Economic Affairs, Vol. 63, No. 2, pp. 533-545, June 2018
DOI: 10.30954/0424-2513.2.2018.33

FDI Inflow, Export and Economic Growth Relationship in India: An ARDL-Bound Cointegration Approach

Kanchan Datta[1] and Abhijit Lahiri[2]

[1]Department of Economics, University of North Bengal, West Bengal, India
[2]Assistant Professor of Commerce, St. Joseph's College, Darjeeling, West Bengal, India

Corresponding author: kanchan.datta@gmail.com / abhijitsjc@gmail.com

ABSTRACT

There is a debate about the role of Foreign Direct Investment (specially from Developed nations to developing nations) for raising economic growth of the host nation. Some researchers' support that FDI raises the economic growth of the host country since it brings sophisticated technology, efficient management, raises employment opportunities and fills the gap between domestic savings and investment. Other researchers think that no entrepreneur wants to sacrifice their self interest for interest of a foreign nation. Hence, whatever the positive outcome for FDI inflow put forwarded by MNCs or developed nations ultimately these FDI sucks the main juice of a less developed nations and try to keep a control on the central government of that poor nations. Empirical finding also shows the impacts of FDI on economic growth is not unique. The outcome depends on many factors of the receiving nations. Under these circumstances this paper tries to investigate this FDI inflow, Export and economic growth nexus in the economy of India by applying a newly developed econometric tools ARDL Bound Cointegration Approach.

Keywords: FDI, Economic Growth, ARDL model, Cointegration, Error Correction Mechanism

SECTION -I

Concept of Foreign Direct Investment (FDI)

Foreign Direct investment (FDI) is investment made for controlling an enterprise operating outside of the economy of the investor or starting a fresh venture in foreign land. An investor based in one country acquires an asset in another country with the intent to manage the asset (OECD, 2000).

FDI may give an opportunity to a developing country to bring non- debt foreign resources, technology up gradation, skill enhancement, and new employment. It fills the gap between domestic savings and investments (Ray A.K. & Ghosh, D., 2014).

FDI may be categorized as inflows and out flows. *FDI net inflows* are the value of inward direct investment made by non-resident investors in the reporting economy, including reinvested earnings and intra-company loans, net of repatriation of capital and repayment of loans.

FDI net outflows are the value of outward direct investment made by the residents of the reporting economy to external economies, including reinvested earnings and intra-company loans, net of receipts from the repatriation of capital and repayment of loans.

These series are generally expressed as shares of GDP. These values sometimes may be negative. Negative values of *FDI net inflows* for a particular year show that the value of disinvestment by foreign investors was more than the value of capital newly invested in the reporting economy. Negative values of *FDI net outflows* show that the value of direct investment made by domestic investors to external economies was less than the value of repatriated (disinvested) direct investment from external economies.

For many developing countries, FDI inflows are a major source of external financing and thereby provide important means of implementation of sustainable development goals and growth of the private sector. Moreover, FDI is typically less volatile than Foreign Portfolio Investment. In many cases, FDI also contributes to the transfer (spill-over) of technology and improvement of labor and management skills. Sustained increases in FDI inflows are often a sign of an improved investment climate. Although the largest share of FDI goes from high income economies to other high income economies, though in recent year, FDI flows between developing countries have also increased.

The internationally accepted definition of FDI is provided in the fifth edition of the IMF's Balance of Payments Manual (1993). Under this definition FDI has three components: equity investment, reinvested earnings, and short- and long-term inter-company loans between parent firms and foreign affiliates.

The Issue of Debate

There is a belief among a group of thinkers specifically related the developing countries that to remove all economic problems the only medicine is FDI. The basis of this belief may be to some extent compulsion or propaganda sprayed out by the developed nations, or to some extent theoretical logic or empirical experiences. FDI means import of sophisticated technology, advanced managerial skill or knowledge, utilization of unused capacity, employment generation, increase of foreign exchange reserve, more export and more economic growth. This group also opined that due to volatility experience in the short term capital flow (hot money) that is Foreign Portfolio Investment , developing or less developed and least developed countries shifted their focus from attracting short term capital flows to FDI due to its long term effects (Miankhel, Thangavelu, 2009). According to this group Inward FDI can play an important role by increasing and augmenting the supply of funds for domestic investment in the host country. This is can be done through production chain when foreign investors buy locally made inputs and sell intermediate inputs to local enterprises.

On the other hand , other group of thinkers feel that FDI is not an unmixed blessings. It is one kind of market capturing or business expanding strategy of the foreign giant companies to penetrate into the under developed or developing nations. They also feel that because of some obligation most of the governments specially developing nations are giving priorities or special facilities to attract FDI to their own nations. The MNCs or TNCs or foreign companies in most of the cases decide what to produce, how to produce, where to produce and for whom it may be sold out. Hence terms of trade always in favour of them. Hence the net gains for the host nations are insignificant. Moreover, with the presence of FDI another fear is that these giant companies may eaten up the micro, small and medium enterprises which may lead to raise unemployment problem. Though they are supposed to bring latest technology but in practice they generally bring obsolete (in their own country) technology which may have environmental or other negative externalities.

On the another angle, since the foreign companies generally use sophisticated capital intensive technology, hence only high skilled laborers will get job with prestigious or handsome salary and there is no or minimum opportunities for unskilled or semi skilled laborers. Hence to what extent this FDI model of growth is feasible for a labour abundant nation? Moreover, the empirical evidence also shows that in spite of increasing FDI as % of GDP, the GDP growth declines in some countries. So according to this group FDI only tries to suck the juice of the developing or poor nations and the net result is to bow down of head in front of foreign power which ultimately may be a threat of sovereignty or democracy of a developing nation.

