# Chapter- V

# ANALYSIS AND FINDINGS OF THE STUDY

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## 5.1 Findings from the Descriptive Statistics

The summary statistics presented in table 5.1 measures the basic statistical properties like central tendency, dispersion, normality etc. of concerned macro level variables. The mean value of FDI is INR 223.9778 billion with standard deviation 243.043. The figures portray that, although the average FDI inflow into the country for last 10 quarters is good enough, there are considerable differences in FDI inflows in across quarters. In the case of FI, the maximum investment in a particular year is almost 1251(billion INR) with a average of INR 325 billion.

**Table 5.1: Descriptive Statistics of Macro Level Variables**

Rs. in Billion

| Statistics | GDP | FI | FDI | FII |
|---|---|---|---|---|
| Mean | 13314.34 | 325.4253 | 223.9779 | 101.4474 |
| Median | 9195.887 | 193.9552 | 91.17540 | 35.50650 |
| Maximum | 34731.57 | 1250.519 | 937.4092 | 569.2210 |
| Minimum | 2872.657 | 11.26912 | 13.24542 | -310.2900 |
| Std. Dev. | 9539.583 | 314.5546 | 243.0433 | 164.1037 |
| Skewness | 0.781185 | 0.863420 | 1.210394 | 0.882643 |
| Kurtosis | 2.255902 | 2.652745 | 3.746823 | 3.750601 |
| Jarque-Bera | 10.35661 | 10.72970 | 22.19543 | 12.72541 |
| Probability | 0.005638 | 0.004678 | 0.000015 | 0.001725 |

*Source: Calculated by Researcher*

Besides, the mean GDP is found to be INR 13314.340 billion with standard deviation of 9539.583. The summary statistics of FII reports a very high standard deviation

(164) in comparison to its mean values (101 billion). Furthermore, descriptive statistics of other two variables also show high dispersion during the study period. Notably, the average FDI of the country is found to be 1.682 percent [(223.9778/13314.340) x 100] of average GDP which is quite good enough in comparison to other emerging economies.

Table 5.2 presents the basic summary statistics of sector level variables. One of the important observations is that, the sectoral contribution to GDP in India is the highest for service sector and the lowest for the primary sector. Over the study period, the mean service sector output is about four times of primary sector and three times of manufacturing sector output. The results also show that the service sector has attracted the highest volume of FDI having highest mean among all three sectors where the mean values of primary sector's FDI is exceptionally lower than that of other two sectors. This signifies that the primary sector in India has the lowest potential to attract foreign investment among all three sectors of Indian economy.

**Table 5.2: Descriptive Statistics of Sector Level Variables**

| Statistics | Sector-wise FDI | | | Sector-wise GDP | | |
|---|---|---|---|---|---|---|
| | **FDI_AGR** | **FDI_MFG** | **FDI_SRV** | **GDP_AGR** | **GDP_MFG** | **GDP_SRV** |
| **Mean** | 37.86940 | 408.4806 | 587.1665 | 6305.789 | 7817.572 | 24303.47 |
| **Median** | 9.736085 | 129.2906 | 373.4168 | 6068.385 | 6943.410 | 21075.39 |
| **Maximum** | 338.5577 | 1312.498 | 1999.371 | 8513.153 | 14860.57 | 49815.19 |
| **Minimum** | 0.459405 | 13.18551 | 6.668708 | 4471.270 | 3813.520 | 9069.510 |
| **Standard Deviation** | 73.27009 | 426.6157 | 645.2402 | 1252.390 | 3441.816 | 12750.57 |
| **Skewness** | 3.364875 | 0.679646 | 0.848541 | 0.335776 | 0.580357 | 0.561863 |
| **Kurtosis** | 14.22099 | 2.050903 | 2.690830 | 1.776188 | 2.082220 | 2.058240 |
| **Jarque-Bera Test Statistic** | 156.9334 | 2.519423 | 2.727702 | 1.786305 | 2.007114 | 1.970533 |
| Probability | 0.000000 | 0.283736 | 0.255674 | 0.409363 | 0.366573 | 0.373340 |

*Source: Calculated by Researchers*

Besides, the service sector remains the utmost attractive avenue of investment for the foreign affiliates. However, considering the standard deviation figures it becomes noteworthy that, both the measures such as sectoral contribution to GDP and sector specific flow of FDI, show considerable fluctuations over the study period.

## 5.2 Relationship between GDP and Foreign Investment

### 5.2.1 Findings from long-run analysis

According to the specified objectives the study first investigates the relationship between GDP and foreign investment against both the long-run and short-run perspective. The long-run analysis is organized by using either the Johansen cointegration technique or the Auto Regressive Distributed Lag (ARDL) cointegration technique as per the fulfillment of the precondition to use these tests to provide robust results. As mentioned above, examining the unit root property is a must for establishing meaningful inferences of concerned time series variables under Johansen test of cointegration but, testing the unit root property is not a prerequisite for the ARDL bound testing procedure. In spite of that, this study conduct unit root tests to ensure that none of focused variables, namely absolute value of GDP and net FII inflows, are stationary after second or higher order differences i.e. I(2), I(3)..

#### 5.2.1.1 Unit Root Test Results

ADF and PP tests are used to testify the unit root property with intercept and time trend & intercept for GDP and FI in their levels, first differences and so on until they become stationary. However, in case there is ambiguity between the test results the study applies KPSS test to make final decision about stationarity of the series under consideration. The results of ADF, PP and KPSS unit root test of GDP and FI at the

levels and the first differences are reported in the Table 5.3 and Table 5.4. From the results depicted in the Tables, it is observed that the null hypothesis, i.e., the presence of a unit root in its levels cannot be rejected for GDP series since the t-statistics of both ADF and PP tests are less than the critical values at 5 percent significance level i.e., the GDP series is non-stationary at level. Therefore, the study applies again the same tests to its first differences and reports that the null hypothesis of a unit root is rejected after looking into the results of both ADF and PP tests for the two models, Intercept and Trend & Intercept. The results of ADF unit root test of FI are displayed in the Table 5.3 which shows contradictory findings for Intercept and Trend & Intercept models. Interestingly first model i.e. Intercept indicate rejection of null hypothesis but the second model i.e. Trend and intercept advocates acceptance of null hypothesis. Again, while considers the unit root results applying PP test the study documents (Table 5.4) that the FI series is stationary at level under doth the models. Therefore, the study considers FI series is stationary at level. Therefore, on the basis of the results of two tests an ambiguity is observed regarding the stationarity of the foreign investment series. Hence, the investigation is extended to employ KPSS test of stationarity.

**Table 5.3: Results of Augmented Dickey-Fuller (ADF) Unit Root Test**

| **Variables** | **Level** | | **First Difference** | | **Result** |
|---|---|---|---|---|---|
| | **Intercept** | **Trend and Intercept** | **Intercept** | **Trend and Intercept** | |
| **GDP** | 2.713907 (1.0000) | -0.216195 (0.9916) | -0.950117 (0.7669) | -4.117697 (0.0090) | **I(1)** |
| **FI** | -.088587 (0.9464) | -8.322145 (0.0000) | -8.371461 (0.0000) | -8.398655 (0.0000) | **I(1)/I(0)** |

*Notes: ( ) MacKinnon (1996) one-sided p-values; I(1): Stationary after first difference*

*Source: Calculated by Researchers*

**Table 5.4: Results of Phillips-Perron (PP) Unit Root Test**

| Variables | Level | | First Difference | | Result |
|---|---|---|---|---|---|
| | Intercept | Trend and Intercept | Intercept | Trend and Intercept | |
| **GDP** | 5.714524 (1.0000) | 0.052764 (.9963) | -9.844605 (0.0000) | 14.25087 (0.0000) | **I(1)** |
| **FI** | -3.038499 (0.0476) | -8.375049 (0.0000) | -38.62156 (0.0001) | 54.68747 (0.0001) | **I(0)** |

*Notes: ( ) MacKinnon (1996) one-sided p-values; [ ]; I(1): Stationary after first difference*

*Source: Calculated by Researchers*

**Table 5.5: Results of Kwiatkowski-Phillips-Schmidt-Shin (KPSS) Unit Root Test for GDP and FI**

| Variables | Level | | First Difference | | Result |
|---|---|---|---|---|---|
| | Intercept | Trend and Intercept | Intercept | Trend and Intercept | |
| GDP | 1.064047** | 0.330124** | 0.435796 | 0.100707 | I(1) |
| FI | 1.210147** | 0.276802** | 0.051524 | 0.050743 | I(1) |
| Asymptotic Critical Values<br>1% level<br>5% level<br>10%level | <br>0.739000<br>0.463000<br>0.347000 | <br>0.21600<br>0.14600<br>0.11900 | <br>0.73900<br>0.46300<br>0.34700 | <br>0.21600<br>0.14600<br>0.11900 | |

*Notes: ** Statistical significance at 1% level ;* Statistical significance at 5% level; I(1): Stationary after first difference. Null Hypothesis : GDP and FI are Stationary,*

*Source: Calculated by Researchers*

It is noteworthy to mention that the null hypothesis of KPSS test is opposite to the ADF and PP test, i.e., the series doesn't contain unit root. The results of KPSS unit root test is presented in the Table 5.5 establishes stationarity at the first differences as null hypothesis of having stationary is accepted at I(I) at both the models. However, from the above discussions regarding unit root it can be concluded that GDP and FI series are stationary at their first difference.

### 5.2.1.2 Selection of Optimum Lag Length

Before going to analyses the long-run nexus between foreign investment inflow and GDP using cointegration technique, the study needs to determine the suitable lag length providing the emphasis on sensitivity of autoregressive technique to the selection of appropriate lag order. Table 5.6 shows the VAR lag order selection criteria based on the three commonly prescribed criteria, namely AIC, SIC and HQC. The AIC and HQC results suggest appropriate lag for the model is seven quarters having lowest test statistic at 5 percent level. But SIC points out six quarter as the appropriate lag for this model. Therefore, our decision goes with majority and accepts seven quarters as a lag length for this relationship measure.

**Table 5.6: VAR Lag Order Selection Criteria for GDP and FI**

| Lag Length | AIC | SIC | HQC |
|---|---|---|---|
| **0** | 34.21370 | 34.27550 | 34.23838 |
| **1** | 28.93143 | 29.11683 | 29.00546 |
| **2** | 28.99025 | 29.29925 | 29.11363 |
| **3** | 28.57796 | 29.01055 | 28.75069 |
| **4** | 27.97626 | 28.53246 | 28.19834 |
| **5** | 27.74874 | 28.42853 | 28.02017 |
| **6** | 27.56132 | 28.36472* | 27.88211 |
| **7** | 27.50586* | 28.43285 | 27.87600* |
| **8** | 27.50827 | 28.55886 | 27.92776 |

*Source: Calc lated by Researchers*

### 5.2.1.3 Results of Johansen Cointegration Test

Having established the time series properties under ADF and KPSS tests of the data, the study conducts Johansen-Juuselius (1992) Trace and Maximun Eigen statistics for cointegration to gauge the long-run co-movement between GDP and foreign

investment. The results presented in Tables 5.7 and 5.8 show that the null hypothesis of no cointegration between the variables can be rejected at the 1 percent level of significance as the Mackinnon-Haug-Michelis critical values [15.49471 & 14.26460 respectively] are less than the computed value of Trace statistic [37.45044] and maximum eigen statistic [35.12464] respectively at 5 percent level of significance. From the cointegration results, it is also clear that there exists only one linear combination between the variables in the long-run. However, the Johansen's cointegration test result concludes about the existence of co-movement between GDP and foreign investment in the long-run in India. The long-run cointegrating equations are formulated as:

$$GDP = 49.82672\ FI_{(t=15.4426)} - 3288.965 + \mu_t$$

$$FI = 0.020070\ GDP_{(t=13.4338)} + 66.00805 + \mu_t$$

**Table 5.7: Results of Johansen Cointegration Test (Trace Statistics) for GDP and FI**

| $H_0$ | $H_1$ | Trace Statistics | 5% Critical Value | Probability* |
|---|---|---|---|---|
| **r = 0** | r = 1 | 37.45044 | 15.49471 | 0.0000 |
| **r ≤ 1** | r = 2 | 2.325801 | 3.841466 | 0.1272 |

** MacKinnon-Haug-Michelis (1999) p-values*

*Source: Calculated by Reseacher*

**Table 5.8: Results of Johansen Cointegration Test (Maximum Eigen Statistics) for GDP and FI**

| $H_0$ | $H_1$ | Maximum Eigen Statistics | 5% Critical Value | Probability* |
|---|---|---|---|---|
| **r = 0** | r = 1 | 35.12464 | 14.26460 | 0.0000 |
| **r ≤ 1** | r = 2 | 2.325801 | 3.841466 | 0.1272 |

** MacKinnon-Haug-Michelis (1999) p-values*

*Source: Calculated by Researcher*

### 5.2.2 Findings from Short-Run Analysis

As both the series, GDP and Foreign Investment are found to be cointegrated, the analysis proceeds to document the short-run dynamics between the concerned variables employing the vector error correction mechanism**.**

#### 5.2.2.1 Result of the Vector Error Correction Model

Table 5.9 documents the results of vector error correction model for short-run dynamics between the foreign investments and the volume of GDP. The t-values associated with the coefficients of the corresponding lag values of foreign investment when GDP is taken as dependent variable are statistically significant except third lag but, the sign of the significant t-values are altered unstably. The last column shows significant positive t-values for lag two and six only but first, fourth and fifth lag's t-values have negative sign. Therefore, VECM results show foreign investments do have a mixed impact on economic growth through increase in the volume of GDP in the short-run. Alternatively, the t-values associated with lag values of the coefficients of the GDP while considering foreign investment as now dependent, are statistically significant for second lag to fifth lag and all have hold positive signs. So the short-run empirical results show increasing volumes of GDP in India have been alluring foreign investors but foreign investment inflow have made an intricate impact in GDP volume with incremental and detrimental influences.

