Chapter: 5
Causal relationship between FDI & endogenous macroeconomic variables

5.1 Introduction

This chapter primarily focused to measure causal relationship of endogenous macroeconomic variables with FDI inflow in India. The various endogenous macroeconomic variables and their relationship with inflow of FDI used in the present study has discussed in the part of methodology. In the present study depending upon the literature the following variables has been used in time series with the addition of some more endogenous variables which has not been used earlier in Indian context i.e., GNP deflator (GNPDIFL) is used as a proxy of inflation, Okun's formulation of unemploymentas a proxy of unemployment (UNOKUN) and gap of output growth (GOG). Development expenditure and non-development expenditure, gross domestic saving, gross fixed capital formation is also used. The objectives of this chaptermentioned in introduction are: to estimate the short run and long run relationship between FDI inflow and endogenous macroeconomic variables in India; and to analyse the causal relationship between FDI inflow and endogenous macroeconomic variables. Null hypothesis of this chapter are: FDI inflow does not cause inflow, unemployment and gap of output growth; FDI inflow does not cause development expenditure and non-development expenditure; FDI inflow does not cause gross fixed capital formation and gross domestic saving.

To achieve above mentioned objectives, econometrics methods has been used the unit root test of non stationarity, co-integration test, ECM method and granger causality test by the help of Eview.

5.1.0 FDI Inflow, Unemployment, Inflation and Gap of growth output

There are number of definitions about the relationship among the variable i.e.(FDIINFL) Inflow of Foreign Direct Investment, Inflation (GNPDIFL), Unemployment(UNOKUN) and Output Gap (which is gap of output growth (GOG)). Different researcher has attempted to explain the possible relationship between FDI inflow and different endogenous macroeconomic variable in different way. The findings of most of researcher (as discussed in literature) about these variables are:Inflation rate made negative impact on Inflow of FDI (Xiaoying Li and et al.2005);FDIINFL will help in bringing down inflation because FDIINFL improve supply side, further reduce inflation;Inflow of FDI and unemployment has not found any relationship (Shu-Chen Chang, 2006). Inflation and Unemployment is also the part of Phillips Curve and mix results are existing in literature about various economies. How FDI inflowhelps to bridge the gap of actual output and estimated output in economy? Therefore, it is required to check the causal relationship of inflow of foreign direct investment and unemployment, inflation and gap of output growth, respectively.

5.1.1 ADF Unit Root Test of stationarity

Table 5.1.1 shows the results of ADF test-statistics on level , 1st difference and 2nd difference for Intercept and Trend & Intercept model. The computed ADF test-statistics is compared with the critical value of t(tau). If the computed ADF test-statistics is smaller than the critical values of 'tau' then we cannot reject the Null Hypothesis. It means the series are stationary. It may be on 1%, 5% or 10% significant level.

The computed ADF test-statistics on intercept model for stationary are performed on level, 1st difference and 2nd difference (0.4802, -2.0745 and -3.5192 respectively). The value of 2nd difference is smaller than the critical vale of 'tau'. Therefore, we cannot reject Null Hypothesis on 5%level of significant for 2nd difference computed ADF test-statistics. It means at 2nd difference FDIINFL series become stationary. The trend & intercept model value on 2nd difference are significant at 10% level of significance. It means the value of FDIINFL becomes stationary.

The computed ADF test-statistics is significant at 10% level of significance for the series GNPDIFL, UNOKUN and GOG, thus it means the series does not has an unit root problem and GNPDIFL, UNOKUN and GOG are stationary at 10% significant level. That means the 2nd difference of series becomes stationary. Therefore all the series are stationary integrated order of two, I(2) for ADF test-statistics in table 5.1.1.

Table 5.1.1: Augmented Dickey-Fuller Unit Root Test

Variables	Model	Level	1st Diff	2nd Diff
FDIINFL	Intercept	0.480	-2.074	-3.519**
	Trend & Intercept	-1.283	-2.30	-3.423***
GNPDIFL	Intercept	2.539	1.470	-2.900***
	Trend & Intercept	1.081	-0.066	-3.658***
UNOKUN	Intercept	-0.953	-3.340	-3.223**
	Trend & Intercept	-2.571	-2.722	-3.776**
GOG	Intercept	-2.861	-3.243**	-5.274*
	Trend & Intercept	-2.169	-3.973**	-5.071*

*Significant at 1%, ** Significant at 5%, *** Significant at 10%

Critical values of 'tau' are given in appendix

5.1.2 PP Unit Root Test of stationarity

As the ADF Unit Root Test –statistics helps to check the stationarity and non stationarity of time series data. Phillips Parron test-statistics is also useful to check the stationarity and non stationarity without augmented term in the model of Intercept and Trend & Intercept. If the value of Phillips Parron is smaller than the critical value of 'tau', it means the time series does not have a unit root problem. It may be on 1%, 5% or 10% significant level.

Table 5.1.2 shows that the computed PP test-statistics is smaller than the critical vale of 'tau' which is indicated with *(star). It means the time series does not have unit root problem may be on 1%, 5% or 10% significant level. The computed PP test-statistics is smaller than the critical vale of 'tau' for UNOKUN and GOG on level. UNOKUN and GOG series are stationary to accept the Null Hypothesis. If the time series is stationary on level, I(1) then it will be stationary on 1st difference and 2nd difference.FDIINFL and GNPDIFL become stationary at 1% level of significant on 2nd difference and FDIINFL is already significant on 1st difference at Intercept and Trend & Intercept.

As the ADF test-statistics and PP test-statistics table 5.1.1 and 5.1.2 shows that all the series become stationary on I(2).Once variable have been classified as integrated of order I(0), I(1) and I(2) etc is possible to setup models that leads to stationary relation among the variables and where standard inference is possible. The necessary criteria for stationary among non-stationary variable is called co-integration. Johanson co-integration test has been employed to test whether there are long run relationship exits or not.

Table 5.1.2: Phillips-Parron Unit Root Test

Variables	Model	Level	1st Diff	2nd Diff
FDIINFL	Intercept	0.239	-4.431*	-8.095*
	Trend & Intercept	-1.592	-4.708*	-7.887*
GNPDIFL	Intercept	3.359	0.211	-7.277*
	Trend & Intercept	2.614	-1.455	-9.792*
UNOKUN	Intercept	-5.209*	-6.638*	-5.998*
	Trend & Intercept	-7.022*	-5.745*	-6.753*
GOG	Intercept	-4.440*	-5.575*	-11.124*
	Trend & Intercept	-3.441**	-6.562*	-10.704*

*Significant at 1%, ** Significant at 5%, *** Significant at 10%

Critical values of 'tau' are given in appendix

5.1.3 Johanson Co-integration Test

Having confirmed the existence of unit roots for all time series, we employ co-integration technique of Johansen(1988) and Johansen and Juselius(1990) to test whether there exist a long-run relationship among variables. In the case of co-integration test, the null hypothesis can be detected by Johansen's maximum likelihood method. The None indicate the Null Hypothesis for no co-integrated equation. At most 1 indicates that there is one co-integrated equation or error term. At most 2 mean that there are two co-integrated equation.

