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Research Article

FDI Performance In The Indian Economy

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ABSTRACT

The link between FDIs and economic growth has been analysed in order to examine the performance of FDIs in the Indian economy. FDI Equity Inflows and GDP are used as proxy for India's foreign direct investment and economic development. In order to examine the connection between FDI and GDP between 1991-92 and 2016-17, is both short-term and long-term. In other words, the main prerequisite for sustainable economic development in the Indian economy is foreign direct investment.

Keywords: FDI performance, GDP, FDI inflows in Indian Economy, etc.

INTRODUCTION

FDI is not a new conception but has acquired relevance after the Second World War. FDI is not a new concept, it is a new. Many of the developing countries were formerly suspicious of FDI, but the situation has changed recently. It is seen as a driver for economic progress and as an essential channel for technology transfers from industrialized to developing nations. Today is the time of globalization and reflects multinationals' unfettered migration (MNCs). There is a significant volume of FDI flowing through MNCs to developing nations. Now, FDI has been considered an important source of capital acquisition, leading to economic growth in the receiving economy, so these countries are building every kind of policy possible to attract more FDI by removing foreign capital constraints, enhancing domestic policy and regulation, promoting financial sector development and fostering an internal business environment. Extensive study on FDI and economic growth was performed. Neo-classical and endogenous growth models are some significant FDI growth models. Both theories say that capital plays an unpredictable role in any economy's economic progress. For both models, FDI not only improves physical investment, but also efficiency and supports economic growth (Adegboyega & Odusanya, 2014). FDI complements national investments that support the creation of capital under the neo-classical paradigm. Contrary to this idea, the endogenous model of growth emphasises that the economy's long-term economic growth is not only affected by capital availability, but also via its efficient use. In this view, FDI's role is more productive compared to domestic investment, as FDI encourages new technology integration into the manufacturing function. The effect of technology spillage compensates for a decreasing return on capital that drives economic expansion (Romer P., 1990 and Mankew et al., 1992). This helps the economy to advance on the long-term growth path.

2 EMPIRICAL ANALYSIS AND RESULTS

For the period of twenty-six years from 1991-92 to 2016-17, the empirical study was carried out by means of yearly data for Indian Economy. FDI Inflows of equity are utilized for the purposes of India's economic growth as proxy for direct foreign investment (FDI) and gross domestic product (GDP).by studying the FDI's link between FDI and economic growth, as proxy for Indian economic growth.

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5.2.1 Descriptive Statistics

Descriptive statistics represent the hidden patterns of every data sets. For analysis, FDI and GDP variables are used. The description of variables comprising average, median, various central tendency, dispersion, distribution measures is provided in the following table 5.1.

TABLE: 5.1 DESCRIPTIVE STATISTICS OF FDI AND GDP

Statistics	**FDI**	**GDP**
Mean	709.5785	46010.95
Median	166.5350	31232.00
Maximum	2916.960	121898.5
Minimum	3.160000	15033.37
Standard Deviation	854.8171	33898.47
Skewness	1.166264	1.108912
Kurtosis	3.339707	2.739949
Jarque-Bera	6.019092	5.401899
Probability	0.049314	0.067142
Sum	18449.04	1196285
Sum Square Deviation	18267805	2.87E+10
Observations	26	26
Sources: calculation from E-Views 10		

Analysis: The distribution of the two variables is obviously skewed in the preceding table 5.1. The standard deviation measures a significant degree of variability. The normalcy test of both FDI and GDP populations is done by Jarque Bera (JB). It tests the zero hypothesis of H0: time series distribution is distributed regularly. Following the two-degree Chi-square distribution, there is a JarqueBera (JB) test. At a 1% probability level, the −2 critical value is 10.6. The JB test values derived are 5.40 and 6.01 respectively for GDP and FDI. As we can thus not reject the null norm hypothesis, since the measured values for both variables are lower that crucial levels in the JB test.

5.2.2 Simple Linear Regression Model

The first hypothesis in the present study is that the FDI is not linked to GDP. Let's use a linear regression equation as follows to confirm this hypothesis:

$$GDP_t = \alpha_0 + \alpha_1 \, FDI_t + U, \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (5.1)$$

The above approach implies nevertheless that FDI is influencing GDP in the current year and is not lagging behind. Table 5.2 presents the results of the aforementioned regression equation.