History of FDI in India

'The historical background of FDI in India can be traced back with the establishment of east India Company of Britain. British capital came to India during the colonial era of Britain in India. Before independence major amount of FDI came from the British Companies. After Second World War, Japanese companies entered into the Indian market and enhanced their trade with India, yet U.K remains the most dominant investor in India. However, researcher could not portray the complete history of FDI pouring in India due to lack of abundant and authentic data'. Ray A.K. and Ghosh D. (2014).

After Independence in 1947, India adhered to socialist policies. Attempts were made to liberalize economy in 1966 and 1985. The first attempt was reversed in 1967. Thereafter, a stronger version of socialism was adopted. Second major attempt was in 1985 The process came to a halt in 1987, though 1966 style reversal did not take place.

In 1991, after India faced a balance of payments crisis and the central government took structural adjustment programme as a compulsion for getting loan from IMF. After that there has been a sea change in India's approach to FDI from the early 1990s. The new policies included opening for international trade and investment, deregulation, initiation of privatization, tax reforms, and inflation-controlling measures. In 1997, India allowed foreign direct investment (FDI) in cash and carry wholesale. Then, it required government approval. The approval requirement was relaxed, and automatic permission was granted in 2006. Single brand retailing attracted 94 proposals between 2006 and 2010, of which 57 were approved and implemented. Indian laws already allow foreign direct investment in cold-chain infrastructure to the extent of 100 percent. There has been no interest in foreign direct investment in cold storage infrastructure build out.

For years, India had prevented innovation and organized competition in its consumer retail industry. Several studies claim that the lack of infrastructure and competitive retail industry is a key cause of India's persistently high inflation. Furthermore, because of unorganized retail, in a nation where malnutrition remains a serious problem, food waste is rife. Well over 30% of food staples and perishable goods produced in India spoils because poor infrastructure and small retail outlets prevent hygienic storage and movement of the goods from the farmer to the consumer.

Until 2011, Indian central government denied foreign direct investment (FDI) in multi-brand Indian retail, forbidding foreign groups from any ownership in supermarkets, convenience stores or any retail outlets, to sell multiple products from different brands directly to Indian consumers. After November 2011 the following foreign groups are allowed to own up to 51 per cent in "multi-brand retailers". These market reforms paved the way for retail innovation and competition with multi-brand retailers such as Walmart, Carrefour and Tesco, as well single brand majors such as IKEA, Nike, and Apple.

In January 2012, India approved reforms for single-brand stores welcoming anyone in the world to innovate in Indian retail market with 100% ownership, but imposed the requirement that the single brand retailer source 30 percent of its goods from India. September 2012, the government of India announced the opening of FDI in multi-brand retail, subject to approvals by individual states.

SECTION-II

Theoretical Support

From the theoretical point of view we see the Solow model (1956) of growth first considers technological progress and labour force as endogenous factor for economic growth. Hence FDI presumes that it increases level of income by augmenting advanced technology. In other words, long-run growth can only be increased through technological and population growth and if FDI positively influences technology, then it will be growth advancing. According to endogenous growth theory, FDI can augment growth if it results increasing returns in production through spill over and technological transfers via diffusion processes (Somwaru and Makki 2004). Easterly *et al*. (1995) argue that, technology transfer depends on the diffusion process and that can take place through four models, (Miankhel, Thangavelu and Kalirajan, 2009).

(i) Transfer of New technologies
(ii) High technology imports
(iii) Foreign technology adoption
(iv) Level of human capital

Thus all most all growth models starting from classical to modern era, have given importance on accumulation of capital expansion of International trade for sustained economic growth. However, most of the developing countries experiences shortage in capital accumulation. Hence, this constraint increases the importance of foreign capital inflows in these countries via external savings (Tapsin G. 2016).

Now it is widely accepted idea that foreign direct investment particularly in developing countries induce growth and higher export by increasing

employment, productivity and technological progress (Denisia, 2010).

LITERATURE REVIEW

There have been a plethora of research works on the issue whether FDI, Export and economic growth are related to not? If related then whether FDI stimulates export and growth or not? Etc. however empirical findings seem inconclusive on this issues. Some studies support the view that FDI has positive impact on growth, but some still confirm that without a strong financial system and high skilled human capital FDI is not significantly affecting economic growth of the host economy. Due to the differences in the quality of human capital, geographical location, trade policies, and various economic and social issues across countries the impact of FDI on export and growth must be differential (Sothan S. 2015).

A simple linear regression model was applied by Azam (2010) among SAARC countries to explore the effects of FDI and export on economic growth within the time frame 1980 to 2009. His study found that export and FDI had statistically significant impact on economic growth during these time frame.

Sen and Karagoz (2005) investigated the relationship among FDI, export and economic growth in Turkey using quarterly data from 1994-II to 2004-IV. They applied Granger Causality test. Their study supported export led growth hypothesis in Turkey and also found that it is imperative to consider FDI enhancing policies in order that FDI inflows in Turkey may cause meaningful effects over exports and economic growth.

Won and Hsaio (2008), using panel data analysis, found bi-directional relation between export, FDI and economic growth in South Korea, Taiwan and Singapore. On the other hand, considering all sample countries (China, South Korea, Singapore, Taiwan, Malaysia and Philippines) together their study found out that FDI has a unidirectional impact on economy and causes growth. Besides there is a bi-directional causality relation between export and economic growth.

Alalaya (2008) investigated the relationship between economic growth, trade and FDI for Jordan for the period of (1990 -2008) by applying the ARDL model for Cointegration. He found a unidirectional causal effect from trade and FDI to economic growth. It was also found that the speed of adjustment in the model is 0.587 and it seems relatively high and significant.