The error correction terms (-3.32462 and -3.45379) of the VECM indicate that the both the GDP and FI adjust the disturbances to converge towards long-run equilibrium significantly and in right direction. The convergence rate is very high

(178 percent per period) while GDP is considered as exogenous variable. But, this rate is very low (8 percent per period) while FI is taken as exogenous variable.

**Table 5.9: Results of Vector Error Correction Model for GDP & FI**

| Independent Variables | Dependent Variables | |
|---|---|---|
| | **D(FI)** | **D(GDP)** |
| **ECT ($\gamma_1$)** | -1.779854**<br>[-3.45379] | -0.075903**<br>[-3.32462] |
| **D(FI(-1))** | 0.844551<br>[1.84298] | -2.713324**<br>[-2.68228] |
| **D(FI(-2))** | 0.726141<br>[1.73304] | 2.084187*<br>[2.25336] |
| **D(FI(-3))** | 0.699358*<br>[2.00142] | -1.368669<br>[-1.77437] |
| **D(FI(-4)** | 0.294414<br>[1.03930] | -1.541150*<br>[-2.46453] |
| **D(FI(-5))** | 0.309364<br>[1.47171] | -1.083164*<br>[-2.33428] |
| **D(FI(-6))** | 0.133900<br>[0.92947] | 0.791710*<br>[2.48958] |
| **D(GDP(-1))** | -0.055979<br>[-1.05049] | -0.312493**<br>[-2.65653] |
| **D(GDP(-2))** | 0.108451*<br>[1.98292] | -0.405995**<br>[-3.36277] |
| **D(GDP(-3))** | 0.215430**<br>[4.41339] | -0.265929*<br>[-2.47132] |
| **D(GDP(-4))** | 0.117719*<br>[2.10441] | 0.517770**<br>[4.19304] |
| **D(GDP(-5))** | 0.238439**<br>[4.28614] | -0.019095<br>[-0.15549] |
| **D(GDP(-6))** | -0.004852<br>[-0.07712] | 0.052299<br>[0.37659] |
| **C** | -252.1616**<br>[-2.91956] | 683.3946**<br>[3.58440] |

*Notes: ** Statistically significant at 1% level; * Statistically significant at 5% level; [ ] t-values.*

*Source: Calculated by Researcher*

### 5.2.3 Findings from Causality Test

As the GDP and FI are cointegrated, the standard Granger test may misspecify, so the error correction strategy developed and suggested by Englar and Granger (1987) has been used to identify the short-run and long-run causal relationship between the variables. The short-run and long-run causality results have explored under the VECM framework are reported below**:**

#### 5.2.3.1 Long-run Causality

The coefficients of Error Correction Term (ECT), presented in the first row of Table 5.9, contain information about the long-run equilibrium relationship between GDP & FI and the speed of adjustment to deviation from equilibrium. Both the adjustment coefficients of ECT are negative (-3.45379 and -3.32462) and also statistically significant at 1 percent level implying that, when equilibrium relationship deviates from the focus, ECT has an adjustment effect and the magnitude of the deviation is reduced for both the models. So this empirical investigation confirms the bidirectional long-run causality between GDP and FI which indicating any change in the volume of GDP or inflow of foreign investment causes change the flow of foreign investment or GDP volume respectively.

#### 5.2.3.2 Short-run Causality

The results of short-run causality test between foreign investment inflows and volume of GDP based on vector error correction Granger causality test are presented in table 5.10. Since both the null hypothesis having no causality are rejected so the analysis infer about the existence of bidirectional causality between the set of concerned variables. Therefore, as any change in the volume of GDP can cause the change in the flow of FI like that change in the volume of FI can cause change in the volume of GDP**.**

**Table 5.10: Result of VEC Granger Causality / Block Exogeneity Wald Test for GDP and FI**

| Dependent Variables | Independent Variables | Chi-Square Value | Probability Value | Implication |
|---|---|---|---|---|
| **GDP** | FI | 17.30282 | 0.0082 | Causality Exists |
| **FI** | GDP | 30.89315 | 0.0000 | Causality Exists |

*Source: Calculated by Researcher*

### 5.2.4 Result of Variance Decomposition Test and Impulse Response Function Analysis

After determining the bidirectional causality in the short-run the empirical analysis is extended to Variance Decomposition Test under the VECM framework to determine the degree of exogeneity between GDP and FI beyond the study period. Table 5.11 documents the test results which determine the strength of causality of the set of variables. The decomposition result reveals that almost 72 percent of the variance is explained by the own innovation of GDP for the 20 quarters time horizon and a significant part i.e. 28 percent of the variance is explained by the foreign investment inflows for that period. Although in the very first period the explanatory power of foreign investment to the growth in the GDP volume is tending to zero but after the first year it generates a high explanatory power and still is continuing at a constant level. However, the variance decomposition of FI interestingly establishes equipollent explanatory power from GDP volume and flow of foreign investment. The results indicate that GDP explains almost 44 percent of the forecast error variance of foreign investment where only 56 percent of the variance is explains by its own shocks even after 5 years i.e. 20 quarters. Notably, the outcomes also support the proposition of

gradually increasing explanatory power of GDP for describing the error variance of foreign investment. Finally, considering all the outcomes of the variance decomposition analysis it is concluded that GDP is more exogeneous and it remains the main driver behinds it movement.

**Table 5.11: Variance Decomposition of GDP and FI**

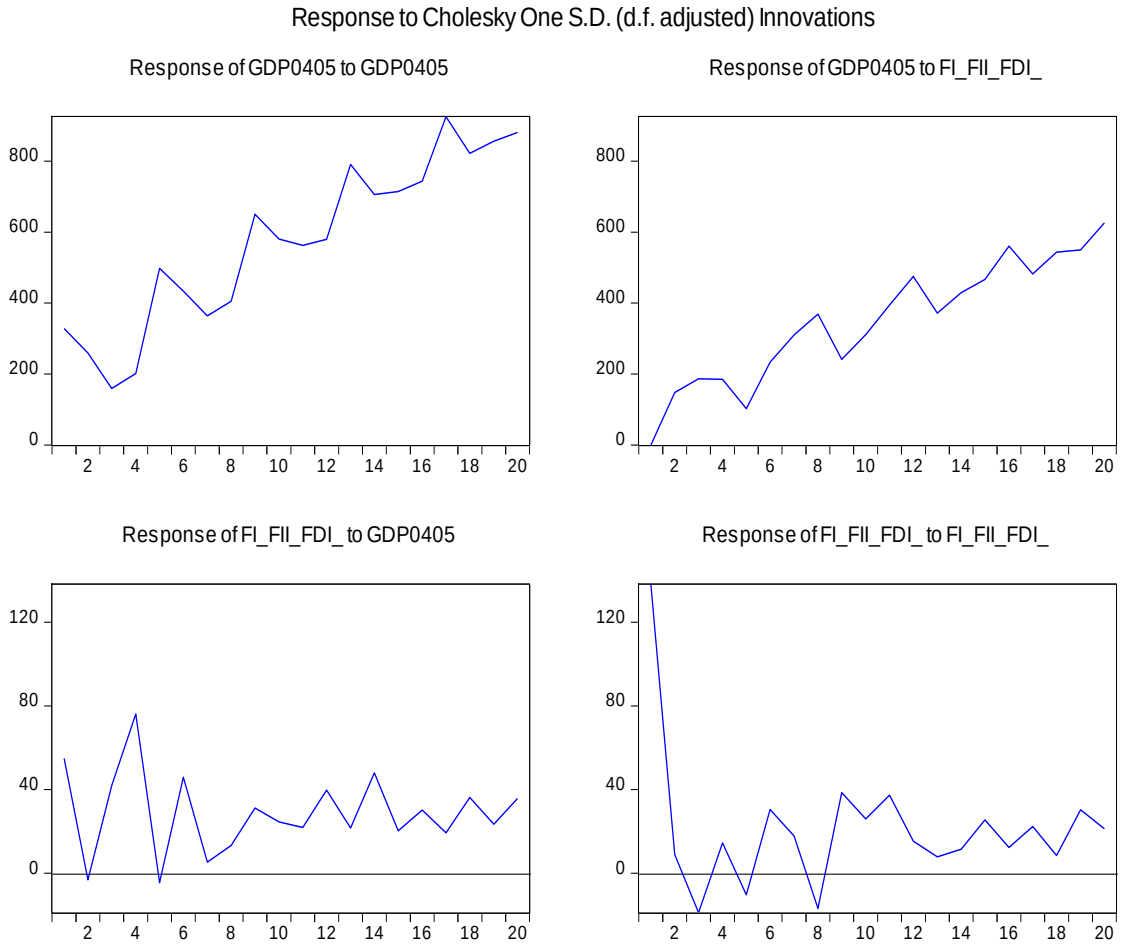
| Variance Decompositions of | Period | Percentage of Forecast Error Variance Explained by Innovation in: | |
|---|---|---|---|
| | | FI | GDP |
| FI | 1 | 86.36918 | 13.63082 |
| | 4 | 65.08554 | 34.91446 |
| | 8 | 62.30684 | 37.69316 |
| | 12 | 60.30261 | 39.69739 |
| | 16 | 55.86242 | 44.13758 |
| | 20 | 53.73886 | 46.26114 |
| GDP | 1 | 0.00000 | 100.00000 |
| | 4 | 27.39349 | 72.60651 |
| | 8 | 28.52282 | 71.47718 |
| | 12 | 27.92735 | 72.07265 |
| | 16 | 28.00274 | 71.99726 |
| | 20 | 28.26606 | 71.73394 |

*Source: Calculated by Researcher*

The results of the impulse response analysis for a time span of 20 quarters to one standard deviation innovation or shock in both the GDP and FI are shown in Figure 5.1. The responses of flow of foreign investment generate from a positive shock to GDP shows a declining trend for the first two quarters but after that it becomes surprisingly positive and sharp high up to the fifth quarters. After that the responses of foreign investment inflows is inconsistently positive all through for the 20 quarter time horizon. Notably, the responses of FI to its own shock is also positive but

inconsistent in the considered time span. Conversely, the response of GDP to the one standard deviation positive innovation to foreign investment inflow is found to be persistently increasing for all the 20 quarters and the response to its own innovation also follows an increasing trend with complete zigzag pattern**.**

**Figure 5.1: Impulse Response of Foreign Investment Inflows and Volume of Gross Domestic Products**




## 5.3 Analysis of relationship between GDP and FII

To determine the long-run relationship, short-run dynamics as well as causal relationship between the GDP and FII the study applies autoregressive estimation. Therefore, we need to check the unit root property to conduct autoregressive estimation.