TABLE: 5.2 RESULTS OF REGRESSION MODEL (GDPt = α0+ α1FDIt + Ut)

Lag(K)	**Estimated a_0**	**Estimated a_1**	**T-statistic**	**R**	**R^2**	**Adjusted R^2**	**F-statistic**
Without Lag	8.663 (0.180)	0.337 (0.031)	10.786	0.910	0.829	0.822	116.348
Note: * Indicates at 1% level of significance and Figures in Parenthesis show standard errroe.							

Analysis: R is the correlation measurement from the observed value to the expected value of the variable criteria. This shows that the connection between FDI and India's economic development is high since R is 0.910. The t-test value is 10,786, meaningful at level 0,001. With a value of 116,348 the F-statistics value is equally important. There is no link between FDI and GDP, that is, a null hypothesis is refused. Alternative hypotheses are acknowledged in other terms. In short, the outcome of the linear regression equation shows that FDI is connected to India's (GDP) economic development.

Lag Regression Model/ Regression Model with Time Lag

FDIs do not offer quick returns to the whole economy in any economy. Between the two, there is time lag. Due to numerous economic and non-economic reasons, time delays and returns depend. In addition, the time lag and the magnitude of the return may vary from time to time, from circumstance to economics. An essential element that has to be identified by means of research is the average time period necessary for the FDI to contribute to the economy's growth. Generally speaking, any economy's economic growth is impacted by several variables. Identifying these elements itself is a challenging process; if not feasible, it may become very difficult to separate the contributions and effect of each aspect. Therefore, it is exceedingly difficult to identify the impact of FDI on GDP. In order to determine the lag time, we need run regression models with different time lag by means of explanatory power of the independent variable FDI. Therefore the models for lag regression are:

$$\left.\begin{array}{l} GDP_t = \alpha_0 + \alpha_1\, FDI_{t-1} + U_t, \text{ when time lag is 1} \\ GDP_t = \alpha_0 + \alpha_2\, FDI_{t-2} + U_t, \text{ when time lag is 2} \\ GDP_t = \alpha_0 + \alpha_3\, FDI_{t-3} + U_t, \text{ when time lag is 3} \\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \end{array}\right\} \qquad \ldots\ldots\ldots\ldots (5.2)$$

The above models employ FDI lagged values, as the investment does not return both to the person and to the economy immediately. The following models show that period GDP does not depend on previous FDI levels of 't-k' where k is between 1 and 23. Now, the GDP of this era has been regressed by the common lowest quadratic (OLS) technique to eliminate the problem of multicolinearity on previous FDI values one by one. The estimators of lag models parameters were fitted using the OLS process. The following statistics are presented in the form of table 5.3. The estimated value of regression coefficients (b2), continuous term (b0), standard regression coefficient error (SEbK), t statistics, determining coefficient (R2 & adjusted R2), Karl Pearson correlation coefficient (R), F-Statistics and Durbin-Watson (d) statistics.

Analysis: Table 5.3 shows the laggard model regression result, which shows that FDI has a positive connection with Indian GDP where temporal lags vary from 1 to 23 years. The lag regression model is analyzed in depth as follows:

Regression Coefficient (b1)

Regression coefficient (b1) highlights the strength of independent variable (FDI) in predicting the dependent variable (GDP). The coefficient of regression in the first phases is relatively reduced. As time is running out, the coefficient of regression is increasing. The value of b1 increases from 37.382 to 609.054 as k increases 0 to 16 but declines to 567.964 when k is 17.

TABLE: 5.3 RESULTS OF LAG REGRESSION MODEL (GDPt=α0+αFDIt-k+Ut)

Lag (k)	Estimated b_0 (SE)	Estimated b_1(SE)	Tb_1 Statistics	R	R^2	Adj R^2	F-Statistics	DW (d)
0	19485.578 (2967.081)	37.382 (2.702)	13.836	0.943	0.889	0.884	191.448	0.557
1	21035.767 (3568.032)	42.194 (3.732)	11.306	0.921	0.847	0.841	127.817	1.096
2	21572.966 (3654.223)	50.170 (4.480)	11.199	0.922	0.851	0.844	125.421	1.249
3	22735.450 (3108.620)	56.805 (4.235)	13.413	0.946	0.895	0.891	179.920	1.321
4	25042.11 (2825.747)	60.795 (4.147)	14.661	0.956	0.915	0.911	214.955	1.908
5	28273.806 (3108.937)	62.264 (4.822)	12.913	0.947	0.895	0.892	166.751	1.419