On the other hand, Rodrick (1995) and Rome (1997) argue that it is difficult to identify the impact of trade on growth and there is evidence that countries with higher income for reasons other than trade, tend to trade more.

Petri and Plummer (1998), opined that it is not clear whether FDI causes export or exports cause FDI. Hsiao and Hsiao (2006) found that FDI may reduce exports by serving foreign markets through establishment of production facilities there.

Objectives of this Study

In this study an attempt has been taken to investigate the existence of any stable relationship (short run and/ or long run) between FDI inflow, Export and Economic Growth in India.

Data and Variables

The data are taken from World Development Indicators published by World Bank. These are yearly time series data covering a time period from 1976 to 2015. The reason for selecting this range is just its availability for these time horizon. Regarding variables , economic growth is measured by GDP growth symbolically denoted by Y, Foreign Direct Investment is denoted by F and it is taken as % of GDP and Export symbolically denoted by X it is also given as % of GDP.

Methodology

Most of the research studies uses traditional estimation techniques, e.g. OLS, GMM, Granger Causality etc. This study applies standard time series tools that is ADF Unit root test further supported by Phillips-Perron Unit root test, ARDL Bound Cointegration test (through Wald test) , Error Correction Mechanism, long run causality and short run causality etc.

The Augmented Dickey Fuller (ADF) Unit root test can be done by estimating the following equations:

$$Y_t = \alpha + \beta_t + \rho Y_{t-1} + \sum \lambda j \Delta Yt-j + \varepsilon t \qquad \ldots(1)$$

where,

$$\Delta Yt = Yt - Yt\text{-}1$$

Now subtracting Yt–1 from both sides we get,

$$Yt - Yt\text{–}1\_ = \alpha + \beta t + (\rho\text{–}1)Yt\text{–}1 + \sum^{p}_{j=1}\lambda j \Delta Yt\text{–}j \quad \ldots(2)$$

The is unrestricted regression and then we put two restrictions t = 0 and (ρ–1) = 0 and then get the following restricted regression,

$$Yt - Y_{t-1} = \alpha + \sum \lambda j \Delta Yt\text{–}j \quad \ldots(3)$$

Now we have to apply OLS for both equations (b) and (c) and obtain the residual sum square of both the estimated regression equation. After that we have to compute a standard F ratio where,

$$F = (N\text{-}K)(RSS_r\text{-}RSS_{ur})/q(RSS_{ur}) \quad \ldots(4)$$

Where RSS_r and RSS_{ur} are the residual sum square of the restricted and unrestricted regression, N= number of observations, and K is the number of estimated parameter in the unrestricted regression and q is the number of parameter restrictions. Here we have to use the distribution tabulated by Dickey and Fuller for hypothesis testing.

Phillips-Perron (PP) Unit root test

Dickey-Fuller assumes that the error terms or are independently and identically distributed. The ADF test adjusts the DF test to take care of possible serial correlation among the residuals by adding lagged difference terms of the regresand. It may reduce the degrees of freedom and also the reliability of estimation given the sample size. So we have added Phillips-Perron test in support of ADF test. Phillips and Perron use non-parametric statistical methods to take care of the serial correlation in the error terms without adding lagged difference terms.

ARDL Bound Cointegration Technique

The paper adopts the recently developed auto regressive distributed lag (ARDL) framework by Pesaran and Shin (1999). There are advantages of using this approach instead of the conventional Johansen (1991) approach. While the conventional cointegrating method estimates the long-run relationships with in a context of a system of equations, the ARDL method employs only a single reduced form equation. Moreover, the ARDL approach does not involve pre-testing variables, which means that the test on the existence relationship between variables in levels is applicable irrespective of whether the underlying regressors are purely I(0), purely I(1) or a mixture of both. The second advantage is that the ARDL test is relatively more efficient in the case of small and finite sample data sizes. The last and third advantage is that by applying the ARDL technique we obtain unbiased estimates of the long-run model (Harris and Sollis, 2003).

This feature alone, given the characteristics of the cyclical components of the data, makes the standard of Cointegration technique unsuitable and even the existing unit root tests to identify the order of integration are still highly questionable. Furthermore, the ARDL method avoids the larger number of specification to be made in the standard Cointegration test. These include decisions regarding the number of endogenous and exogenous variables (if any) to be included, the treatment of deterministic elements, as well as the optimal number of lags to be specified. The empirical results are generally very sensitive to the method and various alternative choices available in the estimation procedure (Pesaran and Smith, 1998). With ARDL, it is possible that different variables have different optimal lags, which is impossible with the standard cointegration test. Most importantly the model could be used with limited sample data (30 to 80 observations) in which the set of critical values were developed originally by Narayan (2004).

Basically the ARDL approach to Cointegration involves estimating the conditional error correction version of the ARDL model for the variables under study.. Two sets of critical values are generated which one set refers to the I(1) series and the other for the I(0) series. Critical values for the I(1) series are referred to as upper bound critical values, while the critical values for I(0) series are referred to as the lower bound critical values.

If the F test statistic exceeds their respective upper critical values, we can conclude that there is evidence of a long-run relationship between the variables regardless of the order of integration of the variables. If the test statistic is below the upper critical value we cannot reject the null hypothesis

of no Cointegration, and if it lies between the two bounds, a conclusive inference order of integration of the underlying regressors. Recently Narayan (2005) developed a set of critical values for the limited data (30 to 80 observations).

