Causality Relationship between Foreign Direct Investment and GDP for India

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Abstract

Deep analysis on how foreign direct investment (FDI) interacts with the host country's GDP is very important for the identification of the strategies that will enable a developing country like India to achieve its development objectives. Hence we continue to analyze the causality relationship between FDI and GDP of India for about 14 years starting from the year 2000 to 2014.In this study the co integration and granger causality test analysis is conducted. The co integration test reveals that there is existence of a long run association ship among the variables in questions. While the granger causality results suggest that there is a causality relationship which is unidirectional running from FDI to GDP.

Keywords: foreign direct investment (FDI), gross domestic product growth (GDPGR), Co integration test and granger causality, India

Introduction

The analysis of an economic growth of one country is complex as its determinant is the combination of many involved variables according to their contribution to the growth rate of Gross Domestic Product (GDP). However, the study of the main variable can be very essential, particularly to the policy makers, to promote further growth from that one variable. Among the many determinants identified to explain an economic growth, Foreign Direct Investment (FDI) has become one significant element in this rising trend of globalization and integration in this world economy although the question as to how, and to what extent, FDI affects economic growth is relatively conflicted from one study to another. Moreover, in developing countries, FDI is often seen as an important contribution for economic growth, and some development economists have long argued that countries pursuing outward-oriented development strategies are more likely to achieve higher rates of economic growth than those that are internally focused (Sethi and Sucharita 2011). Foreign direct investment plays a vital role to make substantial contribution to the economic growth by investing in sectors and bringing along with other indirect positive impacts including transfer of technology, training, skills, employment, to name just a few, which all contribute to the long term development of the recipient countries. In addition, the outstanding increase in FDI inflows demands the analysis of their relationship because the positive relationship between FDI inflows and economic growth cannot be universally agreed and the certainty whether FDI cause economic growth can be varied, yet the critical importance of FDI inflow to one economy cannot be denied. Hence, this paper aims to identify the relationship between FDI inflows and GDP of India over 2000 to 2014.

This study is organized into four parts. Part 1 covers introduction of the study, part 2 that covers the literature review which is followed by part 3 that Covers the Methodology of the study, data source and interpretation of the results part 4 covers Conclusion and policy recommendations.

Literature Review

Generally, most of the previous empirical studies discovered that causality linkage between foreign direct investment (FDI), export and GDP growth to be so mixed. With Some researchers indicating the unidirectional response while others indicating the bi-directional response and remaining group find no response at all among the three variables in questions.

To see how those linkage between the variables

in question is mixed observe the following studies. The studies by M. Dritsaki, C. Dritsaki and A. Adamopoulos (2004) on the analysis of how FDI, export and economic growth relate to each other in Greece for the years between of 1960-2002 shows that the there is existence of a long run equilibrium relationship among the variables analyzed using the co integration test while Granger causality results shows a causal relationship existed on those variables. Miankhel, Thangavelu and Kalirajan (2009) did the causality test between FDI, export and GDP (economic growth) for Pakistan, India, Malaysia, Mexico, Thailand and chile. Their findings were different for all the six nations .Their findings specifically reveal that economic growth attracts FDI in India in the long run that while GDP influence export in Pakistan. The study shows that Thailand had a bidirectional relationship between FDI and GDP implying that FDI leads to GDP and hence GDP attracts FDI.

Dasgupta (2007) examined the long run impact of export, imports and FDI inflows on the outflows of FDI in India. His empirical results suggested the presence of Unidirectional causality running from the export and import to FDI out flows. The results found no causality existed from FDI inflows to the outflows.

According to the study by Syed Imran Ali Meerza (2012) on the investigation of the causal linkage between trade FDI and economic growth of Bangladesh between 1973 to 2008.In his study he found that in the co integration test there was a long run relationship on the variables being analyzed while he also found that economic growth influences both FDI and export and that there was the existence of a unidirectional causal relation between FDI and export which runs from export to FDI.

An empirical study by Shimul and Siddiqua (2009) found no existence of the linkage of FDI and GDP for Bangladesh for a period between 1973-2007.

Mohammad Sharif karimi (2009) using the methodology of Toda and Yamamoto examined the causal relationship between FDI and economic growth for a period between 1970 to 2005 and found no strong evidence of bi-directional causality between the two variables hence he suggested that FDI has an indirect effect on economic growth in Malaysia.

An empirical investigation of the study by Chow P. (1987) on the causal relationships between export growth and industrial development in eight newly industrializing countries found out that there is a strong bidirectional causality relationships between the export growth and industrial development which support the export led growth strategy in the sense that with the export expansion there will be the national income growth of the country.

Chakraborty and Basu (2002) Investigated on the relationship between economic growth and foreign direct investment (FDI) in India by employing the co integration and error correction model method and found out that there is unidirectional relationship with causation running from GDP to FDI and not otherwise.