6	31373.333 (4242.954)	69.550 (7.745)	8.981	0.901	0.818	0.807	80.650	0.845
7	35797.101 (5076.354)	68.441 (9.841)	6.955	0.860	0.740	0.725	48.371	0.512
8	40567.535 (6249.096)	71.025 (14.091)	5.040	0.783	0.614	0.589	25.407	0.351
9	41682.823 (7258.225)	103.401 (24.433)	4.232	0.738	0.544	0.514	17.909	0.425
10	37413.733 (8228.427)	194.190 (45.316)	4.285	0.753	0.567	0.537	18.363	0.510
11	23766.271 (10031.821)	412.312 (84.954)	4.853	0.803	0.644	0.617	23.555	0.815
12	26927.519 (12529.541)	454.958 (121.565)	3.743	0.734	0.539	0.500	14.006	0.723
13	32265.733 (12612.583)	449.627 (127.479)	3.527	0.729	0.531	0.488	12.440	0.823
14	31819.619 (9317.715)	500.274 (94.313)	5.304	0.859	0.738	0.712	28.136	1.138
15	36643.558 (7492.023)	509.168 (78.358)	6.498	0.908	0.824	0.805	42.223	1.314
16	39134.057 (7481.647)	609.054 (92.259)	6.602	0.919	0.845	0.826	43.581	1.148
17	48640.568 (7642.663)	567.964 (98.445)	5.769	0.909	0.826	0.801	33.285	1.371
18	60630.350 (7796.255)	487.971 (103.351)	4.721	0.888	0.788	0.753	22.9292	1.515
19	74818.847 (7379.175)	392.217 (104.666)	3.747	0.859	0.737	0.685	14.042	1.360
20	89304.121 (1454.749)	338.740 (27.079)	12.509	0.987	0.975	0.969	156.487	0.982
21	94317.223 (2311.671)	413.652 (60.553)	6.831	0.969	0.940	0.919	46.666	1.326
22	98988.194 (2914.247)	595.436 (125.896)	4.730	0.958	0.918	0.877	22.369	0.042
23	102494.806 (1271.267)	1077.075 (104.860)	10.272	0.995	0.991	0.981	105.504	2.986

Source: Author's computations
• Standard mistakes appear at percentage levels and parenthesis figures

Standard Error (S.E.)
The parameter variance indication is the default error. If the estimator has minimal variance, it is considered the 'best' estimator. Thus the best model will be the one where the default error is reduced. The default error (SEb1) decreases till k=4 starts to rise after that. At k=4, 4.147 is the best way to demonstrate the model with lag 4.

T-Statistics (t)
The t-statistics value illustrates the importance. The t-statistics value rises to 14 661 when k is 4 after that, and it begins to decrease.

Coefficient of Determination (R2 and adjusted R2)
R 2 and modified R2 emphasise the important temporal lag based on the fitness of the model. This is why FDI explains how many GDP fluctuations. The R2 and adjusted R2 shown in Table 5.3 are greatest respectively 0.915 and 0.911 when k=4. This demonstrates that 91% variance in GDP can be explained by FDI. The deduction may thus be derived from R2 and adjustedR2: the 4-year model is the best model and hence the greatest impact of FDI on GDP occurs after 4 years.

Correlation Coefficient (R)

The correlation coefficient (R) is calculated to measure the strength of the linear relationship between FDI and GDP. The table shows that R rises to K=4 and to k=4 is 0.956. The value of R decreases afterwards. Therefore, when the delay is four years, GDP's connection with FDI is strongest.

F-Statistics

In each lag, the value of F-statistics is also important. This means that in every lag FDI is an important explanatory variable. The greatest figures are F, i.e. 214,955, if there is a time delay of four. Thus, when k=4, the calculated parameters are of maximal importance.

Durbin Watson (d) Statistics

The statistics of Durbin-Watson are calculated to test whether or not the error conditions are automatically linked. If the model is devoid of autocorrelation, the best prediction using a regression coefficient will be feasible. As DW values reach to 0, positive autocorrelation is seen, no autocorrelation is reached and more than two autocorrelations are negative. The DW of k=4 is 1,908, no autocorrelation being underlined. Thus, the model time lag with k=4 is autocorrelated free and OLS estimators are unbiased & best. It can thus be used for forecasting. To summarise, the findings of the model of lag regression show that FDI is positively linked to India's economic development (GDP) at a time lag range of 1-23. Analyzes also show that several indicators such as correlation coefficient value (R), determination coefficient (R2 and modified R2) and F-statistics of the lag pattern always imply that FDI significantly impacts GDP after four (K=4) years. FDI therefore takes 4 years to contribute to the Indian economy as effectively as possible. The findings of this regression show that previous FDI values lead to India's GDP. It can be inferred that the link between past FDI values is the outcome of the FDI regression. It cannot, however, be claimed that FDI generates economic growth in the Indian economy based on the aforementioned facts.

