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Cointegration Approach Towards Causality Of Foreign Direct Investments And Gross Domestic Product In India

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Abstract

The link between foreign direct investments and the growth for India has been explored using a cointegration model with vector error correction model. The existence of four cointegrating vectors between FDI, GDP, price level, exchange rate and exports and imports over GDP have been deducted. These cointegrating vectors capture the long run and short run relationship between the aforementioned entities. The model Vector Error Correction Model (VECM) reveals that there exists a long run relationship between FDI inflows, exports and imports over GDP, the price level, and exchange rates. In the long run FDI inflows of India depend on the openness of India towards international trade, price index of goods in India and the value of its currency in the international market. Whereas, the short run FDI inflow changes according to the value of its currency, openness of India towards international trade and growth of India.

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Chapter 1: Introduction

There has been a lot of academic and empirical literature dealing with the relationship between foreign direct investment (FDI) and economic growth. Foreign direct investments are the investments made by a company or an entity based in a country into another company or an entity based in a different country. Open economies with skilled workforces such as India tend to attract larger amounts of foreign direct investments as compared to closed and highly regulated economies. In recent years, one of the most important factors for FDI inflows in developing countries has been the growth in privatization and globalization. FDI is playing a major role in the developing countries. FDI in India has been on the upswing since 1991. Starting from a baseline of less than USD 1 billion in 1990, a 2012 UNCTAD survey projected India as the second most important FDI destination (after China) for transnational corporations during 2010–2012 [Hannon, Paul et. al. (2012)]. As per the data, the sectors that attracted higher inflows were services, construction activities, telecommunication and computer hardware and software. Singapore, Mauritius, United States and the United Kingdom were among the prominent sources of FDI [Hannon, Paul et. al. (2012)]. Based on UNCTAD data, FDI flows were USD10.4 billion, a drop of 43 percent from the first two quarters of last year. Economic growth is measured as the percentage growth in gross national product (GNP) or gross domestic product (GDP) during one year [Hannon, Paul et. al. (2012)]. FDI inflows to India saw a substantial moderation in 2010-11 while other EMEs in Latin America and Asia received large inflows. This assumes importance as FDI is usually known to be the steadiest source of capital flows to finance the current account deficits. In addition, it adds to investible funds, assists in procuring profits, production expertise and promotes exports, provides access to advanced technologies. This had raised concerns in the wake of widening current intensive economic growth which requires economic development. This

project focuses on the relationship between FDI and economic growth in India. FDI is a kind of direct investment into production or business in a country by an individual or company of another country, either by buying a company in the target country or by expanding operations of an existing business in that country.

This thesis focuses on the relationship between FDI and growth in India. In this study, the cointegration approach was used to study the relationship between FDI and growth for India. The merit of using this approach is that it allows integration of the long run and short run relationship between variables within a specified framework. To understand the possible determinants of the long run and short run relationship between FDI and growth, the variables FDI and GDP, respectively, are taken into account for India. Other auxiliary variables included in the model are the exchange rate, the inflation rate (price level) and openness to trade (EXIM which means exports and imports taken together over GDP).The inclusion of the exchange rate as a variable is backed by the argument that the exchange rate could influence both the total amount of foreign direct investment and the allocation of the investment spending across a range of countries. The variable EXIM or openness to trade has a possible influence on the relationship between FDI and growth in the long run. The price level is important to perceive the relationship between FDI and inflation of a country.

Cointegration tests were run based on the framework of Johansen and Juselius (1990) using the reported data for FDI, GDP, PRICELEVEL, EXIM and EXCHANGERATE. The existence of a cointegration relationship between FDI and GDP for India raises the question of whether short run dynamics ensure the stability of such a long relationship. A parsimonious vector error correction model (VECM) that emanates from the cointegrating relationship is used for the purpose.

Chapter 2: Literature review

2.1 Review of Literature

The relation between FDI and economic growth was widely studied in both empirical and theoretical aspects. There are ongoing studies, especially, on the economic effects of FDI in developing countries like India. A consensus has not been developed yet regarding the results of analyses. A summary of some of the selected studies are provided below.

Carkovic and Levine (2002) examined the relation between FDI and economic growth in 72 countries within the time period of 1960-1995 by means of new statistical techniques and two new databases. The results were later verified by using the FDI data received from the IMF database. Their results showed that FDI does not solely influence economic growth.

In an alternative study, Ghosh and Berg (2006) considered the aspect of FDI inflow's contribution on the growth of the US economy over the period of 1970-2001. In order to define a two-way relation between FDI and economic growth, the time series data and simultaneous equation model were utilized. The results showed that FDIs have a positive and significant effect on the growth of the US economy.

Nair-Reichert et. al. (2001) tested the causality between FDI and economic growth in 24 developing countries within the period of 1971-1995 by means of fixed effects and random effects panel data estimation method. It was found through the study that the effect of FDI on economic growth varies across developing countries. Despite differences among countries, the results show that the effect of FDI on economic growth is higher in open economies.