On the basis of conitegration test trace statistics and maximum eigenvalue found the below given results. Trace statistics (76.07) is greater than critical value at 5% level of significance which rejects the null hypothesis. Its mean there are co-integrated equation. P-value also shows the significance of co-integrated equations. The value of at most 1is also significant by the p-value and trace statistics (37.29) is greater than critical value. It means that the null hypothesis is not accepted to confirm the co-integrated equations. Trace Statistic indicates two co-integrated equation at 95% level of confidence. Trace statistics (15.34) is less than the critical value(15.49), we cannot reject the null hypothesis. It means that there is error term or all the variables are cointigrated and variables have long run association.

The result of trace statistics confirm by maximum eigenvalue test.

Maximumeigenvalue test under the Johanson Co-integration test in table 5.1.3.shows the three cointegrating equations at 5% level of significance and shows 95% level of confidence. On the None hypothesis mean there is no co-integrated equation or error term. The max-Eigen statistics value (38.78) is greater than the critical value at 5% level of significance. It means that the null hypothesis cannot be accepted. At most 1 and at most 2 also shows the significant result to reject the null hypothesis at 5% significant level.

Johanson Co-integration test of Trace and Max confirms the long run association among FDIINFL, GNPDIFL, UNOKUN and GOG. Now it is necessary to check the VECM model it is discussed in the chapter of methodology of this study.

Table 5.1.3: Johanson Co-integration Test

Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.856	76.075	47.856	0.000
At most 1 *	0.666	37.290	29.797	0.005
At most 2	0.533	15.346	15.494	0.052
At most 3	0.005	0.100	3.841	0.750

Trace test indicates 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 Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.856	38.784	27.584	0.001
At most 1 *	0.666	21.943	21.131	0.038
At most 2 *	0.533	15.245	14.264	0.034
At most 3	0.005	0.100	3.841	0.750

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

5.1.4 Normalized Co-integration Equation

Table 5.1.4 :Normalized Co-integration Equation

Normalized cointegrating coefficients (standard error in parentheses)

FDIINFL		GNPDIFL	UNOKUN	GOG
1.000	=	1759.336	24116.560	-28013.270
		(-1184.85)	(-3404.11)	(-33708.2)

Co-integrationequation ,

FDIINFL = 1759.33(GNPDIFL) + 24116.56(UNOKUN) – 28013.27(GOG) ….5.1

Moreover,according table 5.1.4.Normalizedco-integration has shown the long run associations or relationship among the FDIINFL, GNPDIFL, UNOKUN and GOG.

If sign is positive it means thatvariables move together in same direction or negative sign mean variable move in opposite direction in long run. Coefficient of GNPDIFL is insignificant seems to positive sign and coefficient of UNOKUN has positive sign with significant value. The coefficient of GOG is alsoinsignificant.

5.1.5 Vector Error Correction Model

The results of VECM revealed that the targeted model D(FDIINFL) has shown the error correction coefficient (-0.7226) for co-integration equations. All the dependent variables are converted in 1st difference by system during the estimation. There are requirements to check the significance of independent variables on lag one and lag two to explain the dependent variable. D(FDIINFL), D(GNPDIFL),D(UNOKUN) and D(GOG) are dependent variables. D(FDIINFL(-1)), D(FDIINFL(-2)), D(GNPDIFL(-1)), D(GNPDIFL(-2)),D(UNOKUN(-1)), D(UNOKUN(-2)),D(GOG(-1)) and D(GOG(-2)) are independent variables.

The error correction coefficients should be significant and negative Speed. Speed of adjustment towards equilibrium is 72%. Speed of adjustment in any disequilibrium towards long run equilibrium state is 72% which means that it is adjusting very fast toward long run equilibrium. The coefficient value of cointegrating equation is also significant for the long run adjustment towards equilibrium. Short run coefficients are also significant as shows in table 5.1.5.

Table 5.1.5: Vector Error Correction Estimates

Error Correction:	D(FDIINFL)	D(GNPDIFL)	D(UNOKUN)	D(GOG)
CointEq1	-0.722***	4.460	-8.845	7.765***
	-0.404	-4.500	-5.905	-6.405
	[-1.785]	[0.998]	[-1.510]	[1.206]
CointEq2	312.556	-0.066	0.228**	-0.207
	-686.95	-0.075	-0.099	-0.109
	[0.454]	[-0.876]	[2.298]	[-1.896]
CointEq3	-4840.744**	-0.192	-0.978*	1.117*
	-2044.36	-0.225	-0.295	-0.325
	[-2.367]	[-0.853]	[-3.311]	[3.438]
D(FDIINFL(-1))	-0.400	-4.055	7.145	-6.075
	-0.322	-3.505	-4.705	-5.105
	[-1.242]	[-1.141]	[1.533]	[-1.184]
D(FDIINFL(-2))	0.215	-2.335	7.535	-6.395
	-0.386	-4.305	-5.605	-6.105
	[0.557]	[-0.547]	[1.347]	[-1.038]
D(GNPDIFL(-1))	1054.654	-0.217	-1.554*	1.822*
	-3817.47	-0.420	-0.551	-0.607
	[0.276]	[-0.518]	[-2.817]	[3.002]
D(GNPDIFL(-2))	-8670.491***	0.173	-0.825	1.048
	-4462.6	-0.491	-0.645	-0.709
	[-1.942]	[0.352]	[-1.279]	[1.478]
D(UNOKUN(-1))	-176.974	-0.798	2.355	-2.295
	-20011.4	-2.205	-2.892	-3.182
	[-0.008]	[-0.362]	[0.814]	[-0.721]
D(UNOKUN(-2))	11390.65	0.772	-7.467*	8.255*
	-18245.6	-2.010	-2.637	-2.901
	[0.624]	[0.384]	[-2.831]	[2.845]
D(GOG(-1))	-18598.46	-0.924	7.131*	-7.776*
	-17478.9	-1.926	-2.526	-2.779
	[-1.064]	[-0.479]	[2.822]	[-2.798]