Unit Root Test for Gross Domestic Product (GDP)

We apply the unit root test to test whether there is a unit root problem in our GDP sample data. The following three models were utilised to test the fundamental issue of the unit:

$$\Delta GDP_t = \delta\, GDP_{t-1} + U_t \qquad \ldots\ldots\ldots\ldots\ldots\ldots (5.3)$$

$$\Delta GDP_t = \beta_1 + \delta\, GDP_{t-1} + U_t \qquad \ldots\ldots\ldots\ldots\ldots\ldots (5.4)$$

$$\Delta GDP_t = \beta_1 + \beta_2 t + \delta\, GDP_{t-1} + U_t \qquad \ldots\ldots\ldots\ldots\ldots\ldots (5.5)$$

The models (5.3), (5.4) and (5.5) depict no drift, drift and both deterministic and stochastic trends respectively. In equation (5.5), ‘t’ is the time or trend variable. In each case, following hypothesis is used:

Ho: Non stationary; $\delta=0$, that is the time series is non-stationary.

HA: Stationary; $\delta<0$, that is time series is stationary.

First, two distinct unit root tests are used to monitor the stationary nature of the variables (GDP and FDI). Due to ADF (1979) and Phillips and Perron (PP), the stationarity of the data collection is evaluated (1988).

The unit root test findings for GDP series derived from Dickey and Fuller Augmented are shown in table 5.4 below.

TABLE: 5.4 RESULTS OF UNIT ROOT TEST FOR GDP (Augmented Dickey-Fuller test for GDP)

	At level					
	Constant		**Constant, Linear Trend**		**None**	
	Critical Value	**ADF T-Stat.**	**Critical Value**	**ADF T-T-stat.**	**Critical Value**	**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	4.02451 (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 treds**		**None**	
	Critical value	**ADF T-stat**	**Critical Value**	**ADF T-stat**	**Critical value**	**ADF T-stat**
1% Level 5% Level 10% Level	-3.737853 -2.991878 -2.635542	-3947023 (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**	
Sources: Author's Computation (2018) using E-views 10 figures in parenthesis indicate probability						

The results of Unit Root test for series GDP obtained from Phillips-Perron Test is presented in the form of following table 5.5.

TABLE: 5.5 RESULTS OF UNIT ROOT TEST FOR GDP (Phillips-Perron Test for GDP)

	At level					
	Constant		**Constant, Linear Trend**		**None**	
	Critical Value	**PP T-Stat.**	**Critical Value**	**PP T-stat.**	**Critical Value**	**PP T-Stat.**
1% Level 5% Level 10% Level	-3.724070 -2.986225 -2.632604	2.268435 (0.9999)	-4.374307 -3.603202 -3.238054	-0.41847 (0.9809)	-2.660720 -1.955020 -1.609070	4.401987 (1.0000)
	R^2=0.15, Adj. R^2=0.12 D.W.=2.11		R^2=0.25, Adj. R^2=0.18 D.W.=2.09		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 treds**		**None**	
	Critical value	**PP T-stat**	**Critical Value**	**PP T-stat**	**Critical value**	**PP T-stat**
1% Level 5% Level 10% Level	-3.737853 -2.991878 -2.635542	-3.933200 (0.0064)	-4.394309 -3.612199 -3.243079	5.012436 (0.0026)	-2.664853 -1.955681 -1.608793	-2.904921 (0.0055)
	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**	
Sources: Author's Computation (2018) using E-views 10 figures in parenthesis indicate probability						

Analysis: Tables 5.4 and 5.5 show that GDP is not stationary at level, since there are more than 0.05% probability at (a) Constant and Linear trends and (c) None). The tests conducted by ADF and Philips Perron (PP) both show that the time series of GDP are not stationary in the level data and stationary after first differences. It means that at initial GDP difference we may use causal testing and it does not give false findings.

