# Foreign Direct Investment and the Manufacturing Sector in Bangladesh

Munira Begum[1] and Mamta B Chowdhury[2]

[1]PhD Scholar, School of Business, Western Sydney University, Sydney, Australia
[2]Senior Lecturer, Finance & Property (SoB), Western Sydney University, Sydney, Australia
Corresponding author's E-mail: 18521304@student.westernsydney.edu.au

***Abstract:***

*As in many other developing countries, Bangladesh has initiated reform strategies and provided incentives to attract foreign direct investment (FDI). The central aim of FDI strategies is to promote the export-oriented manufacturing sector and improve the productive capacity, efficiency, technological advancement and export performance of the country. However, due to conflicting theoretical and empirical findings, the contribution of FDI to economic development is still an issue of debate. This study examines the contribution of FDI to the performances of the manufacturing sector in Bangladesh over the period 1984-2015 using time series analysis. The Johansen-co-integration technique and Vector Error Correction model (VECM) are applied to estimate long run relationship between FDI and Manufacturing Value Added (MVA) for Bangladesh using time series data for the period 1980-2015. Based on the statistical and empirical results the study found that FDI inflows create some positive contributions to the growth, export, and productive capacity base of the sector. However, FDI inflow seems fail to establish sufficient backward linkages in the sector. Bangladesh should place more emphasis on backward linkages issue when dealing with foreign investors and promoting FDI.*

***Keywords****: Manufacturing value added, FDI and Bangladesh*

## 1. INTRODUCTION

In Bangladesh, as in many other developing countries, there has been an intensification of 'outward oriented' economic reforms since the late 1980's. Considering the low resource, technology and productivity base of the country, pressure for job creation for a growing labour force and the increasing challenges of the global competitiveness, Bangladesh is attempting to attract foreign direct investment to promote its export-oriented manufacturing sector. The current Perspective Plan (2010-2021) and 7th Five year Plan (2016-2020) of the government also recognizes that export-led manufacturing growth is the driver of job creation and sustainable development of the country. The 7th Plan suggests that FDI inflows need to be increased to at least 3 percent of GDP to achieve the overall 8 percent growth target. The main foreign investments now occur in manufacturing, power, trade & commerce, telecommunications, agriculture, chemical, engineering, services (Bangladesh Bank, 2016). The manufacturing sector has the major share (42%) of total FDI inflow in 2015-16.

## 2. THEORETICAL AND EMPIRICAL LITERATURE REVIEW

FDI inflows have the potentiality to generate positive contribution to the host economy both directly and indirectly. FDI inflows supply external capital to the capital scare country which directly contributes to extend the productive base of the country. FDI inflows may stimulate domestic firm's competitiveness and efficiency through its positive 'spillover' or indirect effect. Efficiency spillover

can be generated by establishing linkages with domestic firms, copying of foreign firm's technology by local firms and the training of workers who then find employment in local firms or start their own firms (Gallagher and Zarsky, 2004). On the other hand, FDI may contribute to economic growth negatively. Foreign firms may crowd-out domestic investment by increasing competition (Chudnovsky and López, 2008). In these cases, FDI inflows may create adverse effect on growth and employment of the host country. Furthermore, benefits of the FDI on growth will not come automatically. It depends on the absorption capacity of the host government (Blomstrom et al., 1992, Alfaro et al., 2004, Borensztein et al., 1998, Gallagher and Zarsky, 2004).

The empirical literatures about FDI and growth provide mixed results. Several studies found positive relationship between FDI and economic growth (Choe, 2003, Mullen and Williams, 2005, Yao, 2006). Some studies found negative relationship between FDI and economic growth (Aitken and Harrison, 1999, Alagoz et al., 2008, Mutenyo et al., 2010, Kurtishi-Kastrati, 2013). On the other hand, Carkovic and Levine (2002) concluded that FDI has no significant impact on economic growth. Roy and Mandal (2012) examined causal relationship between FDI and economic growth for selected nine Asian countries (China, India, Pakistan, Sri Lanka, Indonesia, Malaysia, Philippines, Singapore and Thailand). They employed Granger-causality test. Their study found bidirectional relationship only for Thailand. For Malaysia they found granger neutrality between these two variables for Malaysia. On the other hand, unidirectional causality- economic growth to FDI was found for rest of the seven countries.