De Mello (1997) in an comprehensive survey listed two main channels through which FDI could be enhancing the growth. Firstly, FDI could encourage the adoption of new technology in the production process through capital spillovers. Secondly, FDI may stimulate knowledge transfers, both in terms of labor training and skill acquisition, and by introducing alternative management practice. Both de Mello (1997) and OECD (2002) highlight one key insight from all the reviewed studies - the manner in which FDI affects growth is likely to depend on the economic and technological conditions in the host country. The countries have to reach a certain level of development in education and/or infrastructure before they are able to capture potential benefits associated with FDI. Hence, FDI seems to have more limited growth impact in countries with low technological advancement.

Choe (2003) used the traditional panel data causality testing method developed by Holtz Eakin et. al. (1988) in an analysis over 80 countries. The results points towards bi-directional causality between FDI and growth. The findings also indicate the causal impact of FDI on growth to be weak.

Basu et. al. (2003) emphasize on the question of the two way link between growth and FDI. They find a cointegrated relationship between FDI and growth using a panel of 23 countries. The study emphasizes trade openness as a crucial determinant for the impact of FDI on growth. The findings show a two-way causality between FDI and growth in open economies, both in the short run and the long run, whereas the long run causality is unidirectional from growth to FDI in relatively closed economies.

During 2003 to 2007, global FDI flows increased almost four-fold and flows to Emerging Market Economies in the same period grew by about three-fold. After reaching a peak of USD 2.1

trillion in 2007 [Reserve Bank of India (2012)], global FDI flows experienced significant moderation over the next two years and decreased to USD 1.1 trillion in 2009 [Reserve Bank of India (2012)], following the global financial crisis. On the other hand, FDI flows to developing countries increased from USD 565 billion in 2007 to USD 630 billion in 2008 before stabilizing to USD 478 billion in 2009 [Reserve Bank of India (2012)]. The decline in global FDI during 2009 was largely credited to restrained cross border merger and acquisition (M&A) activities and weaker return prospects for foreign affiliates, which detrimentally impacted equity funds as well as reinvested earnings. According to UNCTAD, the drop in M&A activities happened as the turmoil in stock markets obscured the price signals upon which M&A rely [Reserve Bank of India (2012)]. There was deterioration in the number of green field investments cases, predominantly those linked to business and financial services. From an institutional perspective, FDI by private equity funds dropped as their fund raising dropped on the back of investors risk aversion and the collapse of the leveraged buyout market in tune with the deterioration in credit market conditions. On the other hand, FDI from sovereign wealth funds (SWFs) increased by 15 percent in 2009 [Reserve Bank of India (2012)]. This was apparently due to the revised investment scheme of SWFs who have been moving away from banking and financial sector towards manufacturing and primary sector which are less vulnerable to financial market developments as well as focusing more on Asia.

As the world economic recovery continued to be uncertain and fragile, global FDI flows remained stagnant at USD 1.1 trillion in 2010 [Reserve Bank of India (2012)]. According to UNCTAD's global investments trend monitor (released on January 17, 2011), although global FDI flows at collective level remained stagnant, they showed an uneven pattern across regions while it contracted further in advanced economies by about 7 percent, FDI flows recovered by almost 10

percent in case of developing economies as a group driven by strong rebound in FDI flows in many countries of Asia and Latin America [Reserve Bank of India (2012)]. Recoil in FDI flows to developing countries has been supported by of improved corporate profitability and some improvement in M&A activities with enhanced valuations of assets in the stock markets and increased financial capability of potential buyers.

Improved macroeconomic conditions particularly in the emerging economies which boosted corporate profits coupled with better stock market valuations and rising business confidence augured well for global FDI prospects. According to UNCTAD, these favorable developments may help translate MNC's record level of cash holdings (estimated to be in the range of USD 4-5 trillion among firms in developed countries alone) into new investments during 2011 [Reserve Bank of India (2012)]. The share of developing countries, which now constitutes over 50 percent in total FDI inflows, may increase further on the back of strong growth prospects. However, currency volatility sovereign debt problems and potential protectionist policies may pose some risks to this positive outlook. Nonetheless, according to the Institute of International Finance (January 2011), net FDI flows to EMEs was projected to increase by over 11 percent in 2011 [Reserve Bank of India (2012)].

2.2 FDI Inflow Trends to India

With the tripling of the FDI flows to EMEs during the pre-crisis period of the 2000s, India also received large FDI inflows in line with its robust domestic economic performance. The attractiveness of India as a preferred investment destination could be ascertained from the large increase in FDI inflows to India which rose from around USD 6 billion in 2001-02 to almost USD 38 billion in 2008-09 [Reserve Bank of India (2012)]. The significant increase in FDI inflows to

India mirrored the impact of liberalization of the economy since the early 1990s as well as steady opening up of the capital account. As part of the capital account liberalization, FDI was gradually allowed in almost all sectors, excluding few on justification of strategic significance, subject to fulfillment of sector definite rules and regulations. The large and steady FDI flows also increasingly financed the current account deficit over the period. During the recent global crisis when there was a significant deceleration in global FDI flows during 2009-2010, the decline in FDI flows to India was relatively sensible reflecting robust equity flows on the back of strong rebound in domestic growth ahead of global healing and steady reinvested earnings (with a share of almost 25 percent) reflecting enhanced profitability of foreign companies in India [Reserve Bank of India (2012)]. However, when there had been some recovery in global FDI flows especially driven by flows to Asian EMEs during 2010-11 the gross FDI equity inflows to India witnessed significant moderation.