5.2.4.2 (B) Unit Root Test for Foreign Direct Investment (FDI)

In addition, we utilize the following models to assess the fundamental issue of the unit in the FDI series:

$$\Delta FDI_t = \delta\ FDI_{t-1} + U_t \qquad \text{……………………(5.6)}$$

$$\Delta FDI_t = \beta_1 + \delta\ FDI_{t-1} + U_t \qquad \text{……………………(5.7)}$$

$$\Delta FDI_t = \beta_1 + \beta_2\ t + \delta\ FDI_{t-1} + U_t \qquad \text{……………………(5.8)}$$

No drift, drift and deterministic and stochastic trends are presented in the models (5.6), (5.7) and (5.8). The time or trend variable is 't' in equation (5.8). The hypothesis is applied in every case: Ho: Non stationary; $\delta=0$, that is the time series is non-stationary and HA: Stationary; $\delta<0$, that is the time series is non-stationary and HA: Stationary; $\delta<0$, that is time series is stationary
In the first place, an enhanced Dickey Fuller test is utilized to examine the fundamental issue of the unit. Test results for FDI units derived from Dickey-Fuller Augmented Test are provided in table 5.6. Test results are presented as follows.

TABLE: 5.6 RESULTS OF UNIT ROOT TEST FOR FDI (Augmented Dickey-Fuller Test for FDI)

	At level					
	Constant		**Constant, Linear Trend**		**None**	
	Critical Value	**ADF T-Stat.**	**Critical Value**	**ADF T-T-stat.**	**Critical Value**	**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 treds**		**None**	
	Critical value	**ADF T-stat**	**Critical Value**	**ADF T-stat**	**Critical value**	**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	-5344298 (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**	
Sources: Author's Computation (2018) using E-views 10 figures in parenthesis indicate probability						

Secondly, Phillips-Perron is another test utilised in all time series data to study the unit root problem. The findings from PhillipsPerron testing of the unit root test for FDI are provided as Table 5.7 below.

TABLE 5.7: RESULTS OF UNIT ROOT TEST FOR FDI (Phillips-Perron Test for FDI)

	At level					
	Constant		**Constant, Linear Trend**		**None**	
	Critical Value	**PP T-Stat.**	**Critical Value**	**PP T-stat.**	**Critical Value**	**PP T-Stat.**
1% Level 5% Level 10% Level	-3.724070 -2.986225 -2.632604	2.317673 (0.9999)	-4.374307 -3.603202 -3.238054	-0.540504 (0.9740)	-2.660720 -1.955020 -1.609070	3.706326 (0.9998)
	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 treds**		**None**	
	Critical value	**PP T-stat**	**Critical Value**	**PP T-stat**	**Critical value**	**PP T-stat**
1% Level 5% Level 10% Level	-3.737853 -2.991878 -2.635542	-4.532995 (0.0016)	-4.394309 -3.612199 -3.243079	-5.385370 (0.0011)	-2.664853 -1.955681 -1.608793	-3.898610 (0.0004)

	R^2=0.48, Adj. R^2=0.45 D.W.=2.05	R^2=0.58, Adj. R^2=0.54 D.W.=2.04	R^2=0.40, Adj. R^2=0.40 D.W.=2.03
Decision	**Stationary**	**Stationary**	**Stationary**
Sources: Author's Computation (2018) using E-views 10 figures in parenthesis indicate probability			

Analysis: Table 5.6 and Table 5.7 demonstrate that the probability at all levels of FDI are larger than (0.05 percent) (a) constant (b), and linear (s) and (c), non-stationary at the level of data. In order to get stationary variables, we make the first order difference. The Dickey-Fuller and Philips Perron (PP) testers show that the FDI time series is not fixed on the level data, but the series becomes stationary after making the first change. This indicates that we may do the causation test at the initial FDI difference and not give misleading results. And we can see that both ADF and PP's GDP and FDI numbers are larger than critical thresholds, and that the probabilities are lower than 0.05 percent. Thus, GDP and FDI are stable at first differences, which means we may conduct Granger Cause tests on first differences, but not on level data. The next stage is to evaluate if GDP and FDI are co-corporated, having shown that the above variables are stable in the first order difference. If the provided series is determined to be cointegrated, we may immediately conduct Granger Causality tests on level data.

Cointegration

Granger (1981) developed the co-integration idea, which Engel and Granger expanded and enhanced (1987). Engle and Granger found that even if economic time series might wander over time and exhibit non-stationary characteristics, some linear variables could exist which converge with time into a long-term connection. If the series is stationary only after differentiation individually yet it is found to be stationary a linear combination of the levels, the series is called to co-integrate. Time series are considered to be a co-integrated time series if another non-stationary time series is reversed and the outcomes are not false. The following regression equation is used to perform cointegration.

$$GDP_t = \alpha_0 + \alpha_1 FDI_t + U_t \qquad \text{……………………(5.9)}$$

Ordinary Least Square (OLS) is used for evaluating cointegration on the aforementioned regression equation and results are achieved. Table 5.8 shows the results of the Johansen cointegration test.