Several studies have been carried out in relation to FDI and economic growth in Bangladesh. Kabir (2007) investigated the relationship of FDI and sustainable growth for Bangladesh and found positive result. Shimul (2009) examined the long run relationship between foreign direct investment and economic growth for Bangladesh using time series data of 1973-2007. They employed ARDL Model and Engle Granger two step procedures to analyze the data. The study found no co-integration between FDI and GDP. Adhikary (2011) examined the linkage between FDI, trade openness, capital formation, and economic growth rates in Bangladesh over the period 1986 to 2008 using time series analysis. He found a strong unidirectional long-run relationship between GDP growth rates and the explanatory variables. Hossain and Hossain (2012) investigated co-integration between FDI and GDP growth in both short run and long run for three south Asian countries (Bangladesh, India and Pakistan) for the period 1972-2008. They found no co-integration between FDI and GDP in the short and long run in Bangladesh and India. However, for Pakistan they found positive co-integration in both the short and long run.

In sum, both the theoretical and empirical literatures related to FDI and its contribution to economic development provides conflicting and mixed results. Moreover the results could vary from country to country. A very few researches have been conducted to examine the growth and FDI nexus for Bangladesh. Moreover, no research has been carried out for the manufacturing sector specifically. As most of the FDI inflows in Bangladesh goes to the manufacturing sector and the government is promoting FDI in this sector with a hope that it will bring advancement and enhance efficiency and competitiveness this sector, it is crucial to examine the impact of FDI inflows in this sector.

## 3. FDI AND THE MANUFACTURING SECTOR IN BANGLADESH

### 3.1. Growth performance

The FDI inflow started to increase in Bangladesh from mid 1990s and mostly concentrated to the manufacturing sector. The manufacturing sector also growth picked up pace in the 1990s, from average growth of 4.7% per annum in eighties to 7.2% in nineties. The average manufacturing growth reached to 9.47 percent during 2010-2015. Manufacturing growth has shown a double digit (10.3%) in FY 2014/15 and 2015/16 (GOB, 2016). Therefore, it could claim that the outward-looking export-

oriented FDI inflow contribute positively to the growth performance of the manufacturing sector in Bangladesh.

## 3.2. 'Crowding in' or 'crowding out' of domestic investment

FDI may generate negative impact on the domestic investment base by crowding out domestic firms through increasing competition. The gross fixed capital formation is one of the popular indicators to assess the domestic investment base of a country. In Bangladesh, the gross fixed capital formation as percentage of GDP has increased from 20.73 percent in 1996 to 25.83 percent in 2005 and reached to 28.58% in 2014 (World Bank, 2017).The share of FDI in total annual investment increased by 4 folds over the same period of time, increased from annual average of 1.44 percent during 1995-2000 to 4.99 percent in 2015 (Bangladesh Bank, 2016).Therefore, in Bangladesh with the expansion of foreign investment the domestic investment base has also increased which contributed to the positive growth performance of the manufacturing sector in Bangladesh. Moreover, as per the investment registration report of the BOI (as on 15 April 2016), local investment is the principal constituent, more than 90 percent in the total investment basket in Bangladesh which also indicates FDI didn't crowd out domestic investment rather it stimulates domestic investment.

## 3.3. Export performance

Compare to the FDI inflows manufactured exports increased at a higher rate over the last two decades in Bangladesh. Manufactured exports increased from US$3706 million in 1996 to US$32952 million in 2016 (GoB 2016, World Bank 2017). More than 80 percent of Bangladesh exports are from the manufacturing sector. Manufactured exports grew at the rapid rate of 15 percent a year on an average between 1996 to 2014.The share of manufactures in total merchandise exports has been increased from 77.49 percent to over 92 percent during 1990-2014 (GoB 2016, World Bank 2017).