D(GOG(-2))	-4089.449***	-0.108	0.200	-0.155
	-2149.19	-0.236	-0.310	-0.341
	[-1.902]	[-0.459]	[0.643]	[-0.455]
Constant	574.007	0.074	0.152**	-0.184**
	-487.626	-0.053	-0.070	-0.077
	[1.177]	[1.387]	[2.168]	[-2.379]

Standard errors in ( ) & t-statistics in [ ]. * significant at 1%, ** significant at 5%, *** significant at 10%

5.1.6 ECM Statistically viability

The viability of the ECM is measured by the help of R-square and Durbin Watson (DW). R-square values explain the impact of independent variable on dependent variable about the regression model. 1-R^2 value is aware of the outside impact on model. Durbin Watson(DW) test statistics tests the Null hypothesis that the residuals from an Ordinary least squares regression are not auto-correlated against the alternative that the ARI process. If the observed value of the DW test statistics is less than the tabulated lower bound, than one should not accepted the null hypothesis of non –autocorrelated error and vice versa. If the test statistic value lies between dL and dU the test is inconclusive. In this context, you might err on the side of conservatism and not reject the null hypothesis.

In table 4.6, targeted model equation 1 shows the value of R-square and DW statistics. R-square value is 0.8923 meaning that the independent variables can explain the dependent variable 89% from this model. The value of DW test statistics is 2.6597, lies between dL and dU. It means we cannot reject null hypothesis. Hence autocorrelation do not exist.

Table 5.1.6:ECM Statistically Viability

Targeted Model Equation 1: D(FDIINFL) = C(1)*(FDIINFL(-1) - 51905.935*GOG(-1)- 871.856) + C(2)*(GNPDIFL(-1) - 42.910*GOG(-1) - 1.17792978673) + C(3)*(UNOKUN(-1) + 0.526*GOG(-1) - 0.0304) + C(4)*D(FDIINFL(-1)) + C(5)*D(FDIINFL(-2)) + C(6)*D(GNPDIFL(-1)) + C(7)*D(GNPDIFL(-2)) + C(8) *D(UNOKUN(-1)) + C(9)*D(UNOKUN(-2)) + C(10)*D(GOG(-1)) +C(11)*D(GOG(-2)) + C(12)

R-square	0.892	Mean dependent var	97.204
Adjusted R-square	0.723	S.D. dependent var	232.037
S.E. of regression	122.061	Sum squared resid	104292.5
Durbin-Watson stat	2.659		

Targeted Model Equation 2:D(GNPDIFL) = C(13)*(FDIINFL(-1) - 51905.935*GOG(-1) - 871.856) + C(14)*(GNPDIFL(-1) - 42.910 *GOG(-1) - 1.177) + C(15)*(UNOKUN(-1) + 0.526*GOG(-1) - 0.030) + C(16) *D(FDIINFL(-1)) + C(17)*D(FDIINFL(-2)) + C(18)*D(GNPDIFL(-1)) + C(19)*D(GNPDIFL(-2)) + C(20)*D(UNOKUN(-1)) + C(21)*D(UNOKUN(-2)) + C(22)*D(GOG(-1)) + C(23)*D(GOG(-2)) + C(24)

R-square	0.933	Mean dependent var	0.062
Adjusted R-square	0.828	S.D. dependent var	0.032
S.E. of regression	0.013	Sum squared resid	0.001
Durbin-Watson stat	1.585		

Targeted Model Equation 3:D(UNOKUN) = C(25)*(FDIINFL(-1) - 51905.935*GOG(-1) - 871.856) + C(26)*(GNPDIFL(-1) - 42.910*GOG(-1) - 1.177) + C(27)*(UNOKUN(-1) + 0.526*GOG(-1) - 0.030) + C(28) *D(FDIINFL(-1)) + C(29)*D(FDIINFL(-2)) + C(30)*D(GNPDIFL(-1)) + C(31)*D(GNPDIFL(-2)) + C(32)*D(UNOKUN(-1)) + C(33)*D(UNOKUN(-2)) + C(34)*D(GOG(-1)) + C(35)*D(GOG(-2)) + C(36)

R-square	0.896	Mean dependent var	-0.000
Adjusted R-square	0.735	S.D. dependent var	0.034
S.E. of regression	0.017	Sum squared resid	0.002
Durbin-Watson stat	2.480		

Targeted Model Equation 4: D(GOG) = C(37)*(FDIINFL(-1) - 51905.935*GOG(-1) - 871.856) + C(38)*(GNPDIFL(-1) - 42.910 *GOG(-1) - 1.17792978673) + C(39)*(UNOKUN(-1) + 0.526*GOG(-1) - 0.0304) + C(40) *D(FDIINFL(-1)) + C(41)*D(FDIINFL(-2)) + C(42)*D(GNPDIFL(-1)) + C(43)*D(GNPDIFL(-2)) + C(44)*D(UNOKUN(-1)) + C(45)*D(UNOKUN(-2)) + C(46)*D(GOG(-1)) + C(47)*D(GOG(-2)) + C(48)

R-square	0.854	Mean dependent var	0.004
Adjusted R-square	0.625	S.D. dependent var	0.031
S.E. of regression	0.019	Sum squared resid	0.002
Durbin-Watson stat	2.462		

[(dL=0.102, dU=3.227) on 1% level of significance]

[(dL=0.160, dU=3.335) on 1% level of significance]

In table 5.1.6, targeted model equation 2 shows the value of R-square and DW statistics. R-square value is 0.9332 which means that the independent variables can explain the dependent variable 93% from this model. The value of DW test statistics is 1.5854 which lies between dL and dU. It means we cannot reject null hypothesis, meaning that autocorrelation do not exists.

In table 5.1.6, targeted model equation 3 shows the value of R-square and DW statistics. R-square value is 0.8969 meaning that the independent variables can explain the dependent variable 90% from this model. The value of DW test statistics is 2.4807 the value lies between dL and dU. It means we cannot reject null hypothesis. Meaning that autocorrelation do not exist in variables.

In table 5.1.6, targeted model equation 4 shows the value of R-square and DW statistics.The value of DW test statistics is 2.4620 the value lies between dL and dU. It means we cannot reject null hypothesis. It means the autocorrelation do not exist. R-square value is 0.8542 meaning that the independent variables can explain the dependent variable 85% from this model. It means that there is good R-square value which is desirable.

It concludes that the ECM model is statistical viable. The size of statistical significance of the coefficient of the ECM measures the tendencies of each variable to return to equilibrium. Granger causality can still exist.