TABLE: 5.8 RESULTS OF JOHANSEN COINTEGRATION TEST

Hypothesized No of CE(s)	**Eigen Value**	**Trace Statistic**	**Critical Value**	**Prob. ****
None*	0.575774	29.11171	15.49471	0.0003
At most 1*	0.299177	8.531996	3.841466	0.0035
Source: Author's computation (2018) using E-view 10 Trace test indicates 2 cointegrating equation(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**	**Trace Statistic**	**Critical Value**	**Prob. ****
None*	0.575774	20.57972	14.26460	0.0044
At most 1*	0.299177	8.531996	3.841466	0.0035
Source: Author's computation (2018) using E-view 10 Trace test indicates 2 cointegrating equation(s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level ** macKinnon-Haug-Michelis (1999) p-values				

Analysis: Test of coin corporation The trace and maximum autonomy value used to establish the integrative order of Johanness show that the null hypothesis of not co-integrating any of the variables and the co-integration of a variable as p-value 0,00 < 0,05 is more common. The long-lasting connection between GDP and FDI means that GDP increases anytime FDI increases. Now that the variables (FDI and GDP) are co-integrated or a long-term or equilibrium connection exists between the FDI and GDP suggesting that they are not producing misleading findings by using the Granger-Causality test for FDI and GDP.

Causality through Vector Error Correction Model (VECM)

We utilised the ADF and PP unit root tests to verify data stationarity. Both tests demonstrate that the variables at the level are not stationary, but at first stationary (Table 5.4, 5.5, 5.6 and 5.7). This demonstrates that the variables are of order one and further suggests the potential of co-integration of the variables. First, based on a VAR model with beginning data, we will assess the presence, based on the cointegration test, of a long-term link between the variables. Since the model contains very limited data, only models of a maximum of 3 delays may be taken into account. The best number of delays in the model is three based on results achieved using criterion LR, FPE, AIC, SC and HQ (Table 5.11).

TABLE: 5.11 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 Author's Computation (2018) using E-view 10
*indicates lag order selected by the sriterion
LR: sequential modified LR test statics (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information critcrion
HQ: Hannan-Quinn information critcrion

Because the variables are of I (1) order, we have used the co-integration process Johansen-Juselius to examine if the two variables have a long term link (FDI & GDP). The good outcome is that the VECM and not the VAR models must be modelled. Table 5.12 shows that p is below the 5 per cent level of importance and we thus reject a zero assumption and accept alternative assumptions that the variables are long-term co-integrated.

TABLE: 5.12 COINTEGRATION TEST Unrestricted Cointegration Rank Test (Trace)

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

Trace test in dicates 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	Probe•
None	0.908519	52.61574	14.26460	0.0000
At Most 1•	0.132855	3.136079	3.841466	0.0766

Source: Author's Computation (2018) using E-Views 10
Max-cigenvalue test indicates 1 cointegrating eqn(s) a the 0.05 level
denotes rejection of the hypothesis at the 0.05 level
••MacKinnon-Haug-Michelis (1999) p-values

The joint analysis confirms that a long-term balance exists between FDI and GDP in India during the study period. During the study period. However, the analysis of the dynamics of FDI is particularly essential after GDP fluctuation. The Vector Error Correction Model (VECM) is consequently relevant to the estimate of the GDP and FDI variable I (1) and co-incorporated at level. In addition, VECM estimates may be applied to analyse the stability of the long-term balance owing to short-term shocks conveyed by FDIt or GDPt. The adjustment rate to the long run balance may likewise be anticipated by the model following a short run shock.
Where ΔGDPt and ΔFDIt are the first differenced series of GDPt and FDIt respectively, u1t-1 and u2t-1 are error correction terms, ε1t and ε2t are the white noise terms. The aforementioned equations, including 3 delays, were estimated. The equilibrium equation 5.12 and 5.13 suggests that the FDI's rise of 89.67% would result in an anticipated 1% GDP increase of (table 5.13)

TABLE: 5.13 VECTOR ERROR CORRECTION ESTIMATES

Cointegrating Eq	CointEql	
GDP(-1)	1.000000	
FDR-1)	-89.67319 (4.08939) [-21.92831	
C	16505.90	
Error Correction:	**D(GDP)**	**D(FDI)**
D(GDP(-1))	-0.802590 (0.17239) (4.655591	-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. =ids	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	1931318	1432130
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: Author's Computation (2018) using E-Views 10 '( )' shows Standard errors &I]'shows t-statistics.		

The findings of the Vector Error Correction Model are presented in the following table 5.14. The findings are achieved using the approach of Ordinary Least Square (OLS) after estimating the equations (Equation: A and Equation: B).