Despite impressive performances of manufactured exports, the long term stability of this sector is far from assured. Manufactured imports grew even faster than exports in most of the year over the last two decades. The sector runs an average US$ 58 million deficit per year during 2000-2011. The import penetration ratio[1] of the country grew from 51.54 percent in 1972 to more than 84 percent by 2015 which indicates that the demand for intermediate goods is being made by foreign producer's rather domestic producers. In other words, it indicates that FDI inflow fails to establish sufficient backward linkages in the sector. Moreover, as per the latest Survey of Manufacturing Industry (BBS, 2012) conducted by the BBS, both large and medium firms rely more on imported, rather than locally sourced inputs. More than 60 percent of raw materials used in the medium and large firms are purchased from foreign sources.

## 3.4 Empirical Analysis

### *3.4.1 Model specification*

The focus of the study is to investigate the relationship between FDI inflow and performance of the manufacturing sector in Bangladesh. Manufacturing Value Added (MVA) as percentage of GDP is used as an indicator to measure the performance of the manufacturing sector. The model also includes the trade openness (TO) measures as total trade over GDP and gross fixed capital formation (GFCF) as proxy of domestic investment as controlled variables as they likely to influence FDI inflow and manufacturing value added. Time dummy variables (*TimeD)* are incorporated to capture time specific effects and structural breaks of the variables. Therefore, the following econometric equation is used to investigate the relationship and causality among the variables of interest:

*1 The ratio between the values of imports as a percentage of total domestic demand which shows what degree of domestic demand is satisfied by imports. Calculated as M/D, where M denotes import and D denotes domestic demand which is the GDP minus exports plus imports i.e. [D = GDP-X+M)].*

$$\ln MV_t = \beta_0 + \beta_1 \ln FDI_t + \beta_2 \ln GFCF_t + + \beta_4 \ln TO_t + \sum_{t=1}^{n} \beta TimeD + u_t$$

The variables are standardized as percentage of GDP to overcome the problem of nominal value. Log-linear specification provides more appropriate and efficient results compared to simple linear functional form of model (Cameron, 1994). Furthermore, logarithmic form of variables gives direct elasticities for interpretations.

### *3.4.2. Data sources*

In this study, we used time series data from 1984 to 2015 sourced from World Development Indicators (WDI).

### *3.4.3 Estimation procedure, results and main findings:*

The nature of the data distribution is examined by using the standard descriptive statistics (mean, median, standard deviation, skewness and kartosis). The descriptive statistics of the log values of the variables reveal that the data are fairly dispersed around the mean having a considerable degree of homogeneity (see annexure table-1). In time series analysis, before running the causality test the variables must be tested for stationarity. The conventional unit root tests such as ADF (Augmented Dickey–Fuller) test and PP (Phillips– Perron) test are conducted. The unit root results of the variables are found to be first difference stationary (see annexure table-2).

We have applied Johansen maximum likelihood ratio tests in order to a examine co-integration. The Johansen co-integration test both at the trace and maximum eigen value levels provide evidence that there is at least one co-integrating vector in the model (see annexure table-3). Thus, it can be concluded that there is a long-run co-integrating relationship among the variables.

Table- 1 presents the long run coefficients of the variables of interest. The long run coefficients of most of the independent variables have the expected relationships with manufacturing value added to GDP. FDI has a positive estimated coefficient and it is statistically significant. Gross fixed capital formation also has a positive and statistically significant coefficient which is expected as per theory. However, trade openness has a negative coefficient and it is statistically significant. It is probably due to high imports and negative trade balance position for the sample period.