In his study Athukorala (2003) on The Impact of FDI on Economic Growth in Sri Lanka showed that FDI inflows did not exert an independent influence on economic growth and the direction of causation was from GDP growth to FDI rather than FDI to GDP growth.

Many researchers have used the granger causality test to explore the linkage of the variables in question hence these studies employ the same methodology for the case of the developing country like India and observe directions of how these variables react towards one another.

It should also be noted that most of the studies (some not covered in the literature review above) has been focused on the cross sectional data in their research for causality which is contrary on this study in the sense that it puts focus on one individual developing country of India which gives it an advantages of avoiding the problem of country's uniqueness behaviour that would have happened in case other countries were involved for case of a cross section data analysis. In a cross section data analysis usually all countries involved are assumed to be homogeneous in their

economical state. Another disadvantage is with the sensitivity in fixing up a model.

However according to other previous studies a panel data analysis can still capture a countries individual uniqueness behaviour successfully in case more than one country is involved although it has been pointed out there is a possibility that it cannot explain to the great extent the influence of the variables which usually cannot be the same in different countries. Therefore for simplicity only India as one country will be analyzed in this study to determine the causation of the variables in question.

The Methodology of the Study, Data Source and Interpretation of the Results

In this study we employ the granger causality test for the estimation of the causality relation between FDI & GDP of India. The functional form is as shown below:

The study uses the annual (secondary) time series data covering the period 2000-2014. This period has been chosen because data to be used in the foreign direct investment inflow is likely to be available. The data is collected from Handbook of Indian economy published by RBI, India. All results are performed by using E view 7.0.

The data are then put in logarithmic forms denoted by in each variable to avoid hetero scedasticity problem. The model involves the analysis of the relationship between GDP & FDI. Once it is observed that the variables analyzed have the same trend and the first differences are also stationery in that case we can proceed with the process of co integration.

The preliminary step will be to find the order of integration by using the unit root tests. When it happens that the variables have a unit root then to become stationary we will have to differentiate the data on the first difference.

Then the following stage will be using the Johansen and Juselius's co integration test to find the number of co integration. If the co integration is found then there is a need to test for Granger causality.

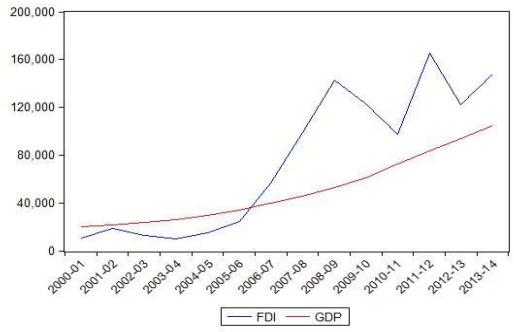

Figure 1 above shows the trend of the two variables under investigation i.e. FDI & GDP of India from the year 2000 to 2014

3.1 Augmented DickeyFuller (ADF)

It is necessary to start with a unit root test to check whether a given series say Xt is stationary or not. The Dickey-Fuller and Augmented Dickey-Fuller unit root tests are popular in the literature. The tests require estimation of the following equation:

$$\Delta X_t = \mu + \alpha X_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta X_{t-i} + \varepsilon_t \quad \text{.....} \quad \text{.....} \quad (1)$$

Where k is the value which ensures et be a white noise series, D is the difference operator, a and gi are parameters. The above procedure is known as the ADF test. The DF test follows a special case of ADF test when summation part of the equation (1) is zero, that is when k = 0. The test statistics of DF and ADF are tested under the null hypothesis of non-stationary against the alternative of stationary.

The results of augmented Dickey-Fuller (ADF) unit root tests for each variable in a model which is a method developed by Dickey and Fuller (1979) testing for the significance of the independent variables .The results are presented in Table 1

TABLE 1 : ADF UNIT ROOT TESTING

Gdp

	At Level		At First Difference	
	ADF Test Statistics	Critical Value	ADF Test Statistics	Critical Value

Constant	-1.814058	1% Level	-4.05791	-3.112274	1% Level	-4.12199
	0.3579	5% Level	-3.11991	0.0527	5% Level	-3.14492
		10% Level	-2.701103	***	10% Level	-2.713751
Constant & Trend	-0.753825	1% Level	-4.886426	-4.608057	1% Level	-5.124875
	0.9428	5% Level	-3.828975	0.0199	5% Level	-3.933364
		10% Level	-3.362984	*,**, ***	10% Level	-3.42003
None	0.414278	1% Level	-2.754993	-3.236421	1% Level	-20.37507
	0.7878	5% Level	-1.970978	0.0039	5% Level	-1.974028
		10% Level	-1.603693	**,***	10% Level	-1.602922