### 5.3.1 Unit root Test results:

Both the ADF and PP tests are used to testify the unit root property with intercept and time trend & intercept for both GDP and FII in their level, first difference and so on until these get stationary. The results of ADF and PP unit root test of GDP & FII at the level and first differences are reported in the Table 5.12 and Table 5.13. From the results presented in Tables, it is observed that the null hypothesis, i.e., the presence of a unit root in its levels, cannot be rejected for GDP series since the t-statistics of both ADF and PP tests are less than the critical values at 5 percent level of significance, but in case of FII series, the unit root tests results in its level presented in the tables show that the null hypothesis can be rejected at 5 percent level of significance i.e. the series is stationary at level. For GDP series, again applying the same tests to its first differences reports that the null hypothesis of a unit root is rejected that signifies the series is stationary. Therefore, the results of ADF test and PP test of GDP and FII, in the level and also first differences, for the two models, namely, Intercept and Trend & Intercept show that GDP is integrated of order one i.e. I(1) and FII is integrated at level i.e. I(0).

**Table 5.12: Results of Augmented Dickey-Fuller (ADF) Unit Root Test**

| Variables | Level | | First Difference | | Result |
|---|---|---|---|---|---|
| | Intercept | Trend and Intercept | Intercept | Trend and Intercept | |
| GDP | 2.713907<br>(1.0000) | -0.216195<br>(0.9916) | -0.950117<br>(0.7669) | -4.117697<br>(0.0090) | I(1) |
| FII | -5.494342<br>(0.0000) | -5.980998<br>(0.0000) | -7.462152<br>(0.0000) | -7.449431<br>(0.0000) | I(0) |

*Notes: ( ) MacKinnon (1996) one-sided p-values; I(0): stationary at level, I(1): Stationary after first difference,*

*Source: Calculated by Researcher*

**Table 5.13: Results of Phillips-Perron (PP) Unit Root Test**

| Variables | Level | | First Difference | | Result |
|---|---|---|---|---|---|
| | Intercept | Trend and Intercept | Intercept | Trend and Intercept | |
| GDP | 5.714524 (1.0000) | 0.052764 (.9963) | -9.844605 (0.0000) | 14.25087 (0.0000) | I(1) |
| FII | -5.460256 (0.0000) | -5.980998 (0.0000) | -18.07459 (0.0000) | -19.58341 (0.0000) | I(0) |

*Notes: ( ) MacKinnon (1996) one-sided p-values; I(0): stationary at level, I(1): Stationary after first difference*

*Source: Calculated by Researcher*

Since the series are integrated at different order i.e., I(0) and I(1),the study uses the ARDL model in line with Pasaran & Shin, Pasaran *et.al.* (2001), Tang & Nair (2002) and Narayan (2005) in order to provides reliable and robust short-run dynamics and long-run relationship between GDP and FII.

### 5.3.2 Findings from Long-run Analysis

#### 5.3.2.1. ARDL Bound Test for co-integration analysis

The results of the bound test for co-integration are shown in Table 5.14. The results establish the existence of a long-run relationship between absolute value of quarterly GDP and net FII inflows, when GDP and FII are considered as the exogenous variables respectively. The calculated F-statistics are 6.577382 and 16.69101 for taking GDP and FII as dependent variable respectively, which are greater than the upper critical bound values documented by Pasaran et. al. (2001). Therefore, the null hypothesis of no cointegration between GDP and FII is rejected. Thus, the bound test for cointegration results under VAR model concludes that there is a co-movement between quarterly volume of GDP and net inflows of FII in the long-run. Having confirmed the existence of a long-run relationship between GDP and FII, the analysis

proceeds to formulate the long-run cointegrating equations by using the ARDL model and the estimated long-run equations are as follows:

**GDP = 3596.4773 + 67.3072 FII**

**FII = 36.9505 + 0.0047 GDP**

**Table 5.14 : Result of Bound Test for Co-integration**

| **Dependent variable** | **Computed F statistics** | |
|---|---|---|
| GDP | 6.577384** | |
| FII | 16.69101*** | |
| **Critical value** | **Table value of Passaran et al. (2001)** (Model: Unrestricted constant and no Trend**)** | |
| | **Lower bound** | **Upper bound** |
| 1% | 6.84 | 7.84 |
| 5% | 4.94 | 5.73 |
| 10% | 4.04 | 4.78 |

*Source: Calculated by Researcher*

**5.3.2.2. Optimum lag length selection:**

As the ARDL technique is sensitive to the selection of appropriate lag order, the analysis is determine the appropriate lag length before conducting the ARDL cointegration analysis. The optimum lag lengths under Akaike Information Criteria (AIC), Schwarz Information Criteria (SIC) and Hannan-Quinn Information Criteria (HQC are presented in Table 5.15

Considering GDP as dependent variable, the optimum lag length selection results under AIC and HQC suggests seven may be the optimum lag order where as SIC advocates five can be the optimum lag length. The present study does not want to take the risk of over parameterization by considering too higher lags for the ARDL model. Therefore, the analysis chooses five as optimum lag length having the lowest SC

(14.97116) for finding short-run dynamic between the GDP and FII. Although this lag length provide unanimous result by all the three criteria when FII is considered as dependent variable. Hence, the optimum lag is one having the lowest AIC, SIC and HQC value.

**Table 5.15: VAR Lag Order Selection Criteria for GDP and FII**

| **Dependent Variable** | **GDP** | | | **FII** | | |
|---|---|---|---|---|---|---|
| **lag** | **AIC** | **SC** | **HQ** | **AIC** | **SIC** | **HQ** |
| 0 | 21.09912 | 21.16092 | 21.12379 | 13.06620 | 13.12800 | 13.09088 |
| 1 | 15.91717 | 16.00987 | 15.95418 | **12.9976*** | **13.0903*** | **13.0347*** |
| 2 | 15.91747 | 16.04107 | 15.96683 | 13.02415 | 13.14775 | 13.07350 |
| 3 | 15.52846 | 15.68295 | 15.59015 | 13.05032 | 13.20482 | 13.11201 |
| 4 | 15.15642 | 15.34182 | 15.23044 | 13.07582 | 13.26122 | 13.14985 |
| 5 | 14.75487 | **14.97116*** | 14.84123 | 13.07687 | 13.29317 | 13.16324 |
| 6 | 14.75283 | 15.00003 | 14.85153 | 13.08033 | 13.32752 | 13.17903 |
| 7 | **14.69323*** | 14.97133 | **14.80427*** | 13.10124 | 13.37933 | 13.21228 |
| 8 | 14.71557 | 15.02457 | 14.83895 | 13.08946 | 13.39846 | 13.21284 |

*Source: Calculated by Researchers*

### 5.3.3. Findings from Short- run Dynamics

The coefficients of the short-run dynamic corresponding to the long-run relationships obtained from the ARDL short-run model are given in Table 5.16. In the short-run, no such major dynamism has been found. The only coefficient of FII in the first lag taking GDP as dependent is observed significant at 5 percent level. It means that in the very beginning the GDP has been influenced by the FII inflows. But, the Table 5.16 beginning with the coefficients of error correction term, which is significant at 1 percent level with the expected negative sign (-1.107406) and it justifies the result of bound test for co-integration. The estimated coefficient value signifies that the speed

of adjustment towards the long-run equilibrium after a shock is high. Approximately 110 percent of disequilibrium from the previous period's shock pulls back to the long-run equilibrium in the subsequent period. Interestingly, however, the coefficient of ECT is insignificant when FII is considered as dependent variable.

**Table 5.16: ARDL Short-run Results for GDP and FII**

| Independent Variables | Dependent Variables | |
|---|---|---|
| | D(GDP) | D(FII) |
| ECT **($\gamma_1$)** | -1.107406 [-3.205256]** | -0.034059 [-0.476672] |
| D(GDP(-1)) | 0.829142 [2.581067]** | -0.033398 [-1.017449] |
| D(GDP(-2)) | 0.014180 [0.209328] | |
| D(GDP(-3)) | 0.084607 [1.219814] | |
| D(GDP(-4)) | 0.843048 [12.49175]** | |
| D(GDP(-5)) | -0.753791 [-2.656409]** | |
| D(FII(-1)) | 0.561674 [1.986095]* | -0.318913 [-.630833]** |
| D(FII(-2)) | 0.353400 [1.114425] | |
| D(FII(-3)) | -0.044384 [-0.118587] | |
| D(FII(-4)) | -0.614822 [-1.757809] | |
| D(FII(-5)) | -0.198140 [-0.697784] | |
| C | 0.441405 [0.005454] | 10.43994 [0.6672] |

*Notes: ** Statistically significant at 1% level; * Statistically significant at 5% level; [ ] t-values*

*Source: Calculated by Researcher*

### 5.3.4 Findings from Causality Test

The results of short-run causality test between net foreign institutional investment and volume of GDP based on error correction Granger causality test are presented in table 5.17. Since the null hypothesis having no causality are rejected only the case where FII is taking as independent variable, so the analysis infer about the existence of unidirectional causality between the foreign institutional investment and volume of GDP which runs from GDP to FII. Therefore, as any change in the volume of GDP can cause the change in the net flow of FII.

**Table 5.17: Result of Granger Causality / Block Exogeneity Wald Test**

| Dependent Variables | Independent Variables | Chi-Square Value | Probability Value | Implication |
|---|---|---|---|---|
| GDP | FII | 5.509009 | 0.4804 | No Causality |
| FII | GDP | 31.09665 | 0.0000 | Causality Exists |

*Source: Calculated by Researcher*

## 5.4 Findings from the GDP- FDI relationship

### 5.4.1 Results of Unit Root Test:

Table 5.18 and Table 5.19 present the Augmented Dickey-Fuller(ADF) and Phillips-Perron (PP) unit root tests results of the GDP and flow of inbound FDI in their level and first difference. From the results shown in the above mentioned tables, it is evident that the null hypothesis, i.e., the presence of a unit root in its levels cannot be rejected for both the GDP and FDI series since the t-statistics of ADF and PP tests of the variables under both processes intercept and trend & intercept are less than their critical values at 5 percent levels of significance. Therefore, the unit root test results show that both the series are non-stationary at their levels. Consequently, applying the same tests to their first differences it has been observed that the null hypothesis of a

unit root is discarded in all measured cases. So, from the unit root tests results, it is concluded that the absolute values of GDP and the FDI inflows into India are stationary at their first difference i.e. I(1).

**Table 5.18: Results of Augmented Dickey-Fuller (ADF) Unit Root Test**

| Variables | Level | | First Difference | | Result |
|---|---|---|---|---|---|
| | Intercept | Trend and Intercept | Intercept | Trend and Intercept | |
| **GDP** | 2.713907 (1.0000) | -0.216195 (0.9916) | -0.950117 (0.7669) | -4.117697 (0.0090) | I(1) |
| **FDI** | 1.899894 (0.9998) | -1.295212 (0.8819) | -9.027982 (0.0000) | -8.084380 (0.0000) | I(1) |

*Notes: ( ) MacKinnon (1996) one-sided p-values; I(1): Stationary after first difference*
*Source: Calculated by Researcher*

**Table 5.19: Results of Phillips-Perron (PP) Unit Root Test**

| Variables | Level | | First Difference | | Result |
|---|---|---|---|---|---|
| | Intercept | Trend and Intercept | Intercept | Trend and Intercept | |
| **GDP** | 5.714524 (1.0000) | 0.052764 (.9963) | -9.844605 (0.0000) | 14.25087 (0.0000) | I(1) |
| **FDI** | -0.702091 (0.8398) | -5.399234 (0.0001) | -20.57866 (0.0001) | -31.56288 (0.0001) | I(1) |

*Notes: ( ) MacKinnon (1996) one-sided p-values; [ ]; I(1): Stationary after first difference*
*Source: Calculated by Researcher*

### 5.4.2 Selection of Optimum Lag Length

Before going to gauge the long-run nexus between GDP and FDI inflows in line with Johansen the study ascertained the appropriate lag length, as the autoregressive technique is sensitive to the selection of appropriate lag order. Table 5.20 present the VAR lag order selection criteria based on the three commonly prescribed criteria, namely, AIC, SIC and HQC. The AIC result suggests accepting a lengthy lag length,

i.e., seven quarters but other two criteria, SIC and HQC, suggest a moderate lag length, i.e., five quarters. Therefore, this study accepts five quarter as a lag length for this relationship measure on the basis of the results of majority of the selection criteria.