Table-1: Long run normalized coefficients (standard error in parentheses)

| LNMV | LNGFCF | LNTO | LNFDI |
|---|---|---|---|
| 1.000000 | -0.907621 | 0.108364 | -0.187587 |
| | (0.01117) | (0.01373) | (0.02629) |

To confirm the long run equilibrium relationship and estimate the speed of the adjustment, we have applied VECM model. The results of the VECM confirm a long run relationship among the variables (see annexure table-4). The estimated coefficient of the error correction term is negative (-0.69), as expected and statistically significant which implies that any short run deviation is being adjusted at the speed of 69 percent and variables will be in an equilibrium position in the long run. The model incorporates time dummy variables are found insignificant (see annexure table-4). Pair wise Granger causality results indicate that there are unidirectional causality running from MVA to FDI inflow, MVA to TO and MVA to GFCF. However, there is a strong bidirectional causality exist between FDI and trade openness (see annexure table-5).

Variance decomposition analysis results (see annexure table-6) forecasted that FDI will have an increasing effect on manufacturing value added and the effect is stronger in the long run. It is indicated that over 32% of the variation in manufacturing value added is expected to be explained by FDI after 8

years beyond the sample period of this study. Gross fixed capital formation has also forecasted to continue to effect on manufacturing value added even to a greater extent.

### *3.4.5 Validity of the model:*

The numeric of adjusted $R^2$ at 0.87 shows a very high explanatory power of the model. The F statistics at 8.16 suggest that a moderate interactive feedback effect exists within the system. The optimum number of lag (3) is determined based on the AIC and SIC criterion. The results of the Breusch-Godfrey LM test (see annexure table-7) confirm that there is no serial among the variables. The normality of data distribution is also ascertained by Breusch-Pagan-Godfrey Heteroscedasticity test (see annexure table-8) and CUSUM test (see annexure Fig-1).

## 4. CONCLUSIONS AND POLICY IMPLICATION

This study examines the relationship between FDI inflows and manufacturing value added for Bangladesh using time series data for the period 1984-2015 to check the contribution of FDI inflows to the manufacturing sector. The study further considers two other important variables; gross fixed capital formation and trade openness that are likely to potentially affect to manufacturing value added.

The Johansen maximum likelihood co-integration test and VECM are applied to estimate the long-run relationship between FDI and economic growth. The causality was determined using the Granger causality test. The robustness of the long-run association was checked by the application of variance decomposition analysis technique.

Findings from VER estimates indicated that there is a positive and significant relationship between FDI and manufacturing value added in Bangladesh in the long-run. Gross fixed capital formation also stimulates economic growth. However the study found a negative but significant relationship between trade openness and manufacturing value added. The Granger causality test revealed that there is strong unidirectional causal link between manufacturing value added and FDI inflows.

Results obtained from this empirical exercise provide a number of important policy implications. Although findings suggest that the economic growth of Bangladesh is stimulated by FDI inflows, the effect could have possibly been even stronger. Such failure may be attributed to failure of establishing sufficient backward linkages of FDI inflows. Moreover, now a days, innovation and technology have emerged as the key elements for industrial development. A high level of industrial sophistication is crucial to meet the internationally recognized standards of product quality. The diffusion of advanced technology and innovation techniques from foreign firms to domestic firms are crucial to harness the benefit of FDI. However, due to the limitation of time and data this paper does not cover that issue. Therefore, a further research is needed on theses area.

## REFERENCES

Adhikary B.K. (2011). FDI, trade openness, capital formation, and economic growth in Bangladesh: a linkage analysis, International Journal of Business and Management, 6**,** 16.

Aitken B. J. and Harrison A. E. (1999). Do domestic firms benefit from direct foreign investment? Evidence from Venezuela, American Economic Review 89(3): 605-618.

Alagöz M., et al. (2008). Foreign Direct Investment and Economic Growth: Evidence from Turkey 1992-2007, Gaziantep University-Journal of Social Sciences **7**(1): 78-89.

Alfaro L., Chanda A., Kalemli-Ozcan S., Sayek S. (2004). FDI and economic growth: the role of local financial markets, Journal of international economics, 64**,** 89-112.

Bangladesh Bank (2016). Foreign Direct Investment in Bangladesh: Survey Report, July-December, 2016, Bangladesh Bank.

BBS (2012). Survey of Manufacturing Industry, Bangladesh Bureau of Statistics, Dhaka.