SECTION-III

Graphical Explanation

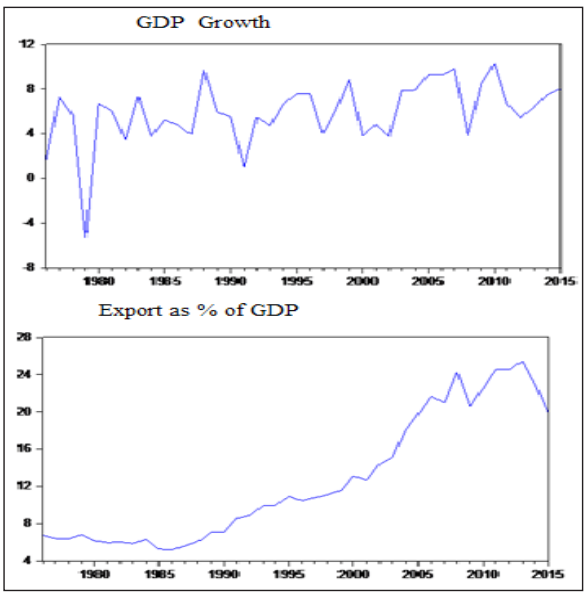
Figure below shows the GDP growth, Export as % of GDP and FDI as % of GDP in India covering time period 1975 to 2015. Except in 1990 the GDP growth shows a steady rise with some fluctuations (sharp decline) specially in, 1977-80s (may be internal political crisis), 1989 to 1991, due to structural reforms or Macroeconomic stabilization policies during this period, 1997-98 may be due to Kargil war, and 2007-2009 due to global recession. But the second figure shows a sustained rise of export (shown by export as a % of GDP) except in 2007 to 2009 the reason is same as worldwide recession and lack of demand for our product especially in the European nations and USA. The FDI a (shown by % of GDP) was more or less constant upto 1990, but after 1990 that is after the liberalization policies that is opening up the door of our economy in a big way for foreign investors the amount of FDI started to increase at a steady rate. It gets its momentum after 2005-06 that is second generation reform except in 2009-12 again it is in increasing trend.

Findings

From the Table 1 it is clear that GDP growth is a I(0) variable that is it is stationary at level but the other two variables are I(1). Hence there is a mixture of integration of the variables under study. So Johansen's Cointegration will not be a suitable technique for investing the long run relationship. Since there is no I(2) variable and exists a mixture of I(0) and I(1) variable , ARDL Bound Cointegration will be appropriate technique to apply.

ARDL Model:

ARDL bound testing approach of Cointegration developed by Pesaran (1997),Pesaran and Shin (1999) and Pesaran et al (2001). Due to low power and other problems associated with other test methods, the ARDL approach to Cointegration has become popular in recent year. It has many advantages in comparison with other Cointegration approach such as Engle and Granger (1987), Johansen (1988) and Johansen and Juselius (1990) .Moreover, the Johansen Cointegration techniques require large data sample for validity, the ARDL procedure is statistically more significant approach to determine the cointegrationin small samples**.** This technique can be applied whether the regressors I(1) and or I(0) while Johansen Cointegration techniques require that all the variables in the system be of equal order of integration. This implies that ARDL can be applied irrespective of whether the



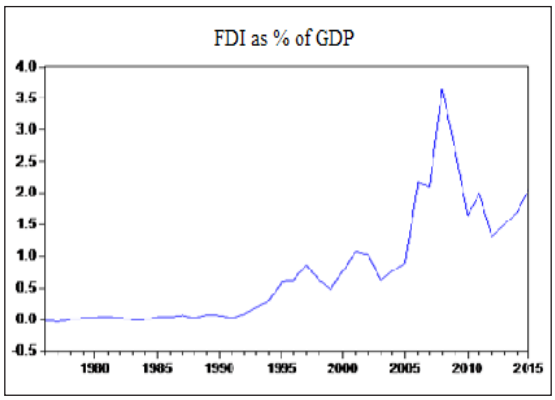


Fig. 1

Table 1: Results of ADF and PP Unit root test

Variable	Exogenous	ADF Stat.	Prob.	PP stat.	Prob.	Decision
Y (GDP Growth)	Intercept	-6.16	0.00	-6.19	0.00	I(0)
Y	Intercept + Trend	-7.67	0.00	-10.75	0.00	I(0)
X (Export as % of GDP)	Intercept	-0.54	0.87	-0.56	0.86	
X	Intercept + Trend	-1.84	0.66	-1.87	0.64	
DX	Intercept	-6.34	0.00	-6.40	0.00	I(1)
DX	Intercept + Trend	-6.26	0.00	-6.32	0.00	I(1)
F (FDI as % of GDP)	Intercept	-1.29	0.62	-1.19	0.66	
F	Intercept + Trend	-2.96	0.15	-2.96	0.15	
DF	Intercept	-7.17	0.00	-7.18	0.00	I(1)
DF	Intercept + Trend	-7.07	0.00	-7.11	0.00	I(1)

underlying regressors are purely I(0), purely I(1) or mutually cointegrated. The Johansen Cointegration techniques require large data sample for validity, the ARDL procedure is statistically more significant approach to determine the Cointegration relation in small samples. Moreover, the ARDL procedure allows that the variables may have different optimal lags while it is impossible with conventional Cointegration procedures. Finally, ARDL procedure employs only a single reduced form equation, while the conventional Cointegration procedure estimates long-run relationships with in a context of system equations. Basically, the ARDL approach to Cointegration involves two steps for estimating the existence of long run relationship among all the variables, the second step is to estimate the following long-run and short-run models that are represented by the following equations,

The ARDL model for Bound Cointegration approach, estimation of the following equations are essential.