**Table 5.20: VAR Lag Order Selection Criteria for GDP and FDI**

| Lag Length | AIC | SIC | HQC |
|---|---|---|---|
| **0** | 33.37486 | 33.43666 | 33.39954 |
| **1** | 28.07584 | 28.26124 | 28.14987 |
| **2** | 28.11848 | 28.42748 | 28.24186 |
| **3** | 27.79876 | 28.23136 | 27.97149 |
| **4** | 27.51594 | 28.07214 | 27.73803 |
| **5** | 27.05252 | 27.73231* | 27.32395* |
| **6** | 27.12334 | 27.92673 | 27.44413 |
| **7** | 26.97817* | 27.90516 | 27.34830 |
| **8** | 27.01389 | 28.06449 | 27.43338 |

*Notes: * Indicates optimum lag order selected by the criterion*

*Source: Calculated by Researcher*

### 5.4.3 Results of Johansen Cointegration Test:

Since, the volume GDPs and inbound FDI inflows have unit root property at their level values and they are stationary at their first differences, the study employs cointegration test suggested by Johansen with the purpose of exploring whether these macro economic variables have a common stochastic trend.

The computed values of Trace statistics [see Table 5.21] and maximum eigen statistics [see Table 5.22] of Johansen cointegration test are 18.28567 and 14.68733 respectively, under null hypothesis ($H_0$) that there is no cointegration between GDP and FDI. Since the Mackinnon-Haug-Michelis critical values [15.49471 & 14.26460 respectively] are less than the computed value of Trace statistics and maximum eigen

statistics respectively at 5 level of significance, the analysis rejects the null hypothesis of no cointegration at the 5 percent level of significance. Therefore, the investigation reveals that existence of a cointegrating vector between the volume of GDP and volume of inward FDI into India. So from the Johansen's cointegration test results, we can confer that the absolute values of quarterly GDP and inflows of inbound FDI are cointegrated, i.e., there exists a co-movement between these two in the long-run. The estimated long-run cointegrating equations are:

$$\mathbf{GDP = 9309.591 + 18.84581FDI}_{(t = 2.94825)} + \mu_t$$

$$\mathbf{FDI = - 493.9872 + 0.053062\ GDP}_{(t = 6.14150)} + \mu_t$$

**Table 5.21: Results of Johansen Cointegration Test (Trace Statistics) for GDP & FDI**

| $H_0$ | $H_1$ | Trace Statistics | 5% Critical Value | Probability* |
|---|---|---|---|---|
| **r = 0** | **r = 1** | 18.28567 | 15.49471 | 0.0185 |
| **r ≤ 1** | **r = 2** | 3.598339 | 3.841466 | 0.0578 |

**MacKinnon-Haug-Michelis (1999) p-values*

*Source: Calculated by Researcher*

**Table 5.22: Results of Johansen Cointegration Test (Maximum Eigen Statistics) for GDP & FDI**

| $H_0$ | $H_1$ | Maximum Eigen Statistics | 5% Critical Value | Probability* |
|---|---|---|---|---|
| **r = 0** | **r = 1** | 14.68733 | 14.26460 | 0.0429 |
| **r ≤ 1** | **r = 2** | 3.598339 | 3.841466 | 0.0578 |

**MacKinnon-Haug-Michelis (1999) p-values*

*Source: Calculated by Researcher*

The above cointegrating equations shows that in the long-run there exhibits a significant (on the basis of t statistic) and positive relationship between GDP and FDI, i.e., they move together in the same direction, since the t-values related to the

coefficient of the FDI in the above mentioned equations are significant at 95 percent confidence level. The same conclusion applies to the second equation that establishes the relationship between FDI and GDP. The coefficient of GDP in this equation is significant at 5 percent probability level.

### 5.4.4 Findings from Short-Run Analysis:

Having established that the volume of absolute GDP and inbound FDI inflows are cointegrated, the fundamental question that arises regarding the short-run dynamics between these two can be documented by considering the vector error correction mechanism. As both the series, GDP and FDI, are found to be cointegrated, so the analysis proceeds to document the short-run dynamics between the concerned variables applying the vector error correction mechanism**.**

#### 5.4.4.1 Result of the Vector Error Correction Model:

Table 5.23 represents the results of vector error correction model for short-run dynamics between the inbound FDI inflows and the GDP growth in India. On the basis of the t-values associated with all the four lag values of the coefficients of the GDPs it is confirmed that in the short-run inflow of inbound FDI doesn't have any significant impact on the contribution of Indian GDP. But the t-values associated with the coefficients of the corresponding lag values of the FDIs when GDP is considered as dependent variable are statistically significant only for the first lag suggested by VAR. It is noteworthy to mention that sign of significant t-value is positive i.e. the inward FDI have positive impact on the GDP volume.

**Table 5.23: Results of Vector Error Correction Model for GDP & FDI**

| Independent Variables | Dependent Variables | |
|---|---|---|
| | **D(GDP)** | **D(FDI)** |
| **ECT ($\lambda_1$)** | -0.690072*<br>[-2.27667] | -0.241954**<br>[-3.01212] |
| **D(GDP(-1))** | -0.214986*<br>[-1.99353] | -0.036660<br>[-1.28276] |
| **D(GDP(-2))** | -0.229779*<br>[-2.15661] | -0.029204<br>[-1.03429] |
| **D(GDP(-3))** | -0.189304<br>[-1.86957] | -0.030413<br>[-1.13339] |
| **D(GDP(-4))** | 0.668005**<br>[6.58338] | -0.070888**<br>[-2.63618] |
| **D(FDI(-1))** | 0.954255*<br>[2.05363] | -0.664624**<br>[-5.39720] |
| **D(FDI(-2))** | 0.400379<br>[071371] | -0.602093**<br>[-4.04996] |
| **D(FDI(-3))** | 0.202990<br>[0.35110] | -0.474385**<br>[-3.09615] |
| **D(FDI(-4)** | -0.290116<br>[-0.58795] | -0.313411*<br>[-2.39674] |
| **C** | 92.43560**<br>[2.58218] | 383.8004**<br>[2.84131] |

*Notes: ** Statistically significant at 1% level; * Statistically significant at 5% level; [ ] t-values*

*Source: Calculated by Researcher*

### 5.4.5 Findings from Causality Test

As the GDP and FDI are cointegrated, the standard Granger test may mis-specify ,so the error correction strategy developed and suggested by Englar and Granger (1987) is used to identify the short-run and long-run causal dependency between the variables. The results provide by the VECM framework for the short -run and long-run causality tests are reported below in Table 5.24:

#### 5.4.5.1 Long-run Causality

The t-values, displayed in Table 5.23 associated with the error correction term under VECM framework indicate the existence of unidirectional significant long-run causality. Notably, the coefficient of error correction term (ECT) -0.002769 is statistically significant at 1 percent level when GDP is considered as dependent variable. This implies that any change in the value of the inbound FDI cause a change in the volume of GDP in the long-run. But in the reverse case, i.e., when FDI is considered as dependent variable, insignificant coefficient of ECT suggest that in the long-run GDP doesn't have any significant impact on FDI inflow**.**

#### 5.4.5.2 Short-run Causality

The results of short-run causality test between inbound FDI inflows and volume of GDP based on vector error correction Granger causality test are presented in Table 5.24. According to the results, it shows a short-run unidirectional causality directed to GDP from FDI as observed in the long-run. It clearly indicates that in the short-run inflow of FDI causes a significant change in the volume of GDP. Conversely, the absolute volume of GDP did not have any significant effect on the inbound FDI inflows.

**Table 5.24: Results of VEC Granger Causality / Block Exogeneity Wald Test for GDP and FDI**

| Dependent Variables | Independent Variables | Chi-Square Value | Probability Value | Implication |
|---|---|---|---|---|
| **GDP** | **FDI** | 15.71648 | 0.0278 | Causality Exists |
| **FDI** | **GDP** | 10.00275 | 0.1884 | Causality Does't Exists |

*Source: Calculated by Researchers*

### 5.4.6 Result of Variance Decomposition Test and Impulse Response Function Analysis

The study carries out the variance decomposition and estimate impulse response function under VECM framework with a view to determining the dynamic relationship between volume of GDP and the flow of FDI into India.

Table 5.25 indicates that inbound FDI inflow is strongly exogenous because more than 90 percent of its variance is explained by its own innovations even after 5 years, i.e., 20 quarters and in this manner; shock in the foreign FDI itself remains the main force behind its movement, while the explanatory power of GDP is only about 10 percent.

**Table 5.25: Variance Decomposition of GDP and FDI**

| Variance Decompositions of | Period | Percentage of Forecast Error Variance Explained by Innovation in: | |
|---|---|---|---|
| | | GDP | FDI |
| GDP | 1 | 100.0000 | 0.000000 |
| | 4 | 98.50342 | 1.496576 |
| | 8 | 97.59664 | 2.403363 |
| | 12 | 94.43233 | 5.567665 |
| | 16 | 82.23963 | 17.76037 |
| | 20 | 67.14051 | 32.85949 |
| FDI | 1 | 0.072003 | 99.92800 |
| | 4 | 2.796902 | 97.20310 |
| | 8 | 5.219555 | 94.78044 |
| | 12 | 7.946360 | 92.05364 |
| | 16 | 9.004366 | 90.99563 |
| | 20 | 9.107016 | 90.89298 |

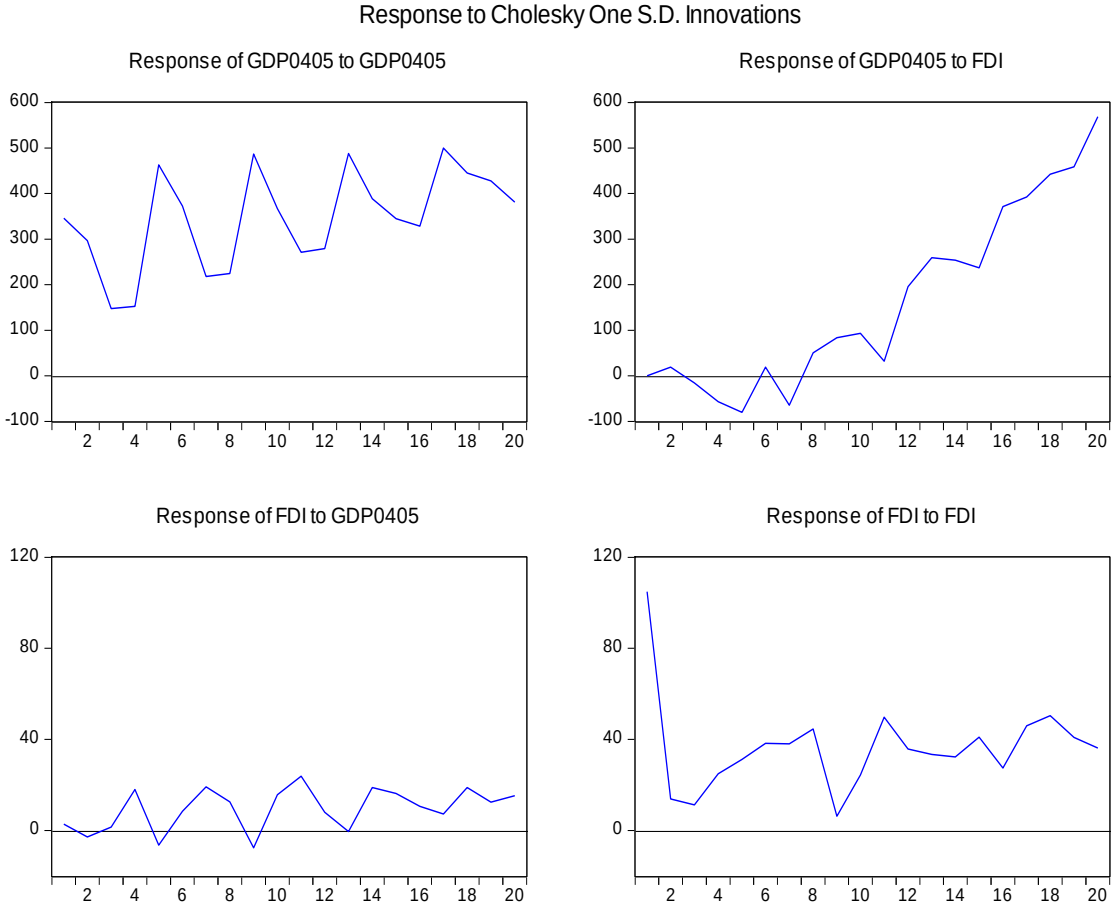
*Source: Calculated by Researcher*

Again, the results of variance decomposition of GDP suggest that almost 67 percent of its forecast error variance is explained by its own shocks, i.e., GDP is less exogenous in comparison with the explanatory power of FDI (90 percent) and the result also signifies that a significant portion, almost 33 percent, of forecast error variance of GDP is due to by the innovation in FDI during the same time horizon. This is due to the fact that, during the study period, the inbound inflows of FDI are more influenced by factors other than GDP, while the inbound inflows of FDI are found to have significantly influenced the GDP. This outcome supports the theoretical foundation behind the positive impact of FDI inflows on the economic growth.