5.1.7 Granger Causality Test

The first row of below table 5.1.7 revealed that the null hypothesis, GNPDIFL does not Granger Cause (FDIINFL), is accepted, the level of significance is not desirable. GNPDIFL does not cause FDIINFL. In the second row the null hypothesis, FDIINFL does not Granger Cause GNPDIFL, cannot accept at 2.2 percent level of significance and therefore, FDIINFL Granger Cause GNPDIFL. Therefore, there is a unidirectional causal relationship between FDIINFL and GNPDIFL. In other words FDIINFL Granger causes GNPDIFL and not vice versa.

Third row shows that the null hypothesis, UNOKUN does not Granger Cause FDIINFL, is accepted, the level of significance is not desirable. UNOKUN does not cause FDIINFL. In the fourth row the null hypothesis, FDIINFL does not Granger Cause UNOKUN, can not accept at 1.3 percent level of significance and therefore, FDIINFL Granger Cause UNOKUN. Therefore, there is a unidirectional causal relationship between FDIINFL and GNPDIFL. In other words FDIINFL Granger causes UNOKUN and not vice versa.

As shows in table the null hypothesis, GOG does not Granger Cause FDIINFL, cannot rejected and vice versa for the FDIINFL does not Granger Cause GOG. So, there is not a unidirectional or bidirectional relationship.

Table 5.1.7:Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.	Relationship Uni / Bidirectional
GNPDIFL does not Granger Cause FDIINFL	21	1.302	0.299	→
FDIINFL does not Granger Cause GNPDIFL		4.884	0.022	Unidirectional
UNOKUN does not Granger Cause FDIINFL	21	2.280	0.134	→
FDIINFL does not Granger Cause UNOKUN		2.996	0.078	Unidirectional
GOG does not Granger Cause FDIINFL	21	2.620	0.105	
FDIINFL does not Granger Cause GOG		0.133	0.876	No relation

5.1.8 Result summery of FDI inflow, unemployment, inflation and labour market

Johnson Co-integration test confirms the long run association among FDIINFL(Inflow of Foreign Direction Investment), GNPDIFL(as indicator of Inflation), UNOKUN(Unemployment estimated by the help of Okun's law) and GOG(Gap between the growth of output and estimated growth of output which shows the disequilibrium in labour market) . Inflow of Foreign Direct Investment and inflation has positive long run relationship. Inflow of FDI and unemployment has also positive long run relationship. It means that the inflow of Foreign Direct Investment goes up then the unemployment goes down,Shu-Chen Chang, 2006 has not found any relationship between FDI inflow and unemployment. On the other hand, the problem of involuntary unemployment is also the puzzle for policy makers On the other hand, the disequilibrium between the inflow of Foreign Direct Investment and labour market has negative relationship. Inflow of Foreign Direct Investment goes up then the labour market seems to be in equilibrium.

Result of Error Correction method concludes that there is speed of adjustment which is 72 percent towards equilibrium in long run. Some variables on lag also influence to adjust inflow of Foreign Direct Investment in short run.

Granger Causality test also confirms the inflow of Foreign Direct Investment which causes the Inflation. FDI inflow has unidirectional relationship with inflation and unemployment.

5.2.0 FDI Inflow and Public expenditure

This section is primarily focused to analyse relationship between public expenditure and foreign direct investment inflow in India. Public expenditure refers to government expenditure. It is incurred on various activities for the welfare of people and also for the economic development, especially in developing countries.Development Expenditure is broadly defined to include all items of expenditure that are designed directly to promote economic development and social welfare. Non-development Expenditure includes expenditure appearing under general services except expenditure on Public Works. It includes expenditure pertaining to the general services rendered by government.Excessive government expenditure has found to exert a negative impact on the foreign investment (Bissoon Ourvashi, 2011). Jain Mamta et al. (2013) said that the foreign investors are a boon to government to revenue with regard to the generation of additional income tax. Also they pay tariff on their imports. Government expenditure requirements are greatly reduces through supplementing government's investment activities in a big way there by lessening the burden on national budget. There are number of definitions about the relationship among the variable i.e. (FDIINFL) Inflow of Foreign Direct Investment, Development Expenditure (DE) and Non-development Expenditure (NDE).Does the foreign direct investment have positive sign to improve the development of country? Has there been any requirement in long run foreign direct investment instead of non-development expenditure?

5.2.1 ADF Unit Root Test of stationarity

Table 5.2.1 shows the computed ADF test-statistics for NDE on intercept and Intercept & Trend model at 1st difference is stationary at 1% level of significance. Because the calculated values of NDE is -4.2025 and -4.7365 less than the critical (at 1% level of significance) for Intercept and Trend & Intercept respectively. Therefore, we can accept Null Hypothesis on 1% level of significance for NDE. So, NDE is stationary I(2). It means that the unit root does not exist and series is stationary on I(2). DE on 2nd difference calculated ADF test statistics value is less than the critical value at 10 % level of significance on intercept model. Again we cannot reject Null Hypothesis on 10% level of significance.

The computed ADF test-statistics on intercept model for stationary are performed on level, 1st difference and 2nd difference (0.4802, -2.0745 and -3.5192 respectively). The value of 2nd difference is smaller than the critical vale of 'tau'. Therefore, we cannot reject Null Hypothesis on 5% level of significant for 2nd difference computed ADF test-statistics.

Table 5.2.1: Augmented Dickey-Fuller Unit Root Test

Variables	Model	Level	1st Diff	2nd Diff
FDIINFL	Intercept	0.480	-2.074	-3.519**
	Trend & Intercept	-1.283	-2.307	-3.423***
DE	Intercept	2.064	-1.228	-2.922***
	Trend & Intercept	0.241	-1.997	-2.726
NDE	Intercept	5.093	0.782	-4.202*
	Trend & Intercept	3.256	-0.909	-4.736*

*Significant at 1%, ** Significant at 5%, *** Significant at 10%

Critical values of 'tau' are given in appendix

5.2.2 PP Unit Root Test of stationarity

Table 5.2.2, shows that the computed PP test-statistics is smaller than the critical value of ‘tau’ which is indicated with *(star). The computed PP test-statistics is smaller than the critical value of ‘tau’ (1% level of significant) DE and NDE on 2^{nd} difference which accepted the null hypothesis. Hence, DE and NDE series are stationary. All the series are stationary on 1^{st} and 2^{nd} difference on 1% and 5% level of significance. The series are stationary, I(1) and I(2).