2.3 Pre-Liberalization Period

Historically, India had followed as extremely watchful and careful approach while making FDI policy in view of the domination of import substitution strategy of industrialization. With the objective of becoming self reliant, there was a dual nature of policy intention. FDI through foreign partnership was welcomed in the areas of high technology and high priorities to make national ability and dismayed in low technology areas to guard and look after domestic industries. The regulatory framework was consolidated through the enactment of foreign exchange regulation act (FERA) 1973 wherein foreign equity holding in a joint venture was allowed only up to 40 percent [Reserve Bank of India (2012)]. Afterward, a range of exemptions were extended to foreign companies occupied in export oriented businesses and high technology areas including allowing equity holdings of over 40 percent [Reserve Bank of India (2012)]. Furthermore, with achievement

of other country experiences in Asia, the Government not only recognized special economic zones (SEZs) but also planned liberal policy and provided incentives for endorsing FDI in these zones with a sight to encourage exports. As India continued to be highly protective, these actions did not add substantially to export competitiveness. Recognizing these limitations, partial liberalization in the trade and investment policy was brought in the 1980s with the objective of improving modernization, export competitiveness and marketing of exports all the way through transnational corporations (TNCs). The announcements of Industrial Policy (1980 and 1982) and technology policy (1983) provided for a liberal approach towards foreign investment in terms of changes in policy directions [Reserve Bank of India (2012)]. The policy was characterized by promotion of Indian manufacturing exports and de-licensing of some of the industrial rules as well as emphasizing on modernization of industries through liberalized imports of capital goods and technology. This was supported by trade liberalization measures in the form of tariff reduction and shifting of large number of items from import licensing to open general licensing (OGL).

2.4 Post-Liberalization Period

A key shift occurred when India embarked upon economic reforms program and liberalization in 1991 aspiring to lift its growth potential and incorporate with the world economy. Industrial policy reforms progressively removed restrictions on investment projects and business expansion on the one side and permitted improved access to funding and foreign technology on the other side. FDI under the mechanical course does not involve any prior approval by any of the two: the government or the Reserve bank. The investors are required to inform the apprehensive regional office of the RBI within 30 days of receipt of innermost remittances and file the necessary credentials with that office within 30 days of issuance of shares to foreign investors.

Table 2.1: Investors (Country) Composition of FDI in India (2001-2002)

Country	FDI inflow in USD_Million	FDI inflow Percent
Mauritius	1863	62.3
Other	445	14.9
United States	364	12.2
Japan	143	4.8
Germany	74	2.5
Netherlands	68	2.3
Italy	28	0.9
South Korea	3	0.1
Total	2988	100

Table 2.1 [Wei, Wenhui (2005)] shows that Mauritius has been the dominant source of FDI inflows in India. In 2001-2002, Mauritius alone constituted 60 percent of the total FDI in India. Investments into India are largely through Mauritius because they are affected through Mauritius Offshore companies (MOCs) which are special reason vehicles best suited to foreign investors that wish to utilize Mauritius as an investment platform benefiting from its network of double Taxation Treaties [Wei, Wenhui (2005)].

The next biggest investor for 2001-2002 was the United States of America with 12.2 percent of total inflow followed by Japan, Germany, Netherlands, Italy and South Korea 4.8 percent, 2.5 percent, 2.3 percent, 0.9 percent and 0.1 percent, respectively, of FDI inflow in India. Other countries of the world constitute 14.9 percent of the total FDI inflow in India.

Chapter 3: Data and Methodology

3.1 Data

This thesis examines the FDI inflows for the Indian economy over the period 1975 to 2010. Annual data for 36 years have been utilized for estimating the model. As mentioned earlier, the relevant variables for the study include the following FDI, GDP, EXCHANGERATE, PRICELEVEL and EXIM. The source of FDI, EXIM, EXCHANGERATE, and GDP data is World Development Indicators & Global Development Finance published by World Bank in 2012. The data for variable PRICELEVEL has been extracted from source Data Market Inc.

The collected data for FDI is net inflows in the Indian economy. FDI is the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments [World Development Indicators (2014)].

The collected data for GDP is the data representing Gross Domestic Product for India. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current U.S. dollars. Dollar figures for GDP are converted from domestic currencies using single year official exchange rates. For a few countries where the official exchange rate does not reflect the rate effectively applied to actual foreign exchange transactions, an alternative conversion factor is used [World Development Indicators (2014)].

The data for EXIM has been generated by exports of goods and services (percentage of GDP) and imports of goods and services (percentage of GDP) adding them and changing them to absolute value wherein exports of goods and services (percentage of GDP) includes exports of goods and services represent the value of all goods and other market services provided to the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude compensation of employees and investment income (formerly called factor services) and transfer payments. Imports of goods and services (percentage of GDP) include imports of goods and services represent the value of all goods and other market services received from the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude compensation of employees and investment income (formerly called factor services) and transfer payments [World Development Indicators, 2014].