Figure 5.2 shows the results of impulse response analysis for 20 quarters time horizon to one standard deviation positive shock in GDP and FDI consecutively. A one standard deviation positive innovation to FDI has a very slight positive impact on GDP in first two periods but from $2^{nd}$ period to $5^{th}$ period it generates gradual negative responses declining negative responses. After $5^{th}$ period the responses try to become positive but after $6^{th}$ period it again falls down to the negative zone until the $8^{th}$ periods. The responses of GDP are generated from a positive innovation in FDI. This relationship between GDP and FDI is an empirical verification theoretical model that postulate that inbound FDI inflows have a significant positive role on GDP growth in the long-run because the graph responses of GDP to one S.D. shock to FDI shows positive and inclining movement for the time span after the eighth period.

However, the responses of FDI to innovation in the GDP are of positive- negative trap in a cyclical pattern up to $14^{th}$ periods but after that the shock to GDP has inconsistent positive impact.

**Figure 5.2: Impulse Response of Foreign Direct Investment inflows and Volume of Gross Domestic Products**




## 5.5. Findings from Sector Level Analysis

### 5.5.1 Results of Unit Root Test

The results of ADF and PP unit root test with Intercept and Time Trend and Intercept for a set of sector-level variables (GDP_AGR, GDP_MFG, GDP_SRV, FDI_AGR, FDI_MFG, and FDI_SRV) consider in this study are concisely displayed in the Tables 5.26 and 5.27 respectively. From the results depicted in these tables, it is observed that the null hypothesis, i.e. the presence of unit root in its level is rejected for all the sector-level variables for the tests and also under both the models, Intercept and Time Trend and Intercept. Although, the results of first difference conversely

shows that all the variables are reject the null hypothesis i.e. the sector-level variables are stationary at their first differences i.e. I(I).

**Table 5.26: Results of Augmented Dickey-Fuller (ADF) Unit Root Test**

| Variables | Level | | First Difference | | Result |
|---|---|---|---|---|---|
| | Intercept | Trend and Intercept | Intercept | Trend and Intercept | |
| GDP_AGR | 1.096569 (0.9959) | -2.248097 (0.4414) | -7.157007 (0.0000) | -7.743034 (0.0000) | I(1) |
| GDP_MFG | 5.812693 (1.0000) | 0.095898 (0.9948) | -4.913034 (0.0012) | -4.029747 (0.0260) | I(1) |
| GDP_SRV | 11.38770 (1.0000) | -0.530231 (0.9709) | -3.923389 (0.0093) | -3.823370 (0.0411) | I(1) |
| FDI_AGR | 4.978210 (1.0000) | 1.834981 (1.0000) | -17.86605 (0.0000) | -14.15058 (0.0001) | I(1) |
| FDI_MFG | -0.085284 (0.9379) | -3.402934 (0.0779) | -6.138433 (0.0001) | -6.070823 (0.0005) | I(1) |
| FDI_SRV | -0.027256 (0.9456) | -3.131544 (0.1261) | -3.449121 (0.0212) | 4.592693 (0.0096) | I(1) |

*Notes: ( ) MacKinnon (1996) one-sided p-values; I(1): Stationary after first difference*

*Source: Calculated by Researcher*

**Table 5.27: Results of Phillips-Perron (PP) Unit Root Test**

| Variables | Level | | First Difference | | Result |
|---|---|---|---|---|---|
| | Intercept | Trend and Intercept | Intercept | Trend and Intercept | |
| GDP_AGR | 0.818391 (0.9918) | -2.054913 (0.5395) | **-7.157007 (0.0000)** | **-8.222707 (0.0000)** | I(1) |
| GDP_MFG | 6.069447 (1.0000) | 0.477751 (0.9983) | **-1.290289 (0.6130)** | **-4.073380 (0.0229)** | I(1) |
| GDP_SRV | 9.883584 (1.0000) | 0.598920 (0.9988) | 4.333245 (0.0035) | -4.012475[5] (0.0268) | I(1) |
| FDI_AGR | -2.341330 (0.0657) | -2.363912 (0.0523) | -14.47935 (0.0000) | -13.83797 (0.0000) | I(1) |
| FDI_MFG | -0.782525 (0.8034) | -3.386452 (0.0802) | -10.5515 (0.0000) | -11.17427 (0.0000) | I(1) |
| FDI_SRV | -0.144263 (0.9319) | -2.142402 (0.4946) | -3.333167 (0.0269) | -3.301617 (0.0446) | I(1) |

*Notes: ( ) MacKinnon (1996) one-sided p-values; I(1): Stationary after first difference*
*Source: Calculated by Researcher*

### 5.5.2 Selection of Optimum Lag Length

As the autoregressive model is sensitive to the selection of appropriate lag length, the study ascertains the appropriate lag length considering the most popular and commonly used AIC, SIC and HQC criteria before conducting the cointegration analysis in line with Johansen. The results of lag order selection criteria for GDP_AGR & FDI _AGR, presented in Table 5.28, suggest 4 lags as the optimum length**.** Furthermore, the same for GDP_MFG & FDI_MFG and GDP_SRV & FDI_SRV, we found that the optimum lag length is 5 as suggest by all the three criteria depicted in Table 5.29 and 5.30 respectively.

**Table 5.28: VAR Lag Order Selection Criteria for FDI_AGR and GDP_AGR**

| Lag Length | AIC | SIC | HQC |
|---|---|---|---|
| 0 | 33.28956 | 33.38759 | 33.29931 |
| 1 | 30.63451 | 30.92859 | 30.66374 |
| 2 | 30.48765 | 30.97778 | 30.53637 |
| 3 | 30.12587 | 30.81204 | 30.19407 |
| 4 | 28.30209* | 29.18432* | 28.38979* |
| 5 | 28.39923 | 29.47751 | 28.50642 |

*Notes: * Indicates lag order selected by the criteria*

*Source: Calculated by Researcher*

**Table 5.29: VAR Lag Order Selection Criteria for FDI_MFG and GDP_MFG**

| Lag Length | AIC | SIC | HQC |
|---|---|---|---|
| 0 | 38.11400 | 38.21202 | 38.12374 |
| 1 | 33.01621 | 33.31029 | 33.04544 |
| 2 | 33.19150 | 33.68162 | 33.24022 |
| 3 | 32.16759 | 32.85376 | 32.23579 |
| 4 | 32.50416 | 33.38639 | 32.59185 |
| 5 | 31.48049* | 32.55877* | 31.58768* |

*Notes: * Indicates lag order selected by the criteria*

*Source: Calculated by Researcher*

**Table 5.30: VAR Lag Order Selection Criteria for FDI_SRV and GDP_SRV**

| Lag Length | AIC | SIC | HQC |
|---|---|---|---|
| 0 | 41.32171 | 41.41973 | 41.33145 |
| 1 | 34.23049 | 34.52456 | 34.25972 |
| 2 | 33.95216 | 34.44229 | 34.00088 |
| 3 | 34.26629 | 34.95246 | 34.33449 |
| 4 | 33.89017 | 34.77239 | 33.97786 |
| 5 | 32.43748* | 33.51576* | 32.54466* |

*Notes: * Indicates lag order selected by the criteria*

*Source: Calculated by Researcher*

### 5.5.3. Long-run Analysis

#### 5.5.3.1. Results of Johansen Co-integration Test

Since, the results of the ADF test (Table 5.26 ) and PP test (Table 5.27) show that all the three sets of variables bear unit root property at their level values and are integrated of order one i.e; I(1), the study considers Johansen co-integration test to determine the long-run co-movement between variables of the respective sets.

Considering GDP_AGR and FDI_AGR, the calculated values of Trace statistics and maximum eigen statistics [See Table 5.31] of Johansens cointegration test are found to be 28.50742 and 27.93055 respectively, given that null hypothesis r = o (i.e., no cointegration). Here the null hypothesis of no cointegration when r = 0, is rejected at 1 percent level of significance, as the calculated value of trace statistics and maximum eigen statistics are higher than the MacKinnon-Haug-Michelis critical value at 1 percent level of significance. This indicates the existence of a cointegrating vector between GDP_AGR and FDI_AGR. Similarly, from Table 5.32 and Table 5.33 we see that GDP_MFG & FDI_MFG and GDP_SRV & FDI_SRV have a long-run common stochastic trend.

**Table 5.31: Results of Johansen Cointegration Test for FDI_AGR and GDP_AGR**

| $H_0$ | $H_1$ | Trace Statistics | Maximum Eigen Statistics |
|---|---|---|---|
| r = 0 | r = 1 | 28.50742<br>(0.0003) | 27.93055<br>(0.0002) |
| r ≤ 1 | r = 2 | 0.576874<br>(0.4475) | 0.576874<br>(0.4475) |

*( ) MacKinnon-Haug-Michelis (1999) p-values at 5 percent significance level*

*Source: Calculated by Researcher*

**Table 5.32: Results of Johansen Cointegration Test for FDI_MFG and GDP_MFG**

| $H_0$ | $H_1$ | Trace Statistics | Maximum Eigen Statistics |
|---|---|---|---|
| r = 0 | r = 1 | 2980269<br>(0.0002) | 25.25629<br>(0.0006) |
| r ≤ 1 | r = 2 | 0.136647<br>(0.7116) | 0.136647<br>(0.7116 |

*( ) MacKinnon-Haug-Michelis (1999) p-values at 5 percent significance level*

*Source: Calculated by Researcher*

**Table 5.33: Results of Johansen Cointegration Test for FDI_SRV and GDP_SRV**

| $H_0$ | $H_1$ | Trace Statistics | Maximum Eigen Statistics |
|---|---|---|---|
| r = 0 | r = 1 | 46.92780<br>(0.0000) | 42.98789<br>(0.0000) |
| r ≤ 1 | r = 2 | 0.271035<br>(0.6026) | 0.271035<br>(0.6026) |

*( ) MacKinnon-Haug-Michelis (1999) p-values at 5 percent significance level*

*Source: Calculated by Researcher*

So, the Johansen's cointegration test results indicates that the variables of the respective sets are cointegrated, signifying the existence of a long-run co-movement between them. The long run cointegrating equations are -

**GDP_AGR and FDI_AGR:** $GDP\_AGR = 6316.56 + 0.22\ FDI\_AGR + \mu_t$

**GDP_MFG and FDI_MFG:** $GDP\_MFG = 5008.61 + 0.48\ FDI\_MFG + \mu_t$

**GDP_SRV and FDI_SRV:** $GDP\_SRV = -7251.80 + 3.49\ FDI\_SRV + \mu_t$

Based on the above cointegrating equations, the study confirms that, in long-run, there is a positive and significant relationship between the sector specific FDI and GDP i.e. they move together in the same direction.

### 5.5.4. Short-run Analysis

Table 5.34 presents the results of vector error correction model that shows, the t-values associated with the coefficients of the corresponding lag values of both the variables FDI_AGR and GDP_AGR are found to be insignificant when GDP_AGR and FDI_AGR are taken as dependent variables respectively.

**Table 5.34: Results of Vector Error Correction Model for GDP_AGR and FDI_AGR**

| Independent Variables | Dependent Variables | |
|---|---|---|
| | D(GDP_AGR) | D(FDI_AGR) |
| ECT ($\gamma_1$) | -0.040190<br>[-1.57943] | -0.124529**<br>[-3.71352] |
| D(GDP_AGR(-1)) | 0.723533<br>[2.13250] | -0.631509<br>[-1.41235] |
| D(GDP_AGR(-2)) | 0.576347<br>[1.21233] | 0.243313<br>[ 0.38836] |
| D(GDP_AGR(-3)) | -0.293261<br>[-0.74411] | 0.866896<br>[ 1.66910] |
| D(FDI_AGR(-1)) | -0.030732<br>[-0.47836] | 1.070661**<br>[12.6458] |
| D(FDI_AGR(-2)) | 0.109698<br>[1.29534] | -1.303396**<br>[-11.6787] |
| D(FDI_AGR(-3)) | 0.180306<br>[1.36642] | -1.758138**<br>[-10.1102] |
| C | 529.9565*<br>[ 2.40615] | 439.9113<br>[ 1.51559] |

*Notes: ** Statistically significant at 1 percent level; * Statistically significant at 5 percent level; [ ] t-values*

*Source: Calculated by Researcher*

It indicates that the concerned variables don't significantly affect each other. The VECM result also indicates that the values of FDI_AGR adjust the disturbances to restore long-run equilibrium significantly and the speed of adjustment towards the long-run equilibrium is about 12 percent per period.