DE and NDE become stationary at 1% level of significant on 2^{nd} difference on Intercept and Trend & Intercept models.Once variable have been classified as integrated of order I(0), I(1) and I(2) is possible to setup models that leads to stationary relation among the variables and where standard inference is possible. The necessary criteria for stationary among non-stationary variable is called co-integration.

Table 5.2.2: Phillips-Parron Unit Root Test

Variables	Model	Level	1st Diff	2nd Diff
FDIINFL	Intercept	0.239	-4.431*	-8.095*
	Trend & Intercept	-1.592	-4.708*	-7.887*
DE	Intercept	3.464	-2.497	-8.770*
	Trend & Intercept	0.355	-3.957**	-8.522*
NDE	Intercept	7.126	-0.806	-9.787*
	Trend & Intercept	2.699	-3.713**	-12.722*

*Significant at 1%, ** Significant at 5%, *** Significant at 10%

Critical values of ‘tau’ are given in appendix

5.2.3 Johanson Co-integration Test

Trace statistics (47.55) is greater than critical value at 1% level of significance which rejects the null hypothesis. Its mean there are co-integrated equation. P-value also shows the significance of co-integrated equations. Trace Statistic indicates 1 co-integrated equation at 99% level of confidence. It means that there is error term or all the variables are cointigrated and variables have long run association.

Maximum eigenvalue test under the Johanson Co-integration test in table 7.3 shows the 1 cointegrating equations at 1% level of significance and shows 99% level of confidence. On the None hypothesis means there is no co-integrated equation or error term. The max-Eigen statistics value (40.07) is greater than the critical value at 1% level of significance. P value shows the higher confidence level. It means that the null hypothesis cannot accept. Max-Eigen statistics indicates 1 significant cointegrating equations.

Johanson Co-integration test of Trace and Max confirms the long run association among FDIINFL, DE and NDE. As discussed in the chapter of methodology it is necessary to check the VECM model to correct or speed of adjustment.

Table 5.2.3: Johanson Co-integration Test

Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.865	47.558	29.797	0.000
At most 1	0.191	7.482	15.494	0.522
At most 2	0.149	3.228	3.841	0.072

Trace 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

Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.865	40.075	21.131	0.000
At most 1	0.191	4.254	14.264	0.831
At most 2	0.149	3.228	3.841	0.072

Max-eigenvalue 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

5.2.4 Normalized Co-integration Equation

Table 5.2.4 the estimates of the normalized cointegrating shows the long run associations or relationship among the FDIINFL, DE and NDE. The positive sign among indicates the same direction movements of variables in long run. While coefficient of DE has significant positive sign meaning that DE has positive relationship in long run with FDIINFL. The coefficient of NDE has significant negative value.

Co-integrationequation ,

FDIINFL = 0.28(DE) – 0.126(NDE) ….5.2

Table 5.2.4: Normalized Co-integration Equation

Normalized cointegrating coefficients (standard error in parentheses)			
FDIINFL		DE	NDE
1.000	=	0.285	-0.126
		(-0.021)	(-0.015)

5.2.5 Vector Error Correction Model

Having discussed in methodology of VECM, the results revealed that the targeted model D(FDIINFL) has shown the error correction coefficient (-0.7507) for co-integration equations. All the dependent variables are converted in 1st difference during the estimation.

There are requirement to check the significance of independent variables on lag one and two to explain the dependent variable in long run D(FDIINFL), D(DE) and D(NDE) are dependent variables. D(FDIINFL(-1)), D(FDIINFL(-2)), D(DE(-1)), ,D(DE(-2)) and D(NDE(-1)), D(NDE(-2)) are independent variables on lag one.

As per ECM, the coefficient of ECMshould be significant and has negative Speed. Speed of adjustment towards equilibrium is 75.07%. Speed of adjustment in any disequilibrium towards long run equilibrium state 75.07% meaning that it is adjusting very fast toward long run equilibrium. The coefficient value of cointegrating equation is also significant for the long run adjustment towards equilibrium. Short run coefficient is also significant as shows in table 5.2.5 with the superscript * on 1%, 5% and 10% level of significance respectively.

Table 5.2.5: Vector Error Correction Estimates

Error Correction:	D(FDIINFL)	D(DE)	D(NDE)
CointEq1	-0.750	2.9241*	-1.480*
	-1.370	-0.577	-0.541
	[-0.547]	[5.064]	[-2.732]
CointEq2	0.411	-0.760*	0.520*
	-0.453	-0.191	-0.179
	[0.906]	[-3.977]	[2.902]
D(FDIINFL(-1))	0.505	-2.372*	1.985*
	-1.260	-0.530	-0.498
	[0.400]	[-4.468]	[3.983]
D(FDIINFL(-2))	0.977	-0.105	0.457
	-1.249	-0.526	-0.493
	[0.782]	[-0.200]	[0.926]
D(DE(-1))	-0.174	-0.794*	0.433**
	-0.435	-0.183	-0.172
	[-0.399]	[-4.327]	[2.514]

D(DE(-2))	-0.493	-0.643*	0.436**
	-0.528	-0.222	-0.208
	[-0.934]	[-2.893]	[2.092]
D(NDE(-1))	0.086	-0.265	-0.0242
	-0.720	-0.303	-0.284
	[0.120]	[-0.874]	[-0.085]
D(NDE(-2))	0.303	-0.543***	0.500***
	-0.683	-0.287	-0.270
	[0.444]	[-1.889]	[1.853]
C	65.364	1291.04*	-306.681
	-583.584	-245.748	-230.669
	[0.112]	[5.253]	[-1.329]

Standard errors in ( ) & t-statistics in [ ]

*significant at 1%,**significant at 5%,***significant at 10%

5.2.6 ECM Statistically viability

In table 5.2.6, targeted model equation 1 shows the value of R-square and DW statistics. R-square value is 0.56 meaning that the independent variables can explain the dependent variable 56% from this model. It means that there is good R-square value which is desirable. The value of DW test statistics is 1.44, which lies between dL and dU.

Targeted model equation 2 shows the value of R-square and DW statistics. R-square value is 0.97 meaning that the independent variables can explain the dependent variable 97% from this model.

In table 5.2.6, targeted model equation 3 also shows the value of R-square and DW statistics. R-square value is 0.95 meaning that the independent variables can explain the dependent variable 95% from this model. It means that there is good R-square value which is desirable. The value of DW test statistics is 1.68, which is between the dL and dU.

It means we accept the null hypothesis in all the three targeted equations. It means that the variables are not autocorrelated.