The data for the exchange rate is the data representing the official exchange rate (LCU per USD, period average). Official exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is calculated as an annual average based on monthly averages (local currency units relative to the USD) [World Development Indicators (2014)].

The data for price level represents the price level of exports for India (Units: Price Level of USA Output-side GDP in 2005=1).The average of current prices across the entire spectrum of goods and services produced in the economy. In a more general sense, the price level refers to any

static picture of the price of a given good, service or tradable security. Price levels may be given in small ranges, such as with securities prices or presented as a discrete value.

As prices rise (inflation), or fall (deflation), consumer demand for goods is also affected, which leads broad production measures like gross domestic product (GDP) higher or lower.

3.2 Methodology

3.2.1 Unit Root Test

From the data set of 36 years to check the stationarity of variables I perform unit root tests. The method of unit test root used is augmented Dickey fuller test [Dickey Fuller Unit Root Test]. The data had an upward trend and average value is not zero. Therefore, we select intercept and trend in test equation which is given by equation 3.1.

$$\Delta Y_t = \alpha + \beta t + \delta Y_{t-1} + u_t$$

Equation 3.1

I perform the test for level and first difference for all the variables: GDP, FDI, EXCHANGERATE, PRICE LEVEL and EXIM. For level in GDP the coefficient is positive. Therefore, I generate a new series of first difference in GDP and name it as DGDP. This is done to make all the variables in same order that their level is non stationary and their first difference is stationary. In this test, the lag length is set to automatic selection with Schwarz info criterion and maximum lags of nine.

3.2.2 Cointegration Test

Cointegration is a statistical property of time series variables. Time series are co integrated if they share a common change in the average value of a random process. As cointegration can find relation between random processes therefore, it solved the existing problem of finding statistical inference of non stationary process. As we can find statistical inference of non stationary time series easily with cointegration method. There are different methods of testing cointegration test; Durbin-Watson statistic, which can be used as a quick test of cointegration But this test suffers from two major problems, it is extremely sensitive being a true random walk and the critical values of the test statistic are not consistent therefore, practical use of this test is extremely limited. Engle and Granger's (1987) two-step procedure this test has the advantage that it is intuitive, easy to perform.

The method used for this was the Johnson cointegration test. Johansen test is a procedure for testing cointegration of time series (Cite, year [Johansen et.al.1990]). The test enables more than one cointegrating relationship so is more generally applicable than the Engle-Granger test which is based on the Dickey-Fuller test for the unit roots in the residuals from a single (estimated) cointegrating relationship. Johansen cointegration test is the most effective method in cointegration.

$$A(L)_{yt} = B(L)_{xt} + u_t,$$

Equation 3.2

The model is in levels, but can easily be rewritten as an error correction model. $A(1)-1B(1)$ represents the long-run steady state solution of the model, and is therefore, the error correction

mechanism. To have cointegration the polynomial A(L) should not contain any unit root. Otherwise the model will not converge to a long-run steady state solution.

After determining stationarity of unit root test the next step is to test the cointegration of the variables to show long run association. For this test the five variables considered are DGDP, FDI, EXCHANGERATE, EXIM and PRICELEVEL. GDP was not considered as we considered only those variables which were non stationary at level and stationary at first difference. In this test for co integration test specification intercept and trend in CE-no intercept in VAR was selected with lag intervals as 1 to 1 because it's an annual data: with critical values as MHM and size 0.05.

3.2.3 Vector Error Correction Model

After it was determined that the variables are cointegrated and the number of cointegrating equations are determined I perform the vector error correction model. A long run relationship can be determined by the cointegration vector, and then this relationship can be utilized to form a refined dynamic model which can have a focus on long run such as the two VECM of a usual VAR in Johansen test. A VECM adds error correction features to a multi-factor model such as a vector auto regression model. The general VECM with deterministic trend is shown in equation 3.2.

$$\Delta Y_t = \varphi + \Pi Y_{t-1} + \alpha t + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t$$

Equation 3.3

For this test the five variables excluding GDP are considered DGDP, FDI, EXCHANGERATE, EXIM and PRICELEVEL. For this estimation VAR is selected. In VAR type vector error correction was selected with endogenous variables as DGDP, FDI

EXCHANGERATE, EXIM and PRICELEVEL and lag interval as 1 to 2. In VAR specification cointegration under the number of cointegrating equations were set to 4. A deterministic trend specification is set to Intercept and trend in CE with no trend in VAR. To generate the model I select the make system order by variable under proc (which is a menu item in Eviews 8). I estimated the system by estimation method ordinary least squares.

To predict long run and short run causality taking FDI as dependent variable and PRICELEVEL, EXCHANGERATE, EXIM and DGDP as independent variable. I estimate the model equation obtained from VECM using least square method. In the equation I choose cointegrating equations and use their coefficient to predict long run causality. Then I choose single coefficients and run a Wald test to predict short run causality. In Wald test I choose probability of Chi-square test statistics. The null hypothesis is that there is no short run causality.

Chapter 4: Empirical Results

4.1 Unit root tests

A Unit root test for stationarity is performed on both levels and first differences for all the five variables in the model. Results are given in Table 4.1.

