilibrium which is negative and significant (-0.347248). This implies GDP is below its equilibrium value, leading GDP to rise in the current year and the speed of rise of GDP in the current year is 34.7 per cent. In other words, the model suggests that 34.7 percent of disequilibrium in the previous year is corrected in the current year. Similarly, C (9) is the coefficient of the cointegrated model (long run) with FDI as the dependent variable while C (10), C (11) and C (12) are short run coefficients. C (9) is the speed of adjustment towards long run equilibrium which is also negative and significant (-0.010799); meaning that FDI has long run influence on the GDP.

Following table 7 presents the results of the Wald test performed to test whether GDP has any short run effect on FDI or FDI has any short run effect on Economic growth (GDP).

Results of Wald test depicted in above table 7 (A) revealed that lagged value of GDP has short run effect on GDP. As C(2), C(3), and C(4) are coefficient of lagged values of GDP. Here we reject null hypothesis that values of C (2) =C (3) = C (4) = 0, meaning that C(2), C(3), and C(4) have short run association-ship. Results of Wald test depicted in above table 7(B) revealed that lagged value of FDI has short run impact on GDP. As C(5), C(6), and C(7) are coefficient of lagged values of FDI. Here p value of chi-square test is less than 5 per cent level so we reject null hypothesis i.e. C (5) = C (6) = C (7) = 0, meaning that these variables also have short run associationship.

Similarly, results of Wald test depicted in above table 7 (C) and 7(D) revealed that lagged value of GDP and FDI has short run impact on FDI. As C(10), C(11), and C(12) are coefficient of lagged values of GDP and C(13), C(14), and C(15) are coefficient of lagged values of FDI. Here p value of chi-square test is less than 5 per cent level so we reject null hypothesis, Meaning that these variables have short run associationship.

In short, Results of Wald test revealed that both GDP has short run influence on FDI as well as FDI has short run influence on GDP. The lagged values of GDP and FDI also have short run impact on its respective values. In all cases, null hypothesis is rejected and alternative is accepted, meaning that coefficients are other than zero and significant.

The results of residual analysis performed to test for the adequacy of the model contained in table 8 and table 9. The following table 8 and figure 1 present the results of residual analysis of equation: A. It revealed that the residuals have no serial correlation, they are homoscedastic and normally distributed since all the p-values are greater than 0.05, the results of the regression analysis performed indicated R square (0.902410) meaning that 90 per cent variability in GDP is being explained by variations in FDI and figure 1 shows the outcome of normality test.

The following table 9 and figure 2 presents the results of residual analysis of equation: B. Table 9 revealed that the residuals have no serial correlation, homoscedastic and normally distributed since the p-values are greater than 0.05, the results of the regression analysis performed indicated R square (0.600737) meaning total 60 per cent of variability in FDI is being explained by variations in GDP and figure 2 shows the outcome of normality test.

From the above analysis, it is clear that long run as well as short run causality exists from economic growth (GDP) to FDI and similarly long run as well short run causality also exists from FDI to economic growth (GDP).

Conclusion with Policy Implications

To sum up, the present study is an attempt to investigate the relationship between foreign direct investment and economic growth in India during 1991-92 to 2016-17. Foreign Direct Investment (FDI) equity inflows and Gross Domestic Product (GDP) are used as a proxy for Foreign Direct Investment and economic growth in India. The study employed unit root test, Johansen cointegrating technique and then Vector Error Correction Model (VECM). The result indicates that variables FDI and GDP are cointegrated meaning that whenever FDI goes up GDP goes and VECM also prove that long run and short run relationship exists among variables under consideration. Test for adequacy performed on the residuals of the VECM indicates that both models are homoscedastic, normally distributed and no serial correlation exists.

Empirical results of study highlighted the importance of foreign direct investment in economic growth of Indian economy. As the results indicates that FDI has short run as well as long run association ship with economic growth of India. On the other hand economic growth has also short run and long run impact on FDI.

No doubt, significant economic growth has been observed in India in last few decades due to many factors. And one of the significant reasons is the measures (in form of liberalization, globalization and privatization) adopted by the Government to boost the inflow of foreign capital in the country. Thus to acquire more technological, managerial skills and supplement domestic savings and foreign exchange on one hand and to generate more employment opportunities to educated unemployed youth on other hand, India needs to attract more foreign capital. To get rid from all the problems of Indian economy and to improve the health of different sectors of Indian economy, there is a strong need to boost both domestic and foreign investment. Over the period of time, many Governments came and gone and they have taken necessary actions accordingly to make business environment very conducive or to improve the ranking of the country in 'ease of doing business'. More efforts are needed to make India a preferred destination hub. Last but not the least, to maintain India's long run economic growth path, there is a rationale to make India as manufacturing hub and in this regard, FDI will be an engine of economic growth as it is supplement to domestic capital formation. The policy implications can be drawn from the study that to increase the pace of economic growth in India, there is an economic rationale to attract more FDI which is necessary but not sufficient. To make it sufficient, we need to reduce the coefficient of distrust by strengthening fundamentals of Indian economy including domestic saving rate, controlled population growth and improved business environment.