Table 5.2.6: ECM Statistically Viability

Targeted Model Equation1: D(FDIINFL) = C(1)*(FDIINFL(-1) + 0.090*NDE(-1) - 823.954) + C(2)*(DE(-1) - 0.124*NDE(-1) - 2104.636) + C(3)*D(FDIINFL(-1)) + C(4)*D(FDIINFL(-2)) + C(5) *D(DE(-1)) + C(6)*D(DE(-2)) + C(7)*D(NDE(-1)) + C(8)*D(NDE(-2)) + C(9)

R-square	0.563	Mean dependent var	92.781
Adjusted R-square	0.245	S.D. dependent var	226.713
S.E. of regression	196.902	Sum squared resid	426476.400
Durbin-Watson stat	1.442		

Targeted Model Equation2:D(DE) = C(10)*(FDIINFL(-1) + 0.090*NDE(-1) - 823.954) + C(11)*(DE(-1) - 0.124*NDE(-1) - 2104.636) + C(12)*D(FDIINFL(-1)) + C(13)*D(FDIINFL(-2)) + C(14)*D(DE(-1)) + C(15)*D(DE(-2)) + C(16)*D(NDE(-1)) + C(17) *D(NDE(-2)) + C(18)

R-square	0.977	Mean dependent var	355.616
Adjusted R-square	0.960	S.D. dependent var	418.137
S.E. of regression	82.915	Sum squared resid	75625.470
Durbin-Watson stat	2.016		

Targeted Model Equation3:D(NDE) = C(19)*(FDIINFL(-1) + 0.090*NDE(-1) - 823.954) + C(20)*(DE(-1) - 0.124*NDE(-1) - 2104.636) + C(21)*D(FDIINFL(-1)) + C(22)*D(FDIINFL(-2)) + C(23)*D(DE(-1)) + C(24)*D(DE(-2)) + C(25)*D(NDE(-1)) + C(26) *D(NDE(-2)) + C(27)

R-square	0.955	Mean dependent var	338.965
Adjusted R-square	0.923	S.D. dependent var	282.027
S.E. of regression	77.828	Sum squared resid	66629.620
Durbin-Watson stat	1.689		

[(dL=0.102, dU=3.227) on 1% level of significance]

[(dL=0.160, dU=3.335) on 1% level of significance]

5.2.7 Granger Causality Test

Having discussed about the granger causality test in the chapter of methodology, the first row of table 5.2.7 revealed that the null hypothesis, DE does not Granger Cause FDIINFL, cannot be accepted, at 8 percent level of significance. It means DE cause to FDIINFL. In the second row the null hypothesis, FDIINFL does not Granger Cause DE, is accepted and therefore, FDIINFL does not cause DE.

The third row of table 5.2.7 revealed that the null hypothesis, NDE does not Granger Cause FDIINFL, is accepted, the level of significance does not desirable. NDE does not cause FDIINFL. In the fourth row the null hypothesis, FDIINFL does not Granger Cause NDE, cannot accept at the desirable level of significance and therefore, FDIINFL cause to NDE. Hence, there is a unidirectional causal relationship between FDIINFL and NDE.

In table 5.2.7.in fifth row is also confirming the cause relationship between NDE and DE to reject the null hypothesis and sixth row shows the acceptance of null hypothesis. Hence, NDE and DE has unidirectional relationship.

Table 5.2.7:Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.	Relationship Uni / Bidirectional
DE does not Granger Cause FDIINFL	21	2.956	0.080	→ Unidirectional
FDIINFL does not Granger Cause DE		28.704	5.000	
NDE does not Granger Cause FDIINFL	21	2.153	0.148	
FDIINFL does not Granger Cause NDE		4.022	0.038	→ Unidirectional
NDE does not Granger Cause DE	21	17.001	0.000	→ Unidirectional
DE does not Granger Cause NDE		1.492	0.254	

5.2.9 Result summery of FDI inflow, development expenditure and non-development expenditure

The empirical results revealed that the (FDIINFL) inflow of foreign direct investment, (DE) development expenditure and (NDE) non-development expenditure are related with the development of economy.

Johanson co-integration test of trace and max confirms the one co-integration equation and long run association among inflow of foreign direct investment, development expenditure and non-development expenditure. Development expenditure has significant positive association with inflow of foreign direct investment. Inflow of foreign direct investment has been complementing the development expenditure. One unit increase in development expenditure can increase the FDI inflow but not in the same proportionate. Dependency of development is going on foreign direct investment as complementary. Non-development expenditure has significant negative association with inflow of foreign direct investment. One unit decrease in Non-development expenditure can reduce the FDI inflow in less proportionate.

Speed of adjustment is 75 percent towards in long run equilibrium in long run. Again some coefficient is significant to adjust the speed with foreign direct investment. ECM statistical viability also shows the significance of R-square and DW statistics.

Granger Causality tests also confirms the unidirectional relationship between development expenditure and inflow of foreign direct investment. Foreign direct investment and non-development expenditure, non-development expenditure and development expenditure has unidirectional relationship. All the three variables are highly correlated.

5.3.0 FDI Inflow, Capital Formation and Domestic Saving.

This section is primarily focused on the relationship of Foreign Direct Investment, capital formation and domestic saving. There are number of definitions about the relationship among the variable i.e. (FDIINFL) Inflow of Foreign Direct Investment, Capital Formation (GDCF) and Gross Domestic Saving (GDS).Chung chen, et al.1995, used the domestic saving variable with FDI and found that the effect of FDI on domestic saving was not statistically significant and may have a negative effect on domestic saving. The volume and composition of domestic savings in India have undergone significant changes over the years. Savings come from three sources, viz. households, the private corporate sector, and the public sector. Capital is the produced means of production or it is called produced wealth by which more wealth is possible in the economy directly and indirectly. FDI seems to have a positive impact on capital accumulation (Mello Luiz R. de, 1999). Capital formation means creation of physical assets and non- physical capital consisting of public health efficiency, visible and no visible capital. How the FDI inflow cause to Domestic Saving and Capital Formation?

5.3.1 ADF Unit Root Test of stationarity

Table 5.3.1 shows the results of ADF test-statistics on level , 1st difference and 2nd difference for Intercept and Trend & Intercept model.

ADF test-statistics is significance at 1% level of significant for the series GFCF and GDS, thus it means the series does not has an unit root problem and GFCF and GDS are a stationary at 11% significant level. That's mean the 2nd difference of series become stationary. Therefore all the series are stationary integrated order of two, I(2) for ADF test-statistics in Table 5.3.1.