$$DY_t = \alpha + \sum\beta_i DY_{t-i} + \sum\gamma_i DX_{t-i} + \sum\delta_i DF_{t-i} + \theta 1\ Y_{t-1} + \theta 2\ X_{t-1} + \theta 3\ F_{t-1} + \mu_{1i} \quad \ldots(5)$$

$$DX_t = \alpha + \sum\beta_i DX_{t-i} + \sum\gamma_i DY_{t-i} + \sum\delta_i DF_{t-i} + \theta 1\ X_{t-1} + \theta 2\ Y_{t-1} + \theta 3\ F_{t-1} + \mu_{2i} \quad \ldots(6)$$

$$DF_t = \alpha + \sum\beta_i DF_{t-i} + \sum\gamma_i DX_{t-i} + \sum\delta_i DY_{t-i} + \theta 1\ F_{t-1} + \theta 2\ X_{t-1} + \theta 3\ Y_{t-1} + \mu_{3i} \quad \ldots(7)$$

The orders of the lags in the ARDL model are selected by either the AIC or BIS a criterion before the selected model is estimated by Ordinary Least Squares (OLS). For annual data, Pesaran and Shin (1999) recommended choosing a maximum of 2 lags. From this the lag length that minimizes the adjusted sum or squared residuals (SSR) is selected (Schwarz Bayesian Criteria). Then, the F test is used for testing the existence of a long-run relationship. When a long-run relationship exists, the F test indicates which variable should be normalized. The null hypothesis for no-cointegration among the variables in all the equations is,

$$H_0: \theta_1 = \theta_2 = \theta_3 = 0$$

against the alternative hypothesis:

$$H_1: \theta_1 \neq \theta_2 \neq \theta_3 \neq 0$$

The F test has a non-standard distribution which depends on:

(i) whether variables included in the model are I(0) or I(1)

(ii) the number of regressors and

(iii) whether the model contains an intercept and or a trend.

Two sets of critical values for a given significance level can be determined (Pesaran *et al.* 2001). The first level is calculated on the assumption that all variables included in the ARDL model are integrated of order zero, while the second one is calculated on the assumption that the variables are integrated of order one. The null hypothesis of no Cointegration is rejected when the value of the test statistic exceeds the upper critical bounds value, while it is accepted if the F-statistic is lower than the lower bounds value. Other ways, the Cointegration test is inconclusive.

Estimation of Long-run and short run relationship among the cointegrating variables.

If there is an evidence of long-run relationships (Cointegration) between the variables, the second step is to estimate the following equations for short run relationship.

$$DY_t = \alpha_1 + \sum\beta_i\ DY_{t-i} + \sum\gamma_i DX_{t-i} + \sum\delta_i DF_{t-i} + \psi ECM_{t-1} + \mu_{1i} \quad \ldots(8)$$

$$DX_t = \alpha_2 + \sum\beta_i\ DX_{t-i} + \sum\gamma_i DY_{t-i} + \sum\delta_i DF_{t-i} + \psi ECM_{t-1} + \mu_{2i} \quad \ldots(9)$$

$$DF_t = \alpha_3 + \sum\beta_i\ DF_{t-i} + \sum\gamma_i DX_{t-i} + \sum\delta_i DY_{t-i} + \psi ECM_{t-1} + \mu_{3i} \quad \ldots(10)$$

Where ψ is the coefficient of the error correction term. It shows how quickly variables converge to equilibrium and it should have a statistically significant coefficient with a negative sign with value less than one. It is also known as seed of adjustment.

Causality Analysis

ARDL Cointegration method tests whether the existence or absence of long-run relationship among the variables. Or the log-run relationship is stable or not etc. It does not indicate the direction of causality. Granger (1988) emphasizes that a vector error correction modeling should be estimated rather than a Vector auto regression as in a standard Granger Causality test, if variables in model are cointegrated. Considering equation (8), (9) and (10), the Wald tests of the *'differenced'* explanatory variables give us an indication of the short-term causal effects, where as the *'long term'* causal relationship is implied through the significance or otherwise of the t-test of the lagged error correction term that contains the long-term information, since it is derived from the long-run cointegrating relationship. Equation 8,9,10 Granger Causality can be examined in three ways.

Short-run or Weak Granger Causality can be examined in three ways:

1. H_0:Φ_i = 0 and H_0: δ_j = 0 for all i and j in equation 8.
2. H_0: γ_i = 0 and H_0: δ_j = 0 for all i and j in equation 9.
3. H_0: γ_i = 0 and H_0: δ_j = 0 for all i and j in equation 10.

In 1(996) Masih and Masih and Asafu-Adjaye (2000) interpret the *weak Granger* Causality as *short-run causality* in the sense that the dependent variable responds only to short-term shocks to the stochastic environment.

Masih and Masih (1996) point out that another possible source of causation is the ECM I equations. The coefficients on the ECM's represent how fast deviations from the long-run equilibrium are eliminated following changes in each variable. Thus the long-run causalities are examined by testing:

4. H_0: ψ_1= 0, ψ_2= 0 and ψ_3 = 0 for all i and j in equation 8.
5. H_0: γ_i = 0 and H_0: δ_j = 0 for all i and j in equation 9.
6. H_0: γ_i = 0 and H_0: δ_j = 0 for all i and j in equation 10.

Asafu –Adjaye (2000) emphasizes that the joint test of two sources of causation indicates which variables bear the burden of short run adjustment to reestablish long-run equilibrium, following a shock to the system.