Blomstorm M., Lipsey R.E., Zejan M. (1992). What explains developing country growth? NBER working paper, 4132, National bureau of economic research.

Borensztein E., De Gregorio J., Lee J-W. (1998). How does foreign direct investment affect economic growth? Journal of international Economics, 45**,** 115-135.

Cameron S. (1994). A review of the econometric evidence on the effects of capital punishment, The Journal of Socio-Economics, 23**,** 197-214.

Carkovic M.V., Levine R. (2002). Does foreign direct investment accelerate economic growth? Working Paper, University of Minnesota, Department of Finance.

Choe J.I. (2003). 2003. Do foreign direct investment and gross domestic investment promote economic growth? Review of Development Economics, 7**,** 44-57.

Chudnovsky D., Lopez A. (2008). 2008. Foreign investment and sustainable development in Argentina, Discussion Paper ,Working Group on Development and Environment in the Americas.

Gallagher K.P., Zarsky L. (2004) Sustainable Industrial Development? The Performance of Mexico's FDI-led Integration Strategy, Global Development and Environment Institute, Tufts University.

GOB (2016). Economic Review 2016, Ministry of Finance, Government of Bangladesh, Dhaka.

Hossain A., Hossain M.K. (2012). Empirical relationship between foreign direct investment and economic output in South Asian countries: A study on Bangladesh, Pakistan and India, International Business Research, 5**,** 9.

Kabir R. (2007). Foreign direct investment and sustainable growth: A case study on Bangladesh. Emory University.

Kurtishi-Kastrati S. (2013). The effects of foreign direct investments for host country's economy, European Journal of Interdisciplinary Studies 5(1): 26.

Mullen J.K., Williams M. (2005). Foreign direct investment and regional economic performance. Kyklos, 58**,** 265-282.

Mutenyo, J., et al. (2010). Does foreign direct investment crowd-out domestic private investment in Sub-Saharan Africa? The African Finance Journal 12(1): 27-52.

Roy S., Mandal K.K. (2012). Foreign direct investment and economic growth: An analysis for selected Asian countries, Journal of Business Studies Quarterly, 4**,** 15.

Shimul S. N. (2009). An Examination of the FDI and Growth Nexus in Bangladesh: Engle Granger and Bounds Testing Cointegration Approach, BRAC University Journal, VI**,** 69-76.

World Bank (2017). World Development Indicators, World Bank. accessed via http://data.worldbank.org/data-catalog/world-development-indicators on 09 October 2017.

Yao S. (2006) . Economic growth, FDI and exports in China. Applied Economics, 38**,** 339-351.

## Annexure

Annexure table-1: Summary of the descriptive statistics

| | LNMV | LNFDI | LNTO | LNGFCF |
|---|---|---|---|---|
| Mean | 2.704598 | -2.334826 | -1.736043 | 3.045193 |
| Median | 2.703432 | -2.137882 | -1.907102 | 3.089600 |
| Maximum | 2.868549 | 0.551249 | -0.734451 | 3.363381 |
| Minimum | 2.510036 | -7.057022 | -2.472455 | 2.669960 |
| Std. Dev. | 0.101276 | 2.275328 | 0.646186 | 0.225520 |
| Skewness | -0.106573 | -0.314349 | 0.427988 | -0.085559 |
| Kurtosis | 2.061731 | 1.783732 | 1.559914 | 1.432062 |
| | | | | |
| Jarque-Bera | 1.388671 | 2.811855 | 4.209813 | 3.731568 |
| Probability | 0.499406 | 0.245140 | 0.121857 | 0.154775 |
| | | | | |
| Sum | 97.36551 | -84.05375 | -62.49754 | 109.6270 |
| Sum Sq. Dev. | 0.358988 | 181.1991 | 14.61445 | 1.780074 |
| | | | | |
| Observations | 36 | 36 | 36 | 36 |