Table 4.1: Unit root tests results

Variable Name	P value		t -statistics		test critical value at 5% level	
	Level	First difference	Level	First difference	Level	First difference
DGDP	0.9182	0.0000	1.072663	8.925649	3.557759	3.557759
FDI	0.6088	0.0000	1.943294	6.441074	3.557759	3.562882
EXCHANGERATE	0.8780	0.0072	1.273943	4.386204	3.544284	3.54849
PRICELEVEL	0.9879	0.0344	0.288881	3.721109	3.544284	3.54849
EXIM	0.5916	0.0000	1.977576	8.504408	3.552973	3.54849

The null hypothesis (H_0) considered is that the variable has a Unit Root and is not stationary and alternative hypothesis (H_1) considered that variable has no Unit Root and is stationary. To infer the results t-statistics the absolute test statistics is more than absolute critical value at 5 percent then I can reject null hypothesis and accept alternative hypothesis and vice versa. If the P-value is more than 5 percent or 0.05 then I can reject the null hypothesis and accept alternative hypothesis and vice versa. For all the variables level is not stationary and has unit root as for all of them t-statistics is less then test critical value at 5 percent level and P-value is more than 0.05 or 5 percent. The first difference of all the variables are stationary and has no unit root test. As for all

of them t statistics is more than test critical value at 5 percent level and P value is less than 0.05 or 5 percent.

4.2 Cointegration

Table 4.2: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Probability
None *	0.853073	164.0253	88.80380	0.0000
At most 1 *	0.722754	100.7373	63.87610	0.0000
At most 2 *	0.626019	58.40320	42.91525	0.0007
At most 3 *	0.388989	25.94603	25.87211	0.0490
At most 4	0.254428	9.688919	12.51798	0.1420

Table 4.3: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Probability
None *	0.853073	63.28800	38.33101	0.0000
At most 1 *	0.722754	42.33410	32.11832	0.0020
At most 2 *	0.626019	32.45717	25.82321	0.0057
At most 3	0.388989	16.25711	19.38704	0.1346
At most 4	0.254428	9.688919	12.51798	0.1420

The cointegration rank test in Table 4.2 and Table 4.3 shows long term association between all the variables. To infer the results if the trace statistics value is less than 5 percent critical level value then that hypothesized number of cointegrating equations are accepted. In this case I choose the number of cointegrating equations to be at most 4. Because the trace statistics value is less than 5 percent critical value for both cases trace and maximum eigenvalue. As the number of

cointegrating equations is more than zero therefore there is cointegration or long term association between all the variables.

4.3 Vector Error Correction Model

After running VECM, two models are selected. In the Model 1 the dependent variable is FDI considering EXIM, PRICELEVEL, EXCHANGERATE, and DGDP as independent variables. In the Model 2 DGDP is considered as a dependent variable and EXIM, PRICELEVEL, EXCHANGERATE and FDI as independent variables.

From Model 1 it shows that coefficient C(1), C(2), C(3), and C(4) are cointegrating equations where FDI is dependent variable. C(1), C(2), C(3), and C(4) are speed of adjustment towards long run equilibrium but it has to be significant and the sign must be negative.

4.3.1 Model 1:

$$D(FDI) = \sum Coefficient * Independent\ Variables$$

Equation 4.1

Model 1 in which dependent variable is first difference of FDI is given by equation 4.1 using coefficients and independent variables from Table 4.4.

Table 4.4: Model 1 with dependent variable as D(FDI)

Coefficient	Independent Variables
C(1)	FDI(-1) - 256475932391*EXIM(-1) + 1252000018.01*@TREND(75) + 29781445714.8
C(2)	DGDP(-1) - 1.20461563419e+12*EXIM(-1) + 4420674803.94*@TREND(75) + 155119419284
C(3)	PRICELEVEL(-1) - 2.60144823397*EXIM(-1) + 0.00297056142944*@TREND(75) - 0.0243099686559
C(4)	EXCHANGERATE(-1) + 602.739222134*EXIM(-1) - 5.03261994692*@TREND(75) - 70.1999983232
C(5)	D(FDI(-1))
C(6)	D(FDI(-2))
C(7)	D(DGDP(-1))
C(8)	D(DGDP(-2))
C(9)	D(PRICELEVEL(-1))
C(10)	D(PRICELEVEL(-2))
C(11)	D(EXCHANGERATE(-1))
C(12)	D(EXCHANGERATE(-2))
C(13)	D(EXIM(-1))
C(14)	D(EXIM(-2))
C(15)	1

4.3.2 Model 2:

Table 4.5: Model 2 with dependent variable as D(DGDP)

Coefficient	Independent Variables
C(1)	DGDP(-1) - 463055777338*PRICELEVEL(-1) + 3045139172.1*@TREND(75) + 166376290717
C(2)	FDI(-1) - 98589673644.8*PRICELEVEL(-1) + 959133336.136*@TREND(75) + 32178157590.9
C(3)	EXIM(-1) - 0.384401268087*PRICELEVEL(-1) - 0.00114188758041*@TREND(75) + 0.00934478277847
C(4)	EXCHANGERATE(-1) + 231.693721314*PRICELEVEL(-1) - 4.34435951494*@TREND(75) - 75.8324654261
C(5)	D(DGDP(-1))
C(6)	D(DGDP(-2))
C(7)	D(FDI(-1))
C(8)	D(FDI(-2))
C(9)	D(EXIM(-1))
C(10)	D(EXIM(-2))
C(11)	D(EXCHANGERATE(-1))
C(12)	D(EXCHANGERATE(-2))
C(13)	D(PRICELEVEL(-1))
C(14)	D(PRICELEVEL(-2))
C(15)	1

$$D(DGDP) = \sum Coefficient * Independent\ Variables$$

Equation 4.2

Equation 4.2 gives Model 2 in which coefficients and independent variables are given in Table 4.5 and dependent variable is second difference of GDP.