Lee and Chang (2008) referred it as strong Granger Causality test that are detected by testing:

- H_0:Φ_i = ψ_1 = 0 and H_0:Φ_j = ψ_1 = 0 for all i and j in equation (8)
- H_0: γ_i = ψ_1 = 0 and H_0:Φ_j = ψ_2 = 0 for all i and j in equation (9) and for all i and j
- H_0: γ_i = ψ_1 = 0 and H_0: = δ_j = ψ_3

Empirical Findings

For Cointegration

In this study using AIC and SC criterion lag 1 is selected. Therefore the estimable model is,

$$DY_t = \alpha_0 + \beta_1 DY_{t-1} + \gamma_1 DX_{t-i} + \delta_1 DF_{t-i} + \theta_1 Y_{t-1} + \theta_2 X_{t-1} + \theta_3 F_{t-1} + \mu_{1i} \quad \ldots(8)$$

Table 2: The results of estimation of equation (8) is shown in the table below

Variable	Coefficient	Std. Error	t-Statistic	Prob.
	6.212716	1.608194	3.863162	0.0005
	0.297360	0.179832	1.653547	0.1080
	0.526254	0.444719	1.183341	0.2454
	-0.472393	1.268175	-0.372498	0.7120

-1.416844	0.257475	-5.502849	0.0000
0.114499	0.157325	0.727785	0.4720
0.891653	1.213253	0.734927	0.4677
R-squared: 0.610926	Akaike info criterion: 4.932060		D.W Stat 1.904486
Adjusted R-squared: 0.537975	Schwarz criterion: 5.230648		

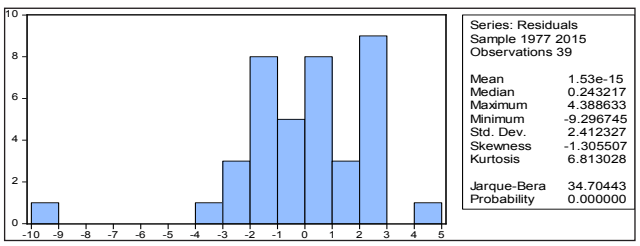
Table 3: Results of Wald Test

Wald Test:, Equation: Untitled			
Test Statistic	**Value**	**df**	**Probability**
F-statistic	10.12442	(3, 32)	0.0001
Chi-square	30.37327	3	0.0000

Null Hypothesis: H_0: $\theta_1 = \theta_2 = \theta_3 = 0$ is rejected. Hence we have to accept the alternative hypothesis (since it exceeds the upper bounds of the critical value). Therefore, there exists long run relationship among the variables concerned. In other words FDI, export and Economic Growth are cointegrated in India over the time period of the study. The diagnostic checking also supports the reliability of our estimation.

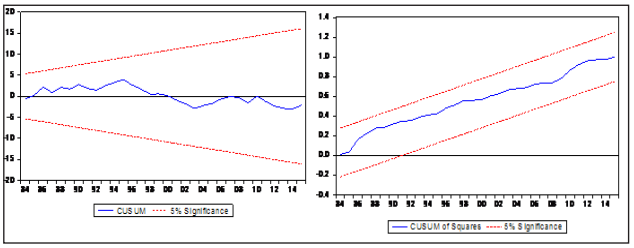
Diagnostic checking

To examine the reliability and stability of our estimation we apply Jarque-Bera statistic for normality of residuals, Breusch-Godfrey Serial Correlation LM test, CUSUM test and finally CUSUM of square test applied. Through all the criteria we can say the residuals are normally distributed, there does not exist any serial correlation among the residual series and the residuals are stable with 5% significance level. All these diagnostic checking reflects the reliability of our estimation of equation (8).



Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	**1.110327**	**Prob. F(2,30)**	**0.3426**
Obs*R-squared	2.687888	Prob. Chi-Square (2)	0.2608

H_0: there is no serial correlation of any order among the residuals. Accepted.



Now after establishing the long run or cointegrating relationship our next attempt is to estimate the long run relationship. Once again based on SBC criterion the following long run model is estimated:

$$Y_t = \alpha + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \beta_3 Y_{t-3} + \gamma_1 X_t + \gamma_2 X_{t-1} + \gamma_3 X_{t-2} + \gamma_4 X_{t-3} \delta_1 F_t + \delta_2 F_{t-1} + \delta_3 F_{t-2} + \delta_4 F_{t-3} + u_{1t} \quad ...(A)$$

The results of estimation is shown in the table below:

Table 4: Results of estimated regression equation (A)

Dependent Variable: Y, Sample (adjusted): 1979 2015				
Included observations: 37 after adjustments				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
	0.113601	0.225737	0.503245	0.6192
	-0.307532	0.203105	-1.514153	0.1425
	0.045668	0.217210	0.210248	0.8352
	-1.024121	0.674882	-1.517481	0.1417
	2.734606	1.137510	2.404029	0.0240
	-1.092909	0.803198	-1.360698	0.1858
	-0.540020	0.815220	-0.662423	0.5138
	-0.450823	1.784366	-0.252652	0.8026
	-2.132733	2.244817	-0.950070	0.3512
	5.578964	2.812404	1.983699	0.0584
	-2.658409	2.193514	-1.211941	0.2369
	5.075758	3.343643	1.518032	0.1416
R-squared: 0.389641		Mean dependent var		6.015573
Adjusted R-squared: 0.121082		S.D. dependent var		2.850540
S.E. of regression: 2.672399		Akaike info criterion		5.060437
Sum squared resid: 178.5429		Schwarz criterion		5.582897
Log likelihood: -81.61808		Hannan-Quinn criter.		5.244628
F-statistic: 1.450861		Durbin-Watson stat		1.599180
Prob (F-statistic): 0.212103				

Findings

From the above results regarding long run

relationship among the variables it is clear that last periods export takes a positive role for raising income. Similarly FDI at lag 2 positively affecting GDP growth of India. Now from this long run estimation we can derive the error series that can be termed as Error Correction Term. Now to test the stability of the long run relationship we apply Error Correction Model, which combines the short run and long run relationship.