Annexure table-2: Unit root test

| | **ADF** | | | | **PP** | | | |
|---|---|---|---|---|---|---|---|---|
| | level | | 1st difference | | level | | 1st difference | |
| | Constant | Constant & trend | Constant | Constant & trend | Constant | Constant & trend | Constant | Constant & trend |
| lnmv | -1.056 | -3.09** | -3.35** | -4.40*** | -0.61 | -2.51* | -4.49*** | -4.41*** |
| lnfdi | -1.26 | -3.78*** | -5.81*** | -5.84*** | -1.26 | -3.70** | -8.305*** | -8.34*** |
| lngfcf | -0.81 | -3.43** | -7.15*** | -3.87*** | -0.91 | -1.93 | -6.52*** | -6.50*** |
| lnto | -0.31 | -2.13* | -7.06*** | -6.74*** | -0.44 | -4.52*** | -6.99*** | -6.67**** |

Note: * indicates significance at 10% level, *** indicates significance at 5% level while *** indicates significance at 1% level.

Annexure table-3: Co-integration test results

| Unrestricted Cointegration Rank Test (Trace) | | | | |
|---|---|---|---|---|
| | | | | |
| Hypothesized | | Trace | 0.05 | |
| No. of CE(s) | Eigenvalue | Statistic | Critical Value | Prob.** |
| | | | | |
| None * | 0.813645 | 78.11165 | 40.17493 | 0.0000 |
| At most 1 * | 0.328031 | 24.34844 | 24.27596 | 0.0490 |
| At most 2 | 0.246622 | 11.62709 | 12.32090 | 0.0651 |
| Trace test indicates 2 cointegrating eqn(s) at the 0.05 level | | | | |
| | | | | |
| Unrestricted Cointegration Rank Test (Maximum Eigenvalue) | | | | |
| Hypothesized | | Max-Eigen | 0.05 | |
| No. of CE(s) | Eigenvalue | Statistic | Critical Value | Prob.** |
| None * | 0.813645 | 53.76321 | 24.15921 | 0.0000 |
| At most 1 | 0.328031 | 12.72136 | 17.79730 | 0.2463 |
| At most 2 | 0.246622 | 9.062041 | 11.22480 | 0.1172 |
| Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level | | | | |

Annexure table-4: Vector Error Correction Estimates

| | | | | |
|---|---|---|---|---|
| Sample (adjusted): 1984 2015 | | | | |
| Included observations: 32 after adjustments, Lags -3 | | | | |
| Standard errors in ( ) & t-statistics in [ ] | | | | |
| | | | | |
| Cointegrating Eq: | CointEq1 | | | |
| | | | | |
| LNMV(-1) | 1.000000 | | | |
| | | | | |
| LNFDI(-1) | -0.139662 | | | |
| | (0.01731) | | | |
| | [-8.06968] | | | |
| | | | | |
| LNGFCF(-1) | -0.241865 | | | |
| | (0.10420) | | | |
| | [-2.32118] | | | |
| | | | | |
| LNTO(-1) | 0.018054 | | | |
| | (0.01048) | | | |
| | [ 1.72226] | | | |
| | | | | |
| C | -2.168722 | | | |
| | | | | |
| Error Correction: | D(LNMV) | D(LNFDI) | D(LNGFCF) | D(LNTO) |
| | | | | |
| CointEq1 | -0.693313 | 0.201584 | -0.209407 | -0.917981 |
| | (0.10798) | (1.15973) | (0.12195) | (7.44052) |
| | [-6.42057] | [ 0.17382] | [-1.71717] | [-0.12338] |
| Time Dummy_1997 | -0.011389 | 0.030430 | -0.016970 | -0.209947 |
| | (0.00709) | (0.07611) | (0.00800) | (0.48832) |
| | [-1.60709] | [ 0.39980] | [-2.12032] | [-0.42993] |
| | | | | |
| R-squared | 0.870573 | 0.215842 | 0.694804 | 0.466128 |
| Adj. R-squared | 0.763987 | -0.429935 | 0.443467 | 0.026469 |
| F-statistic | 8.167748 | 0.334237 | 2.764426 | 1.060204 |
| Log likelihood | 97.63705 | 21.67005 | 93.74494 | -37.81001 |
| Akaike AIC | -5.164816 | -0.416878 | -4.921559 | 3.300626 |
| Schwarz SC | -4.477752 | 0.270185 | -4.234495 | 3.987689 |
| Mean dependent | 0.006430 | 0.045861 | 0.017382 | 0.207097 |
| S.D. dependent | 0.032325 | 0.141044 | 0.023773 | 1.096692 |
| | | | | |
| Determinant resid covariance (dof adj.) | | 9.82E-10 | | |
| Determinant resid covariance | | 7.83E-11 | | |
| Log likelihood | | 190.7127 | | |
| Akaike information criterion | | -7.919542 | | |
| Schwarz criterion | | -4.988070 | | |