FDI

	At Level			At First Difference		
	Adf Test Statistics	Critical Value		Adf Test Statistics	Critical Value	
Constant	-0.822019	1% Level	-4.05791	-4.417982	1% Level	-4.12199
	0.7784	5% Level	-3.11991	0.0062	5% Level	-3.14492
		10% Level	-2.701103	*,**,***	10% Level	-2.713751
Constant & Trend	-2.543346	1% Level	-4.886426	-4.189105	1% Level	-4.992279
	0.3062	5% Level	-3.828975	0.0318	5% Level	-3.875302
		10% Level	-3.362984	**,***	10% Level	-3.38833
None	0.405112	1% Level	-2.754993	-4.005776	1% Level	-2.771926
	0.7854	5% Level	-1.970978	0.0008	5% Level	-1.974028
		10% Level	-1.603693	*,**,***	10% Level	-1.602922

Note: *,**,*** indicates 1%, 5 % & 10 % level of significance respectively

The augmented Dickey Fuller results in table 1 shows that the two variables which are FDI (Foreign Direct investment) and GDP (Gross Domestic Product) were not stationary at level but they became stationary after the first differences with constant, with constant & trend & none .

Johansen Co Integration Analysis

Johansen (1988) outlined a method which was later expanded by Johansen and Juselius (1990), which allowed for the testing of more than one co integrating vector in the data and for the calculation of maximum likelihood of these vectors. This procedure yields two test statistics of the number of statistically significant co-integrating vectors. One is l - max, which compares the null hypothesis H0 (r) with an alternative H1(r+1) where r is the co-integrating vector. The second test is the trace test which examines the same null of H0(r) versus a general alternative, H1 (p) where p is the number of variables. In this framework, it is desirable to obtain at least one co-integrating vector, r = 1 to establish the model. If one gets r = 2, then one could in principle assume that the system is stable in more than one dimension.

Table 2. Johansen co integration tests

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.856933	35.32067	15.49471	0
At most 1 *	0.718192	13.93182	3.841466	0.0002
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.856933	21.38886	14.2646	0.0032
At most 1 *	0.718192	13.93182	3.841466	0.0002
Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Note: Both trace & max eigen Test indicates 2 co integrating eq(s) at 0.05 level.

In conducting this test number of number of lag determination is very important therefore by selecting the Akaike information criterion and Schwartz criterion an optimal number of lag 2 is achieved & hence on performing the co integration test we get 2 co integration vector from both trace statistics and Eigen value statistics at 5 percent level.

Analysis of Granger Causality test

Causality is a kind of statistical feedback concept which is widely used in the building of forecasting models. Historically, Granger (1969) and Sim (1972) were the ones who formalized the application of causality in economics. Granger causality test is a technique for determining whether one time series is significant in forecasting another (Granger, 1969). The standard Granger causality test (Granger, 1988) seeks to determine whether past values of a variable helps to predict changes in another variable. The definition states that in the conditional distribution, lagged values of Yt add no information to explanation of movements of Xt beyond that provided by lagged values of Xt itself (Green, 2003). We should take note of the fact that the Granger causality technique measures the information given by one variable in explaining the latest value of another variable. In addition, it also says that variable Y is Granger caused by variable X if variable X assists in predicting the value of variable Y. If this is the case, it means that the lagged values of variable X are statistically significant in explaining variable Y. The null hypothesis (H0) that we test in this case is that the X variable does not Granger cause variable Y and variable Y does not Granger cause variable X. In summary, one variable (Xt) is said to granger cause another variable (Yt) if the lagged values of Xt can predict Yt and vice versa.

Following is the results of the granger causality test as indicated by table no.3 below

Null Hypothesis	Obs	F-	Prob.	Conclusion
GDP does not Granger Cause FDI	12	2.11114	0.1917	
FDI does not Granger Cause GDP		4.93414	0.046	FDI -GDP

The Granger causality test results shows that the causal unidirectional relationships exist only between FDI and GDP with the direction running direct from FDI to GDP which imply that FDI is can be used in forecasting GDP although in reality it is hard to find this evidence This finding collaborates with the findings of M. Dritsaki, C. Dritsaki and A. Adamopoulos (2004) and Samsu et al. (2008). However, this result contradicts with that was found by study by Syed Imran Ali Meerza (2012) for Bangladesh. All this study still support the FDI leads to growth in GDP for india as evidenced by the results.

Conclusion and Policy Recommendations

The study has been conducted using the annual data spanning from 2000 to 2014 for the sake of identifying the causality relation between FDI & GDP of India. We first started with the

test of stationarity of the three variables in question using augmented Dickey-Fuller (ADF) test and the results showed that the two variables which are FDI (Foreign Direct investment) and GDP (Gross Domestic Product) were not stationery at level but they became stationery after the first differences.
The co integration test found one co integration equation on both the max-Eigen and Trace statistics implying the existence of a long run association ship on the variables in question. While the granger causality test results showed that there is unidirectional causality was found from FDI to GDP, the results also implies that either FDI can be used to predict GDP.

The findings of this study may contribute to the existing literature especially for India and other developing countries on the factors in questions when it comes to policy making in the country. The research is also limited basing on the fact that the data for India is not so exhausted therefore interpretation should be done with care and further studies should focus on those limitation that might bring a more robust results for the case of India.

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