Below Table 4.6 has been generated by running VECM as mentioned in methodology. In this I consider the two models shown above. Model 1 is ΔFDI equation and Model 2 is Δ DGDP equation. ΔFDI equation and ΔDGDP equation are dependent variables considering others as independent variables. In independent variables we consider one to two lags. Subscript t-1 represents lag 1 and subscript t-2 represents lag 2.

Table 4.6: Vector Error Correction Model Result

Independent Variables	**ΔFDI equation**		**ΔDGDP equation**	
	Coefficient	**T- statistics**	**Coefficient**	**T- statistics**
ΔFDI_{t-1}	0.763916	5.88485	0.158837	0.03521
ΔFDI_{t-2}	1.599383	6.73104	-17.08908	-2.06925
$\Delta DGDP_{t-1}$	-0.103178	-3.00599	0.848016	0.71083
$\Delta DGDP_{t-2}$	-0.000579	-0.03056	-0.573134	-0.86994
$\Delta PRICELEVEL_{t-1}$	-7.63E+09	-0.38402	1.12E+12	1.61969
$\Delta PRICELEVEL_{t-2}$	2.28E+10	1.24838	5.56E+10	0.08781
$\Delta EXCHANGERATE_{t-1}$	4.97E+08	1.25372	1.75E+10	1.26892
$\Delta EXCHANGERATE_{t-2}$	1.35E+09	3.47626	-1.57E+10	-1.16764
$\Delta EXIM_{t-1}$	1.37E+10	0.41163	-1.00E+12	0.8677
$\Delta EXIM_{t-2}$	6.51E+10	2.34952	-8.23E+11	-0.85472

Long run causality is when probability is less than 0.05 or 5 percent and coefficient is negative. In Table 4.7 it can be seen that EXIM, PRICELEVEL and EXCHANGERATE have probability less than 0.05 or 5 percent and there coefficients are negative. Hence, long run causality can be seen in EXIM, PRICELEVEL and EXCHANGERATE. Meaning that there is long run

causality from the three variables EXIM, PRICELEVEL and EXCHANGERATE. Table 4.7 shows that these three variables have influence on the dependent variables FDI in the long run. In short there is long run causality running from export and import over GDP, price level and exchange rate to FDI.

Table 4.7: Long run and Short run causality for ΔFDI Equation

Variables	**Long Run Causality for ΔFDI Equation**		**Short Run Causality for ΔFDI Equation**
	Coefficient	**Probability**	**Chi-Square Probability**
EXIM	-1.2431	0.0000	0.0341
DGDP	0.145898	0.0022	0.0000
PRICELEVEL	-4.36E+10	0.0087	0.4056
EXCHANGERATE	-3.88E+08	0.0001	0.0087

Short run causality is in EXIM, DGDP and EXCHANGERATE. In Wald statistics we assume the null hypothesis to be C(7)=C(8)=0 meaning that there is short run casualty running from DGDP to FDI. Similarly we assume null hypothesis to be C(9)=C(10)=0, C(11)=C(12)=0 and C(13)=C(14)=0 meaning that there is short run causality running from PRICELEVEL, EXCHANGERATE and EXIM respectively to FDI. Then I run a Wald statistics test and reject the null hypothesis if Chi-square probability value is less than 0.05 or 5 percent. Hence we find that variables EXIM, DGDP and EXCHANGERATE have running short run causality to FDI. This implies that there is short run influence from these variables to FDI.

From Model 1 it has been found out that there is a long run causality running from EXIM, PRICELEVEL and EXCHANGERATE to FDI and EXIM, DGDP and EXCHANGERATE have

running short run causality to FDI. This shows that in the long run exports and imports, the price level and exchange rates can be used to predict foreign development investment of India one period ahead. Similarly, it is found that exports and imports when considered together, Gross Domestic Product and exchange rate have short run predictability of foreign development investment in India one period ahead [Dufour, Jean-Marie et. al. (1998)]. This means that FDI_{t+1} can be predicted from FDI_t using exports and imports, price level and exchange rate in long run while in short run this can be done using Gross domestic product, exchange rate and exports and imports considered together.

Table 4.8: Long run and Short run causality for ΔDGDP Equation

Variables	**Long Run Causality for ΔDGDP Equation**		**Short Run Causality for ΔDGDP Equation**
	Coefficient	**Probability**	**Chi-Square Probability**
EXIM	1.33E+12	0.1296	0.6226
FDI	1.445342	0.8359	0.0734
PRICELEVEL	-1.899021	0.1949	0.269
EXCHANGERATE	-1.79E+09	0.5285	0.037

From the Table 4.8 Long run causality has not been found in any of the variables. This suggests that there is no long run causality from any of the variables. This shows that these three variables cannot have any influence on the dependent variables.