Table 5.3.1: Augmented Dickey-Fuller Unit Root Test

Variables	Model	Level	1st Diff	2nd Diff
FDIINFL	Intercept	0.480	-2.074	-3.519**
	Trend & Intercept	-1.283	-2.307	-3.423***
GFCF	Intercept	1.870	-2.474	-6.584*
	Trend & Intercept	0.617	-3.897**	-6.571*
GDS	Intercept	1.533	-3.338**	-8.103*
	Trend & Intercept	-1.227	-5.025*	-7.836*

5.3.2 PP Unit Root Test of stationarity

As the ADF Unit Root Test –statistics helps to check the stationarity and non stationarity of time series data. Phillips Parron test-statistics is also useful to check the stationarity and non stationarity without augmented term in the model of Intercept and Trend & Intercept. If the value of Phillips Parron is smaller than the critical value of 'tau', it means the time series does not has an unit root problem. It may be on 1%, 5% or 10% significant level.

Table 5.3.2 shows that the computed PP test-statistics is smaller than the critical vale of 'tau' which is indicated with *(star). It means the time series does not havea unit root problem may be on 1%, 5% or 10% significant level. The computed PP test-statistics is smaller than the critical vale of 'tau' for GFCF and GDS on level. GFCF and GDS series are stationary to accept the Null Hypothesis. If the time series is stationary on level, I(1) than it will be stationary on 1st difference and 2nd difference.

GFCF and GDS become stationary at 1% level of significant on 1st difference at Intercept and Trend & Intercept.As the ADF test-statistics and PP test-statistics table 5.4.1 and 5.3.2 shows that all the series become stationary on I(2).

Once variable have been classified as integrated of order I(0), I(1) and I(2) is possible to setup models that lead to stationary relation among the variables and where standard inference is possible. The necessary criteria for stationary among non-stationary variable is called co-integration.

Table 5.3.2: Phillips-Parron Unit Root Test

Variables	Model	Level	1st Diff	2nd Diff
FDIINFL	Intercept	0.239	-4.431*	-8.095*
	Trend & Intercept	-1.592	-4.708*	-7.887*
GNPDIFL	Intercept	2.517	-4.002*	-14.501*
	Trend & Intercept	-1.119	-5.261*	-15.400*
UNOKUN	Intercept	2.111	-4.596*	-10.574*
	Trend & Intercept	-1.726	-7.179*	-10.610*

5.3.3 Johanson Co-integration Test

Trace statistics (50.16) is greater than critical value at 1% level of significance which rejects the null hypothesis. Its mean there are co-integrated equation. P-value also shows the significance of co-integrated equations. It means that the null hypothesis cannot accept again to confirm the co-integrated equations. Trace Statistic indicates one co-integrated equation at 99% level of confidence. It means that there is error term or all the variables are cointigrated and variables have long run association.

Maximum eigenvalue test under the Johanson Co-integration test in table 5.4.3. shown the one cointegrating equations at 1% level of significance and shows 99% level of confidence. On the None hypothesis mean there is no co-integrated equation or error term. The max-Eigen statistics value (38.49) is greater than the critical value at 1% level of significance. P value is shown the higher confidence level. It means that the null hypothesis is concluded to reject. Max-Eigen statistics indicates 1 significant cointegrating equations.

Johanson Co-integration test of Trace and Max confirms the long run association among FDIINFL, GFCF and GDS. Now it is necessary to check the VECM model to check the error correction model.

Table 5.3.3: Johanson Co-integration Test

Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.854	50.160	29.797	0.000
At most 1	0.395	11.660	15.494	0.173
At most 2	0.076	1.584	3.841	0.208

Trace 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

Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.854	38.499	21.131	0.000
At most 1	0.395	10.076	14.264	0.207
At most 2	0.076	1.584	3.841	0.208

Max-eigenvalue 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

5.3.4 Normalized Co-integration Equation

Moreover, according table 5.3.4.to the estimates of the normalized cointegrating has shown the long run associations or relationship among the FDIINFL,GFCF and GDS. Positive signmeans the variables move together in same direction in long run. Coefficient of GFCF has significant positive sign meaning that GFCF and FDIINFL have positive association in long run. On the other hand GDS and FDIINFL have significant negative association in long run.

Co-integrationequation ,

FDIINFL = 0.32(GFCF) – 0.20(GDS) ….5.3

Table 5.3.4: Normalized Co-integration Equation

Normalized cointegrating coefficients (standard error in parentheses)		
FDIINFL	GFCF	GDS
1.000 =	0.326	-0.205
	(-0.045)	(-0.049)

5.3.5 Vector Error Correction Model

The results revealed that the targeted model D(FDIINFL) has shown the error correction coefficient (-0.3371) for co-integration equations. All the dependent variables are converted in 1st difference by system during the estimation. There are requirements to check the significance of independent variables on lag one and lag two to explain the dependent variable. D(FDIINFL), D(GFCF) D(GDS) are dependent variables. D(FDIINFL(-1)), D(FDIINFL(-2)), D(GFCF(-1)), D(GFCF(-2)),D(GDS(-1)), D(GDS(-2)) and D(GDS(-1))are independent variables.

The error correction coefficient should be significant and negative Speed. Speed of adjustment towards equilibrium is 33%. Speed of adjustment in any disequilibrium towards long run equilibrium state 33% meaning that it is adjusting very fast toward long run equilibrium. The coefficient value of cointegrating equation is also significant for the long run adjustment towards equilibrium. Short run coefficients are also significant at 1 percent level of significance as shows in table 5.3.5.

Table 5.3.5: Vector Error Correction Estimates

Error Correction:	D(FDIINFL)	D(GFCF)	D(GDS)
CointEq1	-0.337**	7.489*	6.344*
	-0.165	-0.886	-1.055
	[-2.032]	[8.449]	[6.008]
D(FDIINFL(-1))	0.177	-0.739	0.279
	-0.146	-0.780	-0.929
	[1.216]	[-0.947]	[0.300]
D(FDIINFL(-2))	-0.065	-8.023*	-7.521*
	-0.196	-1.050	-1.251
	[-0.330]	[-7.636]	[-6.009]
D(GFCF(-1))	-0.130	2.907*	2.621*
	-0.086	-0.463	-0.551
	[-1.506]	[6.274]	[4.749]
D(GFCF(-2))	0.191	2.666*	2.393*
	-0.078	-0.421	-0.502
	[2.431]	[6.320]	[4.762]
D(GDS(-1))	0.183	-2.731*	-2.651*
	-0.088	-0.473	-0.563
	[2.075]	[-5.769]	[-4.701]
D(GDS(-2))	-0.028	-2.438*	-2.362*
	-0.082	-0.441	-0.525
	[-0.340]	[-5.525]	[-4.494]
C	-57.20***	1051.118*	1157.097*
	-29.741	-158.931	-189.313
	[-1.923]	[6.613]	[6.112]

Standard errors in ( ) & t-statistics in [ ]

5.3.6 ECM Statistically viability

In table 5.3.6, targeted model equation 1 shows the value of R-square and DW statistics. R-square value is 0.90 meaning that the independent variables can explain the dependent variable 90% from this model. The value of DW test statistics is 1.98, lies between dL and dU. It means we cannot reject null hypothesis. It means that the variables are not autocorrelated.