Annexure table-5: Pairwise Granger Causality Tests

| Sample: 1984 to 2015, Lags: 3 | | | |
|---|---|---|---|
| Null Hypothesis: | Obs | F-Statistic | Prob. |
| LNGFCF does not Granger Cause LNMV | 33 | 9.66205 | 0.0002 |
| LNMV does not Granger Cause LNGFCF | | 1.71737 | 0.1880 |
| | | | |
| LNTO does not Granger Cause LNMV | 33 | 3.50409 | 0.0294 |
| LNMV does not Granger Cause LNTO | | 2.21060 | 0.1108 |
| LNFDI does not Granger Cause LNMV | 33 | 3.39808 | 0.0327 |
| LNMV does not Granger Cause LNFDI | | 0.97928 | 0.4177 |
| | | | |
| LNTO does not Granger Cause LNGFCF | 33 | 0.27656 | 0.8418 |
| LNGFCF does not Granger Cause LNTO | | 13.6556 | 2.E-05 |
| LNFDI does not Granger Cause LNGFCF | 33 | 1.21433 | 0.3243 |
| LNGFCF does not Granger Cause LNFDI | | 2.49464 | 0.0821 |
| | | | |
| LNFDI does not Granger Cause LNTO | 33 | 1.94159 | 0.1477 |
| LNTO does not Granger Cause LNFDI | | 1.32776 | 0.2868 |

Annexure table-6: Variance Decomposition of LNMV:

| Period | S.E. | LNMV | LNGFCF | LNTO | LNFDI |
|---|---|---|---|---|---|
| 1 | 0.017303 | 100.0000 | 0.000000 | 0.000000 | 0.000000 |
| 2 | 0.024651 | 95.71747 | 0.748203 | 0.279575 | 3.254753 |
| 3 | 0.043578 | 47.66264 | 39.39936 | 1.976502 | 10.96150 |
| 4 | 0.064763 | 29.95564 | 48.35111 | 2.778998 | 18.91425 |
| 5 | 0.082365 | 24.25385 | 50.35804 | 3.013904 | 22.37421 |
| 6 | 0.094001 | 22.46950 | 48.71876 | 2.706362 | 26.10538 |
| 7 | 0.102979 | 21.75773 | 46.81850 | 2.396373 | 29.02740 |
| 8 | 0.109205 | 22.07751 | 44.73457 | 2.172085 | 31.01584 |
| 9 | 0.113538 | 22.91683 | 42.87562 | 2.022834 | 32.18472 |
| 10 | 0.117057 | 23.84789 | 41.42404 | 1.911717 | 32.81635 |

Annexure table-7: Breusch-Godfrey Serial Correlation LM Test:

| F-statistic | 0.377112 | Prob. F(3,15) | 0.7708 |
|---|---|---|---|
| Obs*R-squared | 2.244247 | Prob. Chi-Square(3) | 0.5233 |

Annexure table-8: Heteroscedasticity Test: Breusch-Pagan-Godfrey

| F-statistic | 0.48 | Prob. F(16,15) | 0.91 |
|---|---|---|---|
| Obs*R-squared | 10.93 | Prob. Chi-Square(16) | 0.81 |

**Annexure** Fig-1: CUSUM test