Table 5.35 presents VECM results for short run dynamics of the flow of FDI_MFG and contribution of GDP_MFG. On the basis of the t-values associated with the coefficients of the independent variable it is confirmed that, in the short-run, inflow of manufacturing FDI doesn't have any significant impact on the contribution of manufacturing sector GDP and vice-versa.

**Table 5.35: Results of Vector Error Correction Model for GDP_MFG and FDI_MFG**

| **Independent Variables** | **Dependent Variables** | |
|---|---|---|
| | **D(GDP_MFG)** | **D(FDI_MFG)** |
| ECT ($\gamma_1$) | -0.127913*<br>[-2.50286] | -1.537346*<br>[-2.60421] |
| D(GDP_MFG(-1)) | 0.266039<br>[0.71308] | 0.171863<br>[ 0.04862] |
| D(GDP_MFG(-2)) | -0.540894<br>[-1.43281] | 6.235144<br>[ 1.74335] |
| D(GDP_MFG(-3)) | 0.248323<br>[ 0.64971] | -6.32872<br>[-1.58085] |
| D(GDP_MFG(-4)) | 0.815866<br>[ 1.38782] | -6.438689<br>[-1.15603] |
| D(FDI_MFG(-1)) | 0.110407<br>[ 1.99402] | 0.678469<br>[ 1.29336] |
| D(FDI_MFG(-2)) | 0.047659<br>[ 0.95130] | 1.138815*<br>[ 2.39928] |
| D(FDI_MFG(-3)) | 0.007638<br>[ 0.21153] | 1.402009**<br>[ 4.09810] |
| D(FDI_MFG(-4)) | 0.006264<br>[0.17448] | 1.034920*<br>[ 3.04261] |
| C | 452.0152<br>[ 2.18423] | 3890.853<br>[ 1.98450] |

*Notes: ** Statistically significant at 1 percent level; * Statistically significant at 5 percent level; [ ] t-values*

*Source: Calculated by Researcher*

The VECM results also indicate that the values of GDP_MFG and FDI_MFG adjust the disturbances to restore long-run equilibrium significantly and in right direction. The coefficients of error correction term -0.127913 and -1.537346 are significant at 5 percent level. Thus, the speed of adjustment towards the long-run equilibrium is about 13 percent and 154 percent per period respectively.

**Table 5.36: Results of Vector Error Correction Model for GDP_SRV and FDI_SRV**

| Independent Variables | Dependent Variables | |
|---|---|---|
| | D(GDP_SRV) | D(FDI_SRV) |
| ECT ($\gamma_1$) | -0.251890*<br>[-2.97750] | -3.220204**<br>[-3.97222] |
| D(GDP_SRV(-1)) | 0.472427<br>[ 1.82502] | 0.445040<br>[ 0.17941] |
| D(GDP_SRV(-2)) | 0.005482<br>[ 0.01485] | 5.449329<br>[ 1.53990 ] |
| D(GDP_SRV(-3)) | 0.633481<br>[ 1.49900] | 5.231116<br>[ 1.29173] |
| D(GDP_SRV(-4)) | 1.080642*<br>[ 2.97500] | 3.939363<br>[ 1.13172] |
| D(FDI_SRV(-1)) | 0.212835**<br>[ 3.55778] | 2.154457**<br>[ 3.75822] |
| D(FDI_SRV(-2)) | 0.122229<br>[ 2.09561] | 1.477717*<br>[ 2.64386] |
| D(FDI_SRV(-3)) | 0.160449**<br>[ 3.72361] | 1.320642*<br>[ 3.19830] |
| D(FDI_SRV(-4)) | 0.086729<br>[ 1.93317] | 1.049817*<br>[ 2.44191] |
| C | -2265.926*<br>[-2.60558] | -31451.63**<br>[-3.77408] |

*Notes: ** Statistically significant at 1 percent level; * Statistically significant at 5 percent level; [ ] t-values*

*Source: Calculated by researcher*

The results of VECM with the service sector variables, i.e., GDP _SRV and FDI_SRV, presented in Table 5.36, show that the t-values associated with the

coefficients of FDI_SRV are statistically significant when GDP_SRV is considered as dependent variable. It implies that, the flow of FDI_SRV has a significant and positive impact on the growth of GDP_SRV in the short-run. The result also supports that in short-run the growth of GDP_SRV doesn't have any significant impact on the flow of FDI_SRV. The VECM results also confirm that both the variables GDP_SRV and FDI_SRV adjust the disturbances to restore long-run equilibrium significantly and the speed of adjustment towards the long-run equilibrium are about 25 percent and 322 percent per period respectively.

The study estimates different diagnostic tests such as serial correlation test, normality test and heteroscedasticity test to ensure that the models are rightly specified and to ensure the robustness of the advocated results. The diagnostic test results are presented in Table 5.37. The results of the serial correlation test, conducted through Lagrange-Multiplier test of residuals, clearly indicate that the residuals of all the three VECM estimations (GDP_AGR & FDI_AGR, GDP_MFG & FDI_MFG and GDP_SRV & FDI_SRV) are not serially correlated, as the underlying null hypothesis of 'no serial correlation in the residuals' could not be rejected. Again the results presented in the last column of Table 5.37 show that all the three models are free from heteroscedasticity problem. Similarly, the results of Jurque-Bera test suggest normality of residuals for the two VEC models namely, GDP_AGR & GDP_FDI and GDP_SRV & FDI_SRV. However, the analysis of the model residuals for GDP_MFG and FDI_MFG is found to be non-normal. In this case, the errors do not follow normal distribution, but, however, considering the theoretical consistency and aptness of the concerned model we think it is logical to ignore this issue. Besides, the lack of normality does not always signify the invalidity of the model used. It indicates the presence of some other factors that may significantly explain the pattern of

relationship (Geamanu, 2014). In practice, a bunch of other unobserved determinants may influence the FDI-growth relationship.

**Table 5.37: Diagnostic Tests Results**

| VEC Residual of | Serial Correlation (A) | Normality (B) | Heteroscedasticity (C) |
|---|---|---|---|
| GDP_AGR and FDI_AGR | 2.6053 (0.0811) | 2.1158 (0.7145) | 40.8682 (0.5206) |
| GDP_MFG and FDI_MFG | 0.8087 (0.5532) | 29.05452 (0.0000) | 1.1938 (0.4320) |
| GDP_SRV and FDI_SRV | 1.7810 (0.2258) | 3.8490 (0.4268) | 0.4218 (0.8908) |

*(A) Based on Lagrange Multiplier Test of Residual Serial Correlation*

*(B) Based on a test of Skewness and Kurtosis of Residuals (Jarque-Bera test of Normality)*

*(C) Based on the White Heteroscedasticity Test with no Cross Terms Yields*

*( ) Respective Probability Values are Presented in Parentheses*

Lastly, to test the stability of the estimated coefficients the study employs cumulative sum of recursive residuals. The results of the CUSUM test suggest that at 5 percent level of significance the parameters of all the models are stable over the period of the study. So, this part of investigation ensures the acceptability of the models and the robustness of the results.

## FIGURES

**Figure 5.3: Plot of Cumulative Sum of Recursive Residuals for GDP_AGR and FDI_AGR**

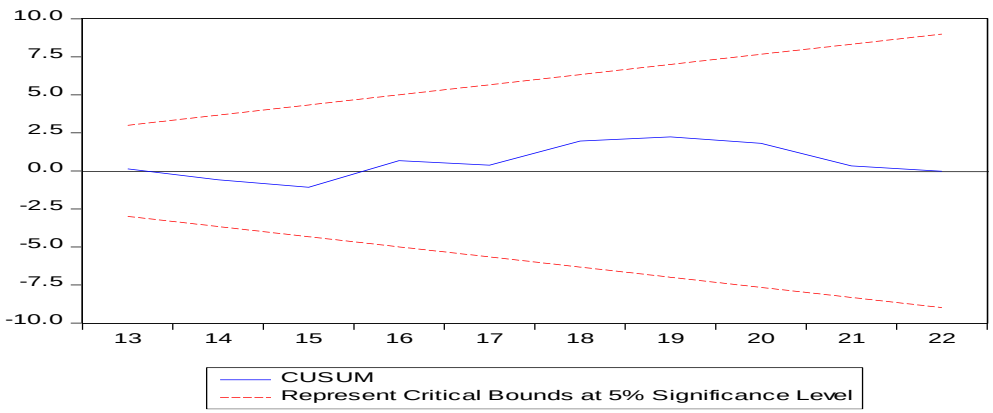


**Figure 5.4: Plot of Cumulative Sum of Recursive Residuals for GDP_MFG and FDI_MFG**

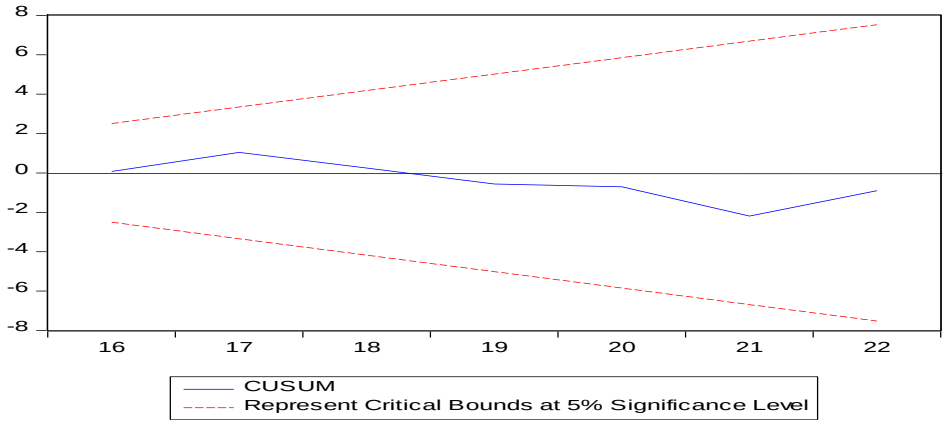
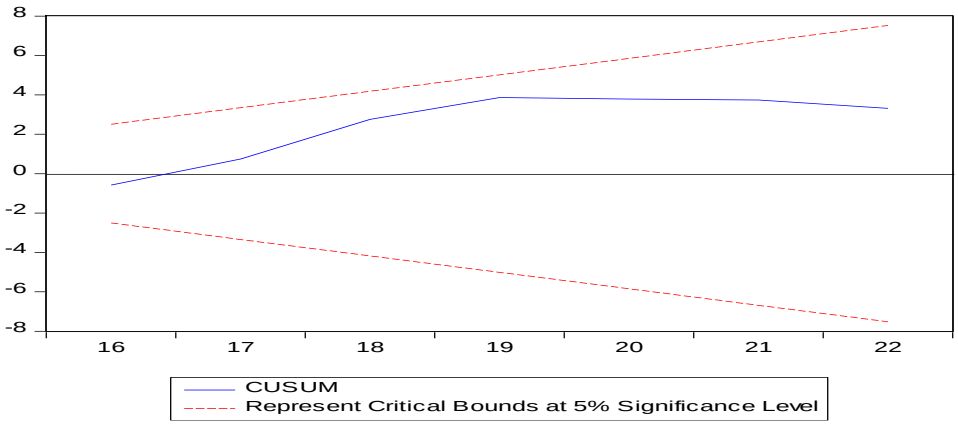



**Figure 5.5: Plot of Cumulative Sum of Recursive Residuals for GDP_SRV and FDI_SRV**




### 5.5.5. Findings from Causality Test

As the variables are found to be cointegrated, the study employs error correction strategy suggested by Engle and Granger (1987) to identify the long and short run causal relationship between variables of each pair. The results of the long-run and the short-run causality tests under VECM framework are presented below:

#### 5.5.5.1. Long-run Causality

The t-values associated with the error correction terms of VECM between the agricultural FDI inflows and the agricultural contribution to GDP are presented in

Table 5.34. The results point towards a significant unidirectional long-run causality flowing from GDP_AGR to FDI_AGR. It implies that any change in the agricultural sector's contribution to the GDP significantly causes change in the inflows of agricultural FDI in long run. Conversely, the study finds long-run bidirectional causality between GDP_MFG & FDI_MFG and GDP_SRV & FDI_SRV. Table 5.35 shows both the coefficients of ECT of manufacturing sector, (i.e., -0.127913 and -1.537346) are statistically significant at 5 percent level, which indicates that the inflows of manufacturing FDI accelerate manufacturing output and again the growth of manufacturing output magnate to invest the inbound FDI into that sector. Again, the result presented in Table 5.36 depicts that, as service sector's output growth attracts more FDI into the sector and such increased FDI inflows in the sector again promote the output growth of service sector.