TABLE: 5.14 VECTOR ERROR CORRECTION MODEL (VECM)

System Equations				
D(GDP) = CON 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(II)*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(II)	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	136.62%	3.709653	0.0009

D(GDP) = C(1)*GDP(-1) - 89.6731908993*FDI(-1) + 16505.9049127) + C(2)*D(GDP(-I)) + 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(-I)89.6731908993•FDI(-1) + 16505.9049127) + C(10)•D(GDP(-I)) + C(II)*D(GDP(-2)) + CO 2)*D(GDP(-3)) + CO 3)*D(FD1(-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: Author's Computation (2018) using E-Views 10			

Analysis: Over Table 5.14 are presented the VECM results and their coefficients, t stats and p-value. The GDP coefficient of the (long run) model is C(1), whereas the short run coefficients of C(2), C(3) and C(4) are. That's the variable dependant. C (1) is a negative and significant rate of long-term balance adjustment (-0.347248). This implies that GDP is lower than its balance value, which leads to an increase in GDP in the current year and an increase in GDP of 34,7 per cent in the present year. In other words, in the last year, the model indicates a correction of 34.7 percent of imbalance. Similarly, coefficient C (9) is co-integrated (long-run) with FDI, dependent, and
short-run coefficients C (10), C (11) and C (12). C(9) is an adjustment speed that is negative and important for long-term equilibrium (– 0,010799); that is to say that FDI is a long-term GDP player.

VARIANCE DECOMPOSITION OF GDP

Period	**S.E.**	**GDP**	**EDI**
1	4815351	100.0000	0.000000
2	5647.535	99.95063	0.049372
3	6330.677	99.57585	0.424151
4	9034.010	92.26630	7.733698
5	11480.26	81.15354	18.84646
6	14225.10	75.00419	24.99581
7	17322.90	72.23367	27.55463
8	19598.63	72.44.537	27.55463
9	21749.21	74.82011	25.17989
10	24077.15	77.43862	22.56138
II	26663.59	79.47517	20.52483
12	30073.23	80.45991	19.54009
13	34429.42	79.92780	20.07220
14	39585.30	78.68316	21.31684
15	45391.44	77.68474	22.31526
16	51529.82	77.39577	22.60423
17	57954.67	77.81794	22.18206
18	64906.15	78.60750	21.39250
19	72696.76	79.37318	20.62682
20	81727.67	79.83643	20.16357
Source: Author's Computation (2018) using E-Views 10			

Table 5.17 (A) shows that, in the short term, for example, GDP shock accounts for a fluctuation of the GDP in the third year, for a shorter period of 99.5 percent (own shock). On the other hand, GDP fluctuations of 0.5% might be due to shocks conveyed through the FDI channel. For example, the shock to GDP can lead to a 79,8 percent variation on the GDp (own shock) fluctuation in the long run throughout the 20th projection period, but an FDI impulse can produce GDP fluctuation of 20,1 percent. This emphasises that the share of shock in the GDP itself decreases over the long term, while FDI increases. Similarly, in the short term, the FDI shock caused 55.3 percent of the FDI shock (own shock) in the third year, whilst the GDP impulse contributed 44.7 percent to FDI fluctuations. The GDP impulse is also a source of 5.3 percent of the FDI fluctuations in the third year. In the long term, the FDI shock is 22.3% fluctuating within FDI itself (own shock) in 20th projection period, whereas GDP innovation (impulse) leads to an FDI fluctuation of 77.6%. This shows that FDI shocks contribute in the long-term volatility of FDI itself while FDI shocks' contributions to GDP are

increasing in the long term. The two-way causation of economic growth (GDP) and FDI is also authenticated.

TABLE: 5.17(B): VARIANCE DECOMPOSITION OF FDI

Period	S.E.	GDP	FDI
1	232.7576	67.01115	32.98885
2	284.6031	53.98328	46.01672
3	310.7209	55.30658	44.69342
4	354.0993	61.31437	38.68563
5	367.1498	63.81263	36.18737
6	389.9451	67.91550	32.08450
7	428.0284	72.37870	27.62130
8	472.7746	74.07408	25.92592
9	548.0015	73.68884	2631116
10	640.4072	71.79964	28.20036
11	729.4642	71.12676	28.87324
12	818.2916	72.14434	27.85566
13	903.8578	74.00584	25.99416
14	993.7555	76.16761	23.83239
15	1101301	78.00939	21.99061
16	1233.471	78.94896	21.05104
17	1396.996	78.92059	21.07941
18	1592.034	7831141	21.68859
19	1810.690	77.75408	22.24592
20	2047.626	77.65218	22.34782
Source: Author's Computation (2018) using E-Views 10			