Table 5.3.6: ECM Statistically Viability

Targeted Model Equation 1: D(FDIINFL) = C(1)*(FDIINFL(-1) - 0.559*GFCF(-1) + 0.495*GDS(-1) + 261.234) + C(2)*D(FDIINFL(-1)) + C(3)*D(FDIINFL(-2)) + C(4)*D(GFCF(-1)) + C(5)*D(GFCF(-2)) + C(6) *D(GDS(-1)) + C(7)*D(GDS(-2)) + C(8)

R-square	0.907	Mean dependent var	114.588
Adjusted R-square	0.848	S.D. dependent var	210.273
S.E. of regression	81.766	Sum squared resid	73543.02
Durbin-Watson stat	1.985		

Targeted Model Equation 2:D(GFCF) = C(9)*(FDIINFL(-1) - 0.559*GFCF(-1) + 0.495*GDS(-1) + 261.234) + C(10)*D(FDIINFL(-1)) + C(11)*D(FDIINFL(-2)) + C(12)*D(GFCF(-1)) + C(13)*D(GFCF(-2)) + C(14)*D(GDS(-1)) + C(15)*D(GDS(-2)) + C(16)

R-square	0.901	Mean dependent var	933.752
Adjusted R-square	0.839	S.D. dependent var	1089.626
S.E. of regression	436.936	Sum squared resid	2100047.00
Durbin-Watson stat	2.165		

Targeted Model Equation 3: D(GDS) = C(17)*(FDIINFL(-1) - 0.559*GFCF(-1) + 0.495*GDS(-1) + 261.234) + C(18)*D(FDIINFL(-1)) + C(19)*D(FDIINFL(-2)) + C(20)*D(GFCF(-1)) + C(21)*D(GFCF(-2)) + C(22)*D(GDS(-1)) + C(23)*D(GDS(-2)) + C(24)

R-square	0.852	Mean dependent var	813.973
Adjusted R-square	0.759	S.D. dependent var	1060.955
S.E. of regression	520.461	Sum squared resid	2979687.00
Durbin-Watson stat	2.075		

In table 5.3.6, targeted model equation 2 shows the value of R-square and DW statistics. R-square value is 0.907 meaning that the independent variables can explain the dependent variable 90% from this model. The value of DW test statistics is 2.16 which lies between dL and dU. It means we cannot reject null hypothesis.

Targeted model equation 3in table 5.3.6 shows the value of R-square and DW statistics. R-square value is 0.852 meaning that the independent variables can explain the dependent variable 85% from this model. The exogenous factor is also affecting the dependent variable which is 15%. The value of DW test statistics is 2.07 the value lies between dL and dU. It means we can accept null hypothesis.

5.3.7 Granger Causality Test

The first row of below table 5.3.7 revealed that the null hypothesis, GFCF does not Granger Cause (FDIINFL), cannot accept the null hypothesis, the level of significance is desirable. GFCF cause FDIINFL. In the second row the null hypothesis, FDIINFL does not Granger Cause GFCF, is accepted at 59% percent level of significance and therefore, FDIINFL does not Granger Cause GFCF. So, there is a unidirectional causal relationship between GFCF and FDIINFL. In other words FDIINFL does not Granger causes GFCF and not vice versa.

Third row shows that the null hypothesis, GDS does not Granger Cause FDIINFL, can not accept, the level of significance is desirable. GDS cause FDIINFL. In the fourth row the null hypothesis, FDIINFL does not Granger Cause UNOKUN, is accepted at 38% percent level of significance and therefore, FDIINFL Granger Cause UNOKUN. So, there is a unidirectional causal relationship between GDS and FDIINFL. In other words GDS Granger causes FDIINFL and not vice versa.

GDS and GFCF are not causing to each other in fifth and sixth row. So, there is not a unidirectional or bidirectional relationship.

Table 5.3.7:Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.	Relationship Uni / Bidirectional
GFCF does not Granger Cause FDIINFL	20	15.508	0.000	→ Unidirectional
FDIINFL does not Granger Cause GFCF		0.540	0.593	
GDS does not Granger Cause FDIINFL	20	8.823	0.003	→ Unidirectional
FDIINFL does not Granger Cause GDS		1.016	0.386	
GDS does not Granger Cause GFCF	20	1.883	0.186	No relation
GFCF does not Granger Cause GDS		1.394	0.278	

5.3.8 Result summery of FDI inflow, gross fixed capital formation and gross domestic saving

The objective of this research work is to identify possible long-run relationship and direction of causalities among FDIINFL, GFCF and GDS in India. The study has used inferential analysis based on Co-integration analysis and Error Correction Method to evaluate the relationship among variables in multidimensional space while considering all the possible dynamic interactions between them.

Johnson Co-integration test confirms the long run association among FDIINFL (Inflow of Foreign Direction Investment), GFCF(Gross Fixed Capital Formation) and GDS(Gross Domestic Saving) . Inflow of Foreign Direct Investment and Gross Fixed Capital Formation has positive long run relationship. FDI seems to have a positive impact on capital accumulation (Mello Luiz R. de, 1999) which supports the findings. If Gross Fixed Capital Formation goes up then the inflow of Foreign Direct Investment also goes up. Creation of physical assets and non- physical capital consisting of public health efficiency, visible and no visible capital goes up with the inflow of foreign direct investment.

The result with the gross domestic saving and inflow of Foreign Direct Investment has negative relation in long run.Chung chen, et al.1995, said that the effect of FDI on domestic saving was not statistically significant and may have a negative effect on domestic saving. Result of Error Correction method concludes that there is speed of adjustment which is 33 percent towards equilibrium in long run. Some variables on lag also influence to adjust inflow of Foreign Direct Investment in short run.

Granger Causality test also confirms the gross fixed capital formation and inflow of Foreign Direct Investment has unidirectional relationship. Gross domestic saving and Inflow of Foreign Direct Investment has also unidirectional relationship.