#### 5.5.5.2. Short-run Causality

The results of short-run causality test between the sector wise FDI inflows and corresponding sector's contribution to GDP based on VEC Granger causality tests are presented in Table 5.38.

**Table 5.38: Result of VEC Granger Causality / Block Exogeneity Wald Test**

| Dependent Variables | Independent Variables | Chi-Square Value | Probability Value | Implication |
|---|---|---|---|---|
| GDP_AGR | FDI_AGR | 2.107912 | 0.5503 | No Causality |
| FDI_AGR | GDP_AGR | 8.085963 | 0.0443 | Causality Exists |
| GDP_MFG | FDI_MFG | 10.74576 | 0.0296 | Causality Exists |
| FDI_MFG | FDI_MFG | 27.47846 | 0.0000 | Causality Exists |
| GDP_SRV | FDI_SRV | 18.08555 | 0.0012 | Causality Exists |
| FDI_SRV | GDP_SRV | 25.91248 | 0.0000 | Causality Exists |

*Source: Calculated by Researcher*

The result of the short-run causality test confirms the bidirectional causality between GDP_MFG & FDI_MFG and GDP_SRV & FDI_SRV and a unidirectional causality flowing from GDP_AGR to FDI_AGR in short-run.

### 5.5.6 Results of Variance Decompositions Test and Impulse Response Functions

From Table 5.39, Table 5.40 and Table 5.41, it is observed that, the outputs of three sectors are more exogenous than the FDI inflows of the respective sectors. This is due to the fact that, during the study period, the values of sectoral outputs are more dependent on themselves than on the FDI inflows into the respective sectors. Notably, the exogeneity of agricultural output is stronger than that of other two sectors, as innovation to GDP_AGR accounts for 97.27 percent variation of its own fluctuation and thereby the sectoral output itself remains the main driver behind its movement. However, a significant portion, i.e., 23.51 percent of the forecast error variance of FDI_MFG is explained by the FDI in the respective sector.

**Table 5.39: Variance Decomposition of GDP_AGR and FDI_AGR**

| Variance Decompositions of | Period | Percentage of Forecast Error Variance Explained by Innovation in: | |
|---|---|---|---|
| | | GDP_AGR | FDI_AGR |
| GDP_AGR | 1 | 100.0000 | 0.000000 |
| | 2 | 99.56659 | 0.433412 |
| | 3 | 98.92016 | 1.079839 |
| | 4 | 98.52513 | 1.474874 |
| | 5 | 97.26537 | 2.734628 |
| FDI_AGR | 1 | 62.97329 | 37.02671 |
| | 2 | 63.59142 | 36.40858 |
| | 3 | 41.35919 | 58.64081 |
| | 4 | 30.85277 | 69.14723 |
| | 5 | 40.40782 | 59.59218 |

*Source: Calculated by Researcher*

**Table 5.40: Variance Decomposition of GDP_MFG and FDI_MFG**

| Variance Decompositions of | Period | Percentage of Forecast Error Variance Explained by Innovation in: | |
|---|---|---|---|
| | | GDP_MFG | FDI_MFG |
| GDP_MFG | 1 | 100.0000 | 0.000000 |
| | 2 | 99.12605 | 0.873947 |
| | 3 | 88.26794 | 11.73206 |
| | 4 | 77.94476 | 22.05524 |
| | 5 | 76.48603 | 23.51397 |
| FDI_MFG | 1 | 70.31090 | 29.68910 |
| | 2 | 65.59372 | 34.40628 |
| | 3 | 44.50736 | 55.49264 |
| | 4 | 31.77555 | 68.22445 |
| | 5 | 39.93968 | 60.06032 |

*Source: Calculated by Researcher*

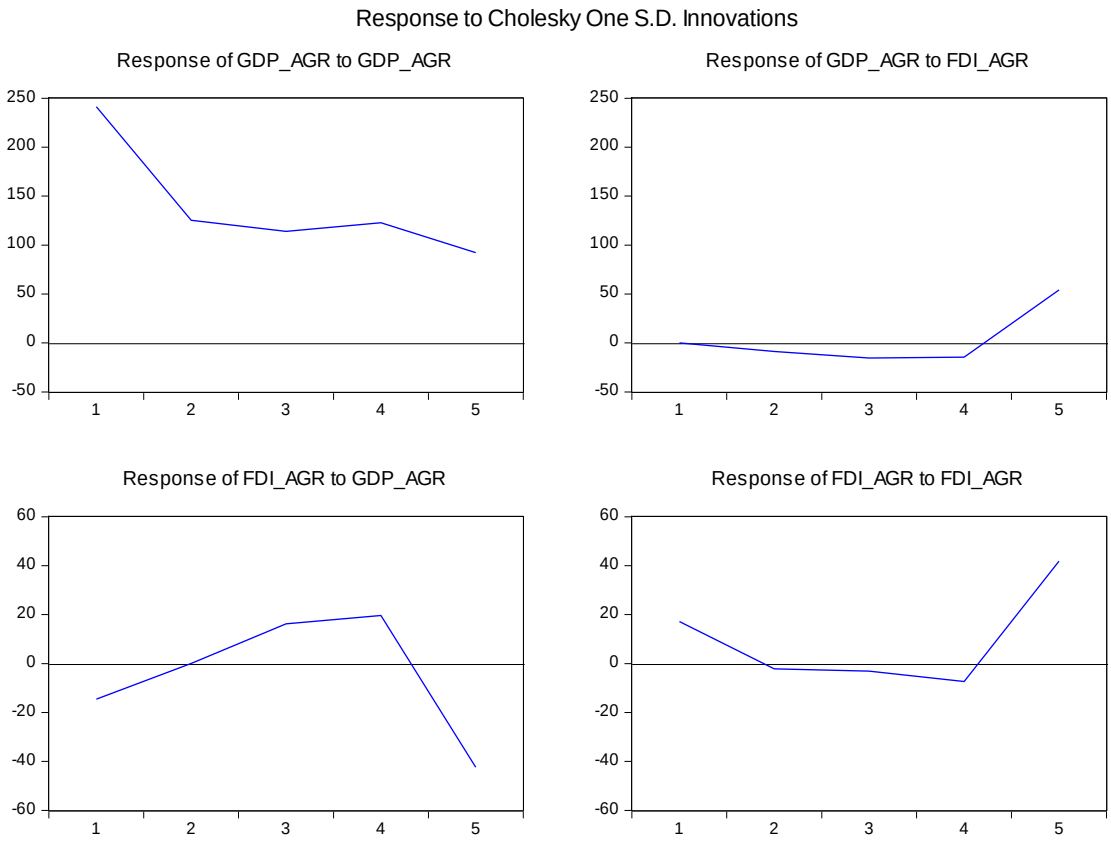
**Table 5.41: Variance Decomposition of GDP_SRV and FDI_SRV**

| Variance Decompositions of | Period | Percentage of Forecast Error Variance Explained by Innovation in: | |
|---|---|---|---|
| | | GDP_SRV | FDI_SRV |
| GDP_SRV | 1 | 100.0000 | 0.000000 |
| | 2 | 98.35174 | 1.648264 |
| | 3 | 91.86201 | 8.137989 |
| | 4 | 92.14335 | 7.856654 |
| | 5 | 93.00024 | 6.999764 |
| FDI_SRV | 1 | 51.01478 | 48.98522 |
| | 2 | 49.36697 | 50.63303 |
| | 3 | 27.43076 | 72.56924 |
| | 4 | 19.92849 | 80.07151 |
| | 5 | 19.36222 | 80.63778 |

*Source: Calculated by Researcher*

The impulse response analysis gives a quantitative idea about the responsiveness of the endogenous variables in the VAR system when shock is put to the error terms (one of these endogenous variables) for several periods in future. Impulse response traces the reactions of structural shocks on the dependent variables over time. Each response explains the effects of a specific unit shock on one of the endogenous variables at impact 't' period, then at 't'+1 period and so on. The results of the impulse response analysis for a time horizon of 5 years to a one standard deviation shock in agricultural output and agricultural FDI inflows are shown in Figure 5.6. The responses from a positive shock of agricultural FDI inflow to agricultural output are insignificant in the first two years but after that it shows an upward movement for the next two years. Again, it shows a down turn after the fourth year.

**Figure 5.6: Impulse Responses of GDP_AGR and FDI_AGR to One Standard Deviation Shock in the Variables**

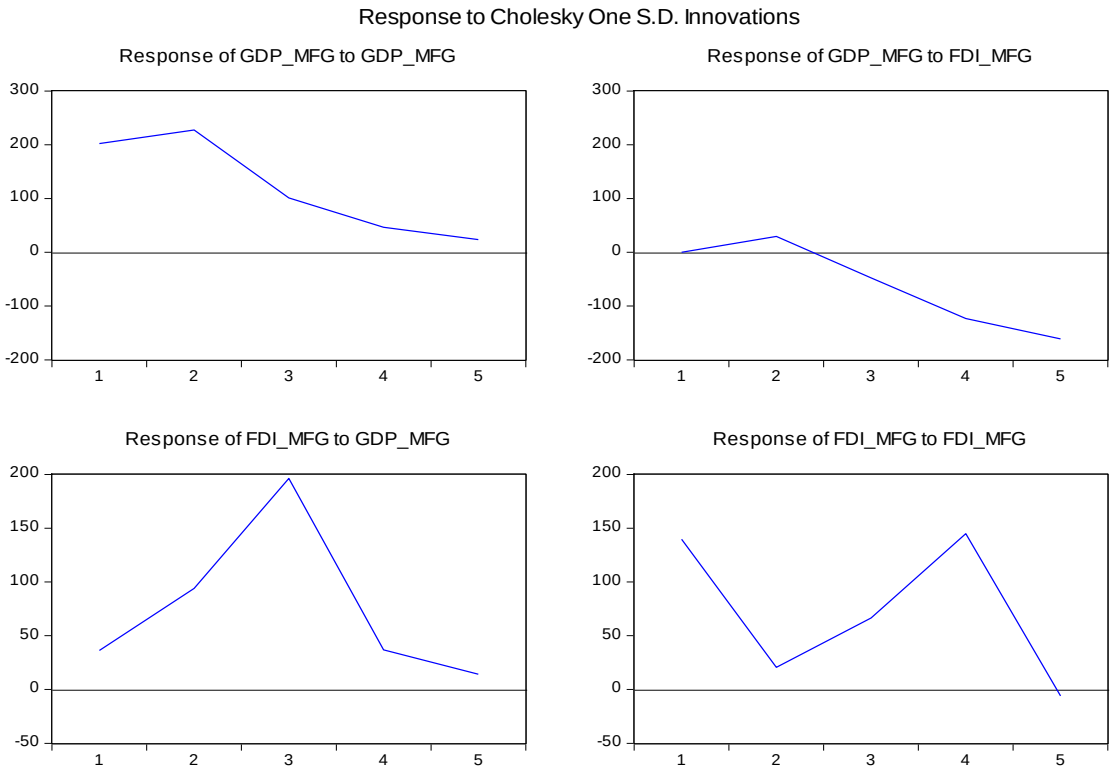



*Source: Prepared by Researcher*

However, in the reverse case, i.e., for one standard deviation positive shock of GDP_AGR to FDI_AGR reacts negatively during the first four years, while after that it shows a high positive movement. Nevertheless, own responses from a positive shock of GDP_AGR remain positive at an increasing rate but positive shock to FDI_AGR generates inconsistent responses.