Outcomes of the Study

It tried, via the analysis of the link between FDI and economic development of the indian economy throughout the 26 year period from 1991 to 1992 to 2016-17, to analyze the performance of foreign direct investment in the Indian economy. To assess the contribution, foreign equity inflows are utilized as an FDI proxy and Gross Domestic Product (GDP) as a proxy for growth. In the present study, a number of econometric approaches were used to fulfil the following research goals:

- Descriptive Statistics
- Regression Model
- Lag Regression Model/ Regression Model with Time Lag
- Test of Stationarity (Graphical Method, Augmented Dickey Fuller Test and Phillips Perron Test)
- Cointegration
- Granger Causality Test
- Vector Error Correction Model
- Variance Decomposition

Descriptive statistics highlight the underlying patterns of FDI and GDP. The results show that the distributions of all macroeconomic variables are slightly skewed and that the standard deviation measures a significant degree of unpredictability. Statistics from Jarque Bera assess the deviation from normalcy of distribution. And in the lagged regression model the parameter estimates were fitted by the OLS technique. The estimated regression coefficient, constant time, standard regression error, t-statistics, determination coefficient (R 2 & R2 adjusted), the F-statistics and KarlPearson correlations suggest that FDI influences Indian Economic Growth (GDP) for a significant investigation period, i.e., 1991-92 to 2016-17. The results demonstrate a link between FDI (Foreign Direct Investment) and GDP (Economic growth), which has shown that historical FDI values lead to India's economic growth. It can nevertheless not be claimed that FDI causes GDP (economic growth) or GDP (economic growth) causes FDI in India, based on the data mentioned above. The causation between FDI and India's economic growth has been attempted. For these purposes the stationary tests or tests of the Unit Root, cointegration test, Granger Causality test, Vector Error Correction Model (VECM) and Variance Decomposition (PP). In summary, the most important results are:

- A Graphic and Unit Root (ADF) testing and Phillips Perron (PP) has explained that the GDP and FDI testing are not stationary, but stationary at the first difference, showing that they are integrated in order one. The test is not only stationary but also stabilised at the first difference. It means we may apply causality tests not at the level of data which do not generate a false result at initial differences.
- The test for cointegration confirmed that GDP and FDI are co-integrated and that the long-term balance of FDI is established between the two. Therefore, despite the presence of unit root at level data, it is possible to perform causality test directly at level data.
- The Granger Causality test confirmed the presence of bidirectional causality between FDI and GDP to explore the causation relationships. FDI leads to GDP (FDI diametric GDP) on the one hand and GDP in India on the other.
- The key characteristic of the Vector Error Correction Model (VECM), since it is able to determine short-term dynamics between timeseries and long-term linkages, is to differentiate between short-term and longer-term causation. Results confirmed that both the FDI and the FDI causality (FDI as GDP), and the GDP (GDP as FDI as GDP) also existed between FDI and FDI (GDP as GFDI) long-term causality.
- Decomposition of differences reveals a long-term decline in the contribution of shock to the GDP of GDP itself, while that of the FDI is growing. And FDI shocks are contributing to FDI fluctuations in a long term way, whereas FDI shocks are contributing to GDP fluctuations in the longer term. This further confirms the two-way causation between FDI and economic growth (GDP).

Moreover, the short and long-term link between Foreign Direct Investments and Indian economic development throughout the period 1991-92 to 2016-17 is apparent from several econometric approaches. In other words, the main necessity of India's continued economic growth is foreign direct investment. The analysis shows that foreign direct investment in India must be improved in order to boost economic growth.

CONCLUSIONS

In the time between 1991-92 and 2016-2017, this chapter examined the relationship between foreign direct investment and Indian economic growth over 26 years. It is also true of the closeness to FDI and is a proxy for economic growth of the Gross Domestic Product (GDP). FDI also serves as a proxy for FDI. Numerous econometric techniques have been used for achievement of the research goals, including the Descriptive Statistics (Dickey Fuller Enhanced Test and Philips Perron Test), Cointegration, the Granger Causality Test, the time-lag regression model, the Vector Error Correction Model (VECM, for example) and Variance Decomposition. Empirical tests revealed that the link between foreign investment and the Indian economy's economic growth was short-term and long-lasting. The analysis also confirmed that there is bidirectional causation between direct foreign investment and India's economic growth.

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