References

1. *Adegboyega, B.S., and Odusanya A. I.(2014), "Empirical Analysis of Trade Oppennes, Capital Formation, FDI and Economic Growth: Nigeria Experience". The International Journal of Social Sciences and Humanities Invention, 1(1), pp.36-50.*
2. *Alfaro, L., Chanda, A., Kalemli-Ozcan, S., & Sayek, S. (2004), 'FDI and economic growth: The role of local financial markets', Journal of International Economics, 64, pp. 89–112.*
3. *Borensztein, E., De Gregorio, J., & Lee, J.W. (1998), 'How does foreign direct investment affect economic growth?', Journal of International Economics, 45, pp. 115–135.*
4. *Duasa, J. (2007), 'Malaysian foreign direct investment and growth: Does stability matter', Journal of Economic Cooperation, 28, 83–98.*
5. *Goel, M. M. & Walia, Ritu, K. (2013), 'Growth and Performance of Foreign Direct Investment (FDI) in Indian Economy: An Analysis', Viewpoint-an International Journal of Management and Technology, Volume 4, No 2, July-December 2013.*
6. *Goel, M. M. and Walia, Ritu, K. (2017), 'Determinants of Foreign Direct Investment (FDI) in India: An Analysis', Finance India, Sept. 2017, Vol XXXI No 3 , ISSN 0970-3772.*
7. *Goel, M. M. & Walia, Suraj (2017), 'Higher Education and Economic Growth in Haryana: An Application of Cointegration and Vector Error Correction Model (VECM) Approach', Asian Resonance, ISSN No. 0976-8602, Vol-6, Issue-3, July 2017, pp. 44-52.*
8. *Handbook of Statistics on India Economy, Published by Reserve Bank of India, www.rbi.ac.in.*
9. *Herzer, D., Klasen, S., & Nowak-Lehmann, D. F. (2008), 'In search of FDI-led growth in developing countries: The way forward.', Economic Modelling, 25, pp. 793–810.*
10. *Mankew, Romer, D.,and Weil, D.(1992), 'A Contribution to the Empirics of Economic Growth.' Quaterly Journal of Economics, 107(2), pp. 407-437.*
11. *Mohamed, M. R., Singh, K. S. J., & Liew, C. Y. (2013), 'Impact of Foreign Direct Investment and Domestic Investment on Economic Growth of Malaysia', Malaysian Journal of Economic Studies, 50, 21–35.*
12. *Mukherjee, T.K. and Naka, Atsuyuki, N. (1995), 'Dunamic Relations between Macroeconomic Variables and the Japanese Stock Market: An Application of a Vector Error Correction Model', The Journal of Financial Research, Vol. 28, no 2, pp.223-237.*
13. *Nair-Reichert, U., & Weinhold, D. (2001), 'Causality Tests for Cross-Country Panels: A New Look at FDI and Economic Growth in Developing Countries', Oxford Bulletin of Economics and Statistics, 63, pp.153–171.*
14. *Pegkas, P. (2015), 'The Impact of FDI on Economic Growth in Eurozone Countries. The Journal of Economic Asymmetries, 12, pp. 124–132.*
15. *Popovici, Oana and Calin, Adrian, Cantemir (2016), 'Economic Growth, Foreign Investments and Exports in Romania: A VECM Analysis', Romanian Journal of Economic Forecasting, September 2016, Year XIX no. 61.*
16. *Ratanapakirna, O. And Sharma, S.C. (2007), 'Dynamic Analysis between the US Stock Returns and the Macroeconomic Variables', Applied Financial Economics, 2007, 17, pp.369-377.*
17. *Romer, P.,M. (1990), 'Endogenous Technological Change', Journal of Political Economy, 98 (5), October (Part 2), pp. S71-S102.*
18. *Singh, Surat and Singh, Dalbir (2016), 'Economic Growth and Foreign Direct Investment: Empirical Evidence from India during Post-Economic Reforms Era', International Journal of Advances in Management and Economics, ISSN: 2278-3369Nov.-Dec. 2016, Vol.5, Issue 6|84-93, pp-84-93.*
19. *Vu, T. B., Gangnes, B., & Noy, I. (2008), 'Is Foreign Direct Investment Good for Growth? Evidence from Sectoral Analysis of China and Vietnam', Journal of the Asia Pacific Economy, 13, 542–562.*
20. *Yao, S., & Wei, K. (2007), 'Economic Growth in the Presence of FDI: The Perspective of Newly Industrialising Economies', Journal of Comparative Economics, 35, pp. 211–234.*
21. *www.dipp.nic.in*
22. *www.rbi.org.in*