Figure 5.7 describes the responses of manufacturing sector output and manufacturing FDI inflow with the one standard deviation shock to the respective endogenous variables for a span of 5 years. The responses generated from a positive shock of FDI_MFG to GDP_MFG are found to be highly positive with high fluctuations. On the other hand, a positive shocks of GDP_MFG to FDI_MFG generates positive responses for first few years and thereafter it gradually declines.

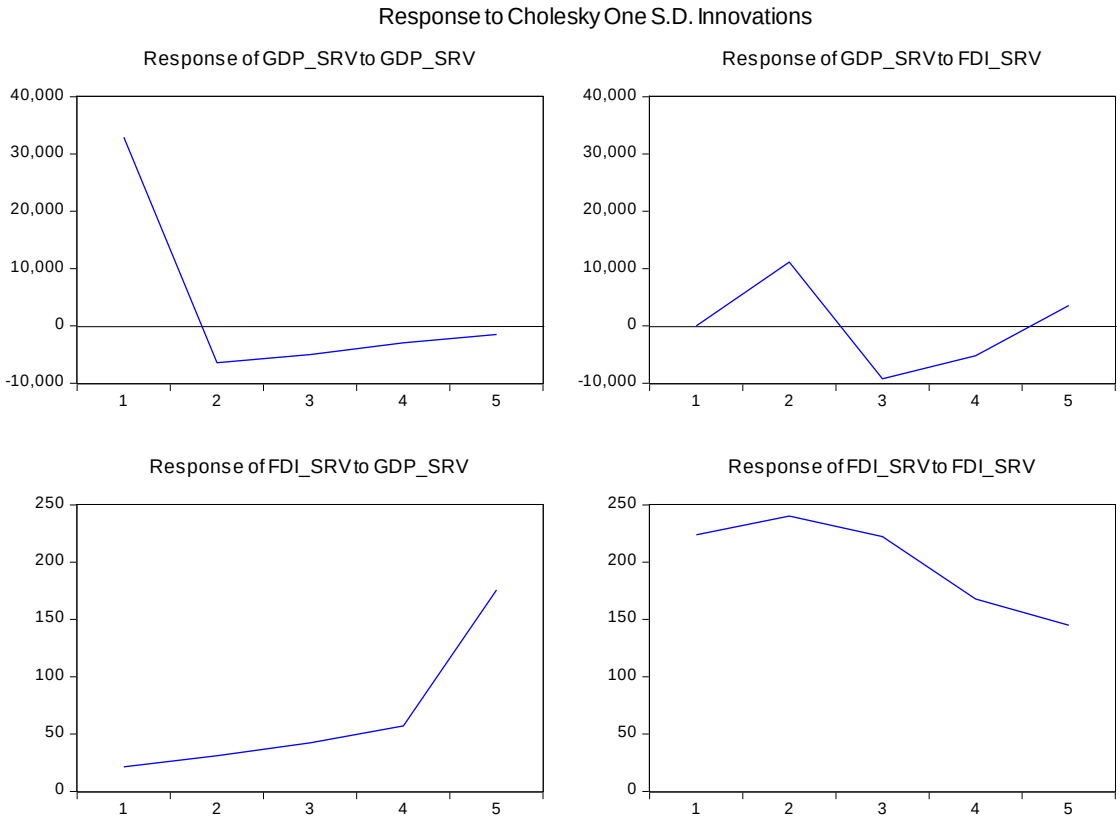
**Figure 5.7: Impulse Responses of GDP_MFG and FDI_MFG to One Standard Deviation Shock in the Variables**




*Source: Prepared by Researcher*

The results of impulses response analysis between GDP_SVR and FDI_SRV alternatively with one standard deviation shock are shown in Figure 5.8. The responses generated from a positive shock of GDP_SRV to FDI_SRV are inconsistent throughout the assessing periods. Again, the responses of FDI_SRV with one standard deviation shock to GDP_SRV are found consistently positive throughout our study period. Therefore, in compare to other two sectors, FDI inflow into the service sector has higher impact on the contribution to GDP of the respective sector.

**Figure 5.8: Impulse Responses of GDP_SRV and FDI_SRV to One Standard Deviation Shock in the Variables**




*Source: Prepared by Researcher*

## 5.6 Key Findings and its interpretations

In this point the study summarizes the hypothesis-wise key findings and most likely reason and justifications behind the results obtained.

**Hypothesis – I:**

Null Hypothesis ($H_0$): Foreign investments do not have any significant impact on economic development of India.

**Alternative Hypothesis ($H_1$):** $H_0$ is not true.

**Findings and its Interpretation:** The empirical results against 'Hypothesis – I' support the rejection of null hypothesis. Therefore, the study argues on behalf of the significant impact of foreign investment on economic development of India through expand of GDP volume. The study, on the basis of the findings, establishes the relationship between foreign investment and GDP where in the long-run these two macroeconomic variables move together. Besides, there is a bidirectional causality is found to exist between them. The short-run causality is also evidenced as in the long-run. Moreover, the results of variance decomposition test also support the VECM and Granger causality results. The results of Impulse response function establish that both the macroeconomic variables respond positively with the one standard innovation of, or shock to the other variables respectively. To sum up, it can be concluded that unprecedented growth in the inflow of foreign capital propels the growth of Indian economy and consequently, the growth in the volume of GDP again magnetizes foreign investors to capitalize their fund in Indian large unexplored market.

**Hypothesis – II:**

Null Hypothesis ($H_0$): FIIs do not have any significant impact on development of Indian Economy.

**Alternative Hypothesis ($H_1$):** $H_0$ is not true.

**Findings and its Interpretation:** In the case of 'Hypothesis – II' we also have shown rejection of null hypothesis on the basis of the analytical results. So, the study documents a significant favorable impact of FII on the Indian economic development measured by GDP. FII inflows, taking as a proxy of FPI inflows into India, show a long-run co-integrating relationship with the growth in the GDP volume, supported by the bound test results. Also, the error correction term is found to be statistically significant with a negative sign which confirms the long-run association between GDP and FII when FII is independent. Therefore, the study may infer that in long-run aggregated FII inflows is positively impacting the economic growth. The short-run causality results conversely provide unidirectional causality flowing from GDP to FII. Therefore, an interesting interaction between GDP and FII has been observed for different time spans. The Indian economy has been maintaining persistence high growth rate, which mostly attract FIIs in the short-run and they have been engaged in reaping up benefits, which provides huge liquidity in the secondary market and consequently instigate the economic growth.

**Hypothesis – III:**

**Null Hypothesis ($H_0$):** FDI does not have any significant impact on growth of Indian economy.

**Alternative Hypothesis ($H_1$):** $H_0$ is not true.

**Findings and its Interpretation:** Again, according to the test results our study rejects the null hypothesis of 'Hypothesis – III' and consequently, accepts the alternative hypothesis. So, we can advocate that inward FDI has significant impact on growth of Indian economy. The detailed empirical analysis shows that there is a bidirectional

causal relationship between volume of real GDP and the volume of inward FDI. But, in the short-run, we have found a unidirectional causal relation from inbound FDI inflow to GDP volume. The VECM results reveal an insignificant role of FDI inflows to the volume of GDP. The variance decomposition results again support the short-run unidirectional causality result i.e. variance decomposition of GDP is explained by the FDI with a highly significant portion, but not the reverse. Further, the impulse response results depict the average responses of FDI with a business cycle nature for a shock to GDP. Conversely, the innovation into FDI generates negative impact for the first few quarters and then it makes sharp positive responses for future periods. The positive impact of inward FDI on the GDP volume may due to the facts that FDI brings various tangible and intangible assets, technology, know-how, etc. which enhance the productivity and promotes exports as well as substitute imports; creates employment directly through absorbing domestic human resources and indirectly through demand creation by foreign employees; multiplier and spill-over effects augmented domestic industries.

**Hypothesis – IV:**

**Null Hypothesis ($H_0$):** Sectoral FDI do not have any significant impact on Sectoral Contribution to GDP.

**Alternative Hypothesis ($H_1$):** $H_0$ is not true.

In order to test our fourth hypothesis, we have modeled three sub-hypothesis. These are presented and discussed below:

**Hypothesis – IV(A):**

**Null Hypothesis ($H_0$):** FDI into agriculture sector do not have any significant impact on agriculture sector's output contribution to GDP.

**Alternative Hypothesis ($H_1$):** $H_0$ is not true.

**Findings and its Interpretation:** Somehow at odds, the empirical results support the acceptance of null hypothesis, which indicates that FDI into agriculture sector do have significant impact on agriculture sector's output contribution to GDP. From the details analysis, the study reveals a positive short-run and long-run unidirectional causality from agricultural output to FDI inflow into the sector. The study finds agricultural output to be strongly exogenous. Interestingly, the impulse response function analysis even suggests a negative impact of agricultural FDI on the output growth of the sector in the first few years of our study period. Therefore, FDI in the agricultural sector fails to exert any favorable impact on the growth of this sector of the Indian economy. This is mainly due to the fact that the primary sector in India, even after much government intervention and policy implications, is still suffering from feeble infrastructure and technology-base resulting into poor investment absorptive capacity and week linkages among the intra-sectoral components. The findings of this study in this regard support the conclusions drawn in number of previous empirical inquiries like Alfaro (2003), Herzer (2012). However, the empirical evidence documented in studies like Msuya (2007) on the Tanzanian economy, Oloyede (2014) in the context of the Nigerian economy, contradict our findings in this regard. Notably, unlike India, the small farmers of Tanzania are found to be much linked in integrated producers schemes (Msuya, 2007) resulting in the magnifying impact of FDI on the sector. Besides, unlike in case of India, where inward FDI mostly targets service sector, FDI to Nigeria is mostly driven by natural resources (Oloyede, 2014) and the agricultural sector remains the central attraction for the foreign affiliates.

**Hypothesis – IV (B):**

**Null Hypothesis ($H_0$):** FDI into manufacturing sector do not have any significant impact on output growth of manufacturing sector in India.

**Alternative Hypothesis ($H_1$):** $H_0$ is not true.

**Findings and its Interpretation:** Unlike the agriculture sector, in this instance, the empirical results support the rejection of null hypothesis, which confirms the significant impact of inward FDI to manufacturing sector on the manufacturing sector's output contribution to GDP. The study finds significant bidirectional causality between FDI in the manufacturing sector and its growth for both in short-run and long-run. Therefore, in line with Alfaro (2003) and Wang (2009), the present study also approves the potential of the manufacturing sector in generating favorable impact from inward FDI. However, the FDI inflow into the manufacturing sector affects its output positively for the first few years of our study period and then it generates a negative impact. This is most likely because well-established foreign affiliates create cut-throat competition in the domestic market which compels the domestic firms to quit or subsequently, switch towards the service sector, resulting in reduced sectoral output.

**Hypothesis – IV(C):**

**Null Hypothesis ($H_0$):** FDI into the service sector do not have any significant impact on service sector's output contribution to GDP in India.

**Alternative Hypothesis ($H_1$):** $H_0$ is not true.

**Findings and its Interpretation:** Similar to the manufacturing sector, empirical results support the rejection of null hypothesis. It implies, the Volume of FDI captured by service sector in India do have significant impact on service sector's output contribution to GDP. In details, the study documents a bi-directional causality

between service sector FDI and service sector growth both for short and long-run. This finding contradicts the existing empirical evidence provided by Aykut and Sayek (2007) in a cross-country investigation that the sectoral composition of FDI has a significant and negative impact on economic growth when it gets skewed towards the services sector. However, this finding is generalized for thirty-three economies worldwide which may not be reasonably in tune with Indian evidence. Notably, the service sector in India has been highly structured and organized and the biggest contributor to the national income and output. The sector is featured with high technology-base with outmost sophistication in operation, involvement of trained and skilled labour, less dependency on natural environment, short payback period on investments, etc. Besides, the sector has high capital abortion capacity and potential to create linkage within its sub-sectors or constituent industries as well as with rest of the economy. As a recent development, the Government of India under its mid-term review of Foreign Trade Policy (2015-20) has increased incentives provided under Services Exports from India Scheme (SEIS) by two percent. Moreover, the continuous efforts from the policy makers to remove many trade barriers to services make the sector much more attractive avenues for foreign investors. For example, recently the Government of India has tabled a draft legal text on Trade Facilitation in Services to the WTO in 2017.