The Error Correction Model

$$DY_t = \alpha + \beta_1 DY_{t-1} + \beta_2 DY_{t-2} + \gamma_1 DX_{t-1} + \gamma_2 DX_{t-2} + \delta_1 DF_{t-1} + \delta_2 DF_{t-2} + \Psi_1 ECM + u_{2t} \quad ...(B)$$

The results of estimation of equation (B) is shown in the table below:

Table 5: Results of Error correction model estimation

Dependent Variable: DY				
Sample (adjusted): 1980 2015				
Included observations: 36 after adjustments				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
	0.077179	0.501637	0.153855	0.8788
	-0.229469	0.172001	-1.334115	0.1929
	-0.289051	0.130800	-2.209864	0.0355
	0.829489	0.483611	1.715199	0.0974
	-0.407455	0.403619	-1.009503	0.3214
	0.275465	1.033632	0.266502	0.7918
	1.616526	1.273140	1.269716	0.2146
	-0.830179	0.253690	-3.272412	0.0028
R-squared: 0.620214		Mean dependent var		0.368007
Adjusted R-squared: 0.525268		S.D. dependent var		3.426599
S.E. of regression: 2.360954		Akaike info criterion		4.749138
Sum squared resid: 156.0749		Schwarz criterion		5.101032
Log likelihood: -77.48449		Hannan-Quinn criter.		4.871959
F-statistic: 6.532259		Durbin-Watson stat		2.014963
Prob (F-statistic): 0.000129				

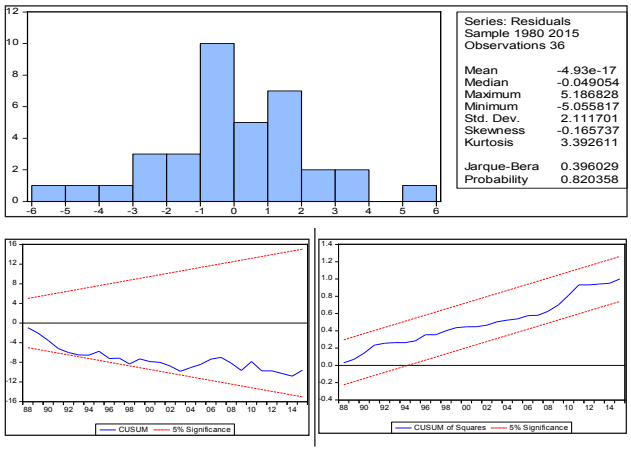
Findings

From the above table it is clear that the error correction term is significant and negative. This implies the long run relationship among the variables is stable. The speed of adjustment is 83%. That is 83% of the previous error is corrected in the current year. Export coefficient at lag 1 is significant. This implies export causes changes of GDP growth. No coefficient of FDI is significant. This implies no short run causality from FDI to GDP growth in India. For the reliability of our estimation we apply some diagnostic checking the results are shown below. In diagnostic checking (shown below) Breusch-Godfrey Serial Correlation LM Test shows residuals are not serially correlated, that is residuals of the estimated equation (B) is free from auto correlation. Again the Jarque –Bera (JB) statistic shows residuals are multivariate normal. This raises the reliability of our estimation. Moreover the CUSUM and CUSUM of square test results show confirms the stability of estimation at 5% level.

Diagnostic Checking

Table 6: Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.203614	Prob. F(2,26)	0.817
Obs*R-squared	0.555160	Prob. Chi-Square(2)	0.757



Causality Analysis

As we know the Wald tests of the 'differenced' explanatory variables give us an indication of the short-term causal effects, considering export variable doesn't weakly causes GDP growth , the Wald test shows the rejection of the null hypothesis. Hence export weakly Granger causes GDP growth in the short run. Or there exist short run causality from Export to GDP in India.

Wald Test:			
Equation: Untitled			
Test Statistic	**Value**	**df**	**Probability**
F-statistic	5.348802	(2, 26)	0.0113
Chi-square	10.69760	2	0.0048

Where as considering FDI variable, the Wald Test shows though the F statistic is significant by with respect to the critical value developed by Narayan (2005), this value is not significant even at 10 % level. Hence we can say that FDI is not weakly causes GDP growth (i.e. no Short run Causality from FDI to GDP growth) in India over the time period of the study.

Wald Test:			
Equation: Untitled			
Test Statistic	**Value**	**df**	**Probability**
F-statistic	3.480705	(4, 26)	0.0210
Chi-square	13.92282	4	0.0075

Strong Granger Causality

Considering the null hypothesis that export does not strongly Granger Causes GDP growth. The F statistic is highly significant and it exceed the critical value developed by Narayan (2005). Hence, we can reject the null hypothesis and accept the alternative hypothesis that is export strongly Granger causes GDP growth in India over the time period of the study.

Wald Test:			
Equation: Untitled			
Test Statistic	**Value**	**df**	**Probability**
F-statistic	11.41816	(3, 26)	0.0001
Chi-square	34.25449	3	0.0000

Now considering FDI does not strongly Granger Causes GDP , again this null hypothesis is rejected through the F statistic (critical values for I(1) variables). Hence we can say FDI is strongly Granger Causes GDP growth in India over the period of the study.