Short run causality is only observed with exchange rate. So in Wald statistics it will be assumed that null hypothesis to be C(7)=C(8)=0 meaning that there is short run casualty running from FDI to DGDP. Likewise, it is assume the null hypothesis to be C(9)=C(10)=0,

C(11)=C(12)=0 and C(13)=C(14)=0 meaning that there is short run causality running from EXIM, EXCHANGERATE and PRICELEVEL respectively to DGDP. After running Wald statistics test and rejecting the null hypothesis, the Chi-square probability value is less than 0.05 or 5 percent. Therefore, I find that variable EXCHANGERATE have short run causality to DGDP. This implies that there is short run influence only from EXCHANGERATE to DGDP.

Model 2 shows that there is no long run causality with any variables with DGDP but there is short run causality running from EXCHANGERATE to DGDP. This shows that in long run, none of the variables have any effect on the Gross domestic product of India. In the short run exchange rates can be used to predict Gross Domestic Product of India one period ahead of time [Dufour, Jean-Marie et. al. (1998)]. Hence, GDP_t can be predicted from GDP_{t-1} using exchange rates in short run.

Chapter 5: Conclusion

In this thesis, the link between FDI inflow, GDP, exchange rate, exports and imports considered together and price level for India is found by utilizing the technique of unit root test followed by cointegration and error correction modeling.

The econometric analysis of the net FDI inflow model for India shows that there exists a long run relationship between FDI inflow, export and import over GDP, price level and exchange rate. However, in the short run, FDI inflow largely depends on first difference of GDP, export and import over GDP and Exchange Rate. Thus it means that in long run FDI inflow of India depends on openness of India towards international trade, price index of goods in India and value of its currency in international market. Whereas in the short run, FDI inflow changes according to the value of its currency, openness of India towards international trade and growth of India when considered with lag of one year.

However, when considering the model for first difference of GDP of India it does not show any long run relationship to the variables considered in the study. But in short run it only changes according to exchange rate of India. Growth of India when considered with lag of one year depends only on valuation of its currency in short run. While in long run it is not affected by any variables considered in the study.

Thus it can be said that to some extent the results support the conclusion of some authors like Carkovic, M. V., & Levine, R. (2002) which concluded that FDI has no impact on long run growth.

Theoretically, neither of the links can be ruled out and this is probably the reason why the causality issue has been the topic of so many recent studies Hansen, Henrik, and John Rand (2006).

In 1991, which is almost in the middle of the dataset (1975-2010) used liberalization policy was introduced by India. Hence, there is high variation after 1991 and minor variations before that in GDP and FDI inflow in India. Therefore, it can be concluded from the results that there is short run association rather than long run association. India might need more years to witness the actual relationship between FDI and GDP. As de Mello (1997) and OECD (2002) concluded developing countries need to reach at certain level of development in education and infrastructure to capture potential benefits associated with FDI.

References

[Basu, Parantap, Chakraborty, Chandana and Reagle, Derrick. "Liberalization, FDI, and growth in developing countries: a panel cointegration approach."*Economic Inquiry* 41.3 (2003): 510-516.]

[Borensztein, Eduardo, Gregorio, Jose De and Lee, Jong-Wha. "How does foreign direct investment affect economic growth?." *Journal of international Economics* 45, no. 1 (1998): 115-135.]

[Carkovic, Maria V. and Levine, Ross. "Does foreign direct investment accelerate economic growth?." *U of Minnesota Department of Finance* Working Paper (2002).]

[Chakraborty, Chandana, and Parantap Basu. "Foreign direct investment and growth in India: a cointegration approach." *Applied economics* 34, no. 9 (2002): 1061-1073.]

[Chakraborty, Chandana, and Nunnenkamp, Peter. "Economic reforms, FDI, and economic growth in India: a sector level analysis." *World development* 36, no. 7 (2008): 1192-1212.]

[Chaturvedi, Ila. "Role of FDI in economic development of India: Sectoral analysis." In International Conference on Technology and Business Management, pp. 528-533. 2011.]

[Choe, Jong Il. "Do foreign direct investment and gross domestic investment promote economic growth?." *Review of Development Economics* 7.1 (2003): 44-57.]

[de Mello Jr, Luiz R. "Foreign direct investment in developing countries and growth: A selective survey." The Journal of Development Studies 34.1 (1997): 1-34.]

[Dickey Fuller Unit Root Test, World Wide Web: http://staffweb.hkbu.edu.hk/billhung/econ3600/application/app01/app01.html]

[Dufour, Jean-Marie, and Renault, Eric. "Short run and long run causality in time series: theory." *Econometrica* (1998): 1099-1125.]

[Engle, Robert F., and Granger, C. W. "Co-integration and error correction: representation, estimation, and testing." Econometrica: journal of the Econometric Society (1987): 251-276.]

[Ghosh Roy, Atrayee, and Van den Berg, Hendrik F. "Foreign direct investment and economic growth: a time-series approach." *Global Economy Journal* 6.1 (2006).]