Equation: Untitled			
Test Statistic	**Value**	**df**	**Probability**
F-statistic	8.009144	(5, 26)	0.0001
Chi-square	40.04572	5	0.0000

Now considering estimation of equation (6) lag 1 is selected by AIC and or SC criterion.

$$DXt = \alpha_0 + \beta_1 DY_{t-i} + \beta_2 DX_{t-i} + \beta_3 DF_{t-1} + \theta_1 Y_{t-1} + \theta_2 X_{t-1} + \theta_3 F_{t-1} + \mu_{2i} \quad \ldots(9)$$

The results of estimation of equation (9) is shown in the table below:

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
	-0.055797	0.655514	-0.085120	0.9327
	-0.014559	0.073301	-0.198624	0.8438
	0.307815	0.181271	1.698089	0.0992
	-2.177251	0.516919	-4.211976	0.0002
	0.199889	0.104949	1.904635	0.0658
	-0.086997	0.064127	-1.356637	0.1844
	0.362507	0.494533	0.733029	0.4689
R-squared: 0.497762		AIC: 3.137165		
Adjusted R-squared: 0.403592		Schwarz criterion: 3.435753		D.W Stat 1.5806

Results of Wald Test

Wald Test:, Equation: Untitled			
Test Statistic	**Value**	**df**	**Probability**
F-statistic	1.561918	(3, 32)	0.2177
Chi-square	4.685755	3	0.1963

Wald test results shows when export is the dependent variable the variables are not cointegrated.

Now considering estimation of equation (8) lag 1 is selected by AIC and or SC criterion,

$$DF_t = \alpha_0 + \beta_1 DY_{t-i} + \beta_2 DX_{t-i} + \beta_3 DF_{t-1} + \theta_1 Y_{t-1} + \theta_2 X_{t-1} + \theta_3 F_{t-1} + \mu_{3i} \quad \ldots(10)$$

The results of estimation of equation (10) is shown in the table below:

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
	-0.771178	0.227891	-3.383976	0.0019
	-0.040054	0.025483	-1.571781	0.1258
	-0.076849	0.063019	-1.219444	0.2316
	0.154237	0.179708	0.858266	0.3971
	0.087853	0.036486	2.407863	0.0220
	0.064800	0.022294	2.906633	0.0066
	-0.653638	0.171926	-3.801866	0.0006
R-squared: 0.402859		AIC: 1.024062		D.W Stat
Adjusted R-squared: 0.290895		Schwarz criterion: 1.322650		1. 2.222215

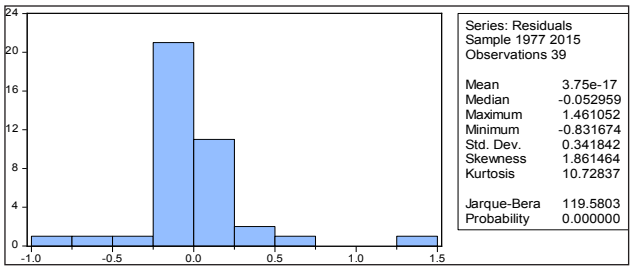
Results of Wald Test

Wald Test:, Equation: Untitled			
Test Statistic	**Value**	**df**	**Probability**
F-statistic	6.330341	(3, 32)	0.0017
Chi-square	18.99102	3	0.0003

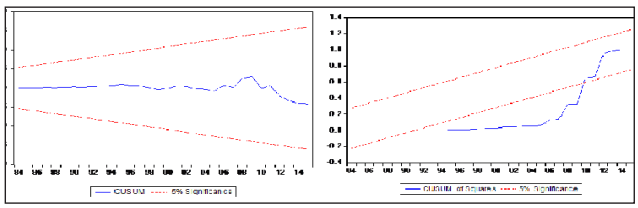
Here again the Wald test results shows that the variables are cointegrated. This implies there exists a long-run relationship among the variables of this study.

Diagnostic checking

To examine the reliability and stability of our estimation we apply Jarque-Bera statistic for normality of residuals, Breusch-Godfrey Serial Correlation LM test, CUSUM test and finally CUSUM of square test applied. Through the first two criteria we can say the residuals are normally distributed, there does not exist any serial correlation among the residual series but square of CUSUM test results shows the residuals are unstable with 5% significance level.



Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	5.459848	Prob. F(2,30)	0.0095
Obs*R-squared	10.40741	Prob. Chi-Square(2)	0.0055



SECTION-IV

CONCLUSION

'FDI' means investment by non-resident entity/ person resident outside India in the capital of an Indian company under Schedule 1 of Foreign Exchange Management (Transfer or Issue of Security by a Person Resident Outside India) Regulations, 2000. Government of India is trying to attract and promote foreign direct investment in order to supplement domestic capital, technology and skills, for accelerated economic growth. Foreign Direct Investment, as distinguished from portfolio investment, has the connotation of establishing a 'lasting interest' in an enterprise that is resident in an economy other than that of the investor.

Many changes have been made to the Foreign Direct Investment (FDI) policy in the last few years. Further, FDI is also allowed through two different routes namely, Automatic and the Government route. The erstwhile Foreign Investment Promotion Board (FIPB) has been phased out recently. In the automatic route, foreign entities do not need the prior approval of the government to invest. However, they have to inform the RBI about the amount of investment within a stipulated time period. In the government route, any investment can be made only after the prior approval of the government. Various other conditions as defined in the consolidated FDI policy are applicable to various sectors. In specific sectors, the FDI is prohibited. The list is given in the appendix.

This paper finds that:

- ❒ Export strongly Granger causes GDP growth in India over the time period of the study and
- ❒ FDI is strongly Granger Causes GDP growth.
- ❒ No Short run Causality from FDI to GDP growth
- ❒ There exists long run relationship among the three variables that is GDP growth, FDI inflow and Export.
- ❒ The long run relationship is stable.
- ❒ The speed of adjustment is 83%. That is 83% of the previous error is corrected in the current year.
- ❒ In the appendix some important informations are given for future research in this area.

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