[Goldberg, Linda S. "Exchange Rates and Foreign Direct Investment." *The Princeton Encyclopedia of the World Economy* 1 (2009): 393-396.]

[Hannon, Paul and Reddy, Sudeep. "China Edges Out U.S. as Top Foreign-Investment Draw Amid World Decline." *Wall Street Journal,* 2012-10-23.]

[Holtz-Eakin, Douglas, and Schwartz, Amy Ellen. "Infrastructure in a structural model of economic growth." Regional Science and Urban Economics 25.2 (1995): 131-151.]

[Johansen, Søren and Juselius, Katarina. "Maximum likelihood estimation and inference on cointegration—with applications to the demand for money." *Oxford Bulletin of Economics and statistics* 52.2 (1990): 169-210.]

[Nair-Reichert, Usha, and Weinhold, Diana. "Causality Tests for Cross-Country Panels: a New Look at FDI and Economic Growth in Developing Countries." *Oxford bulletin of economics and statistics* 63.2 (2001): 153-171.]

[OECD. "Foreign direct investment for development: Maximising benefits, minimizing costs", OECD publishing, Paris, 2002.]

[Reserve Bank of India, "Foreign Direct Investment Flows to India.", World Wide Web: http://rbidocs.rbi.org.in/rdocs/Content/PDFs/FDIST_110412.pdf , 2012]

[Sharma, Reetu. "Role of Foreign Direct Investment (FDI) in Different Sectors." *International Journal of Advances in Management and Economics*. ISSN: 2278-3369]

[Singh, Jasbir, Chadha, Ms Sumita and Sharma, Anupama. "Role of Foreign Direct Investment in India: An Analytical Study." World Wide Web: http://researchinventy.com/papers/v1i5/E015034042.pdf]

[Wei, Wenhui. "China and India: Any difference in their FDI performances?."*Journal of Asian Economics* 16.4 (2005): 719-736.]

[World Bank data, World Wide Web: http://data.worldbank.org/country/india, 2014]

[World Development Indicators, World Wide Web: http://data.worldbank.org/data-catalog/world-development-indicators, 2014]

[Yao, Shujie. "On economic growth, FDI and exports in China." *Applied Economics* 38.3 (2006): 339-351.]

Appendix

Table: Dataset

Indicator Name / Year	GDP (current USD)	Foreign direct investment, net inflows (USD)	Official exchange rate (LCU per US$, period average)	Export and Imports of goods and services/ GDP	Price Level of Exports for India (USD)
1975	1.002E+11	-10326246.71	8.375891946	0.120820953	0.293604076
1976	1.04518E+11	-7706430.543	8.960412728	0.125805783	0.292709827
1977	1.23618E+11	-36060000	8.738576171	0.12430115	0.339784116
1978	1.39709E+11	18090000	8.192840348	0.126806324	0.369117945
1979	1.55674E+11	48570000	8.125790946	0.146616836	0.377115875
1980	1.89594E+11	79160000	7.862944701	0.151194284	0.386892498
1981	1.96883E+11	91920000	8.658522817	0.142572366	0.414384812
1982	2.04234E+11	72080000	9.455131933	0.138824718	0.411235929
1983	2.2209E+11	5640000	10.09889824	0.134546407	0.443812847
1984	2.15878E+11	19240000	11.36258333	0.137679287	0.438875586
1985	2.36589E+11	106090000	12.36875	0.126777081	0.438143194
1986	2.53352E+11	117730000	12.61083333	0.120086765	0.47159344
1987	2.83927E+11	212320000	12.9615	0.123679187	0.515098572
1988	3.01791E+11	91250000	13.91708333	0.132579464	0.560285568
1989	3.01234E+11	252100000	16.2255	0.14906714	0.573020995

1990	3.26608E+11	236690000	17.5035	0.152390159	0.595380127
1991	2.74842E+11	73537638.39	22.74243333	0.166949484	0.597300947
1992	2.93262E+11	276512439	25.91808333	0.181154103	0.560554147
1993	2.84194E+11	550370024.9	30.49329167	0.193128516	0.566284716
1994	3.33014E+11	973271468.7	31.3737425	0.197321038	0.57201761
1995	3.666E+11	2143628110	32.42707667	0.224733353	0.624924541
1996	3.99787E+11	2426057022	35.43317333	0.215515399	0.647450209
1997	4.2316E+11	3577330042	36.31328583	0.222295487	0.624224782
1998	4.28741E+11	2634651658	41.259365	0.232910171	0.591489017
1999	4.64344E+11	2168591054	43.05542833	0.245204032	0.584224045
2000	4.74692E+11	3584217307	44.941605	0.265440875	0.56452775
2001	4.92379E+11	5471947158	47.18641417	0.256270213	0.553064346
2002	5.22798E+11	5626039508	48.61031917	0.29064997	0.566164911
2003	6.17573E+11	4322747673	46.58328417	0.301033469	0.629852116
2004	7.21585E+11	5771297153	45.31646667	0.368574635	0.682301879
2005	8.34217E+11	7606425242	44.099975	0.413051878	0.695552945
2006	9.49117E+11	20335947448	45.30700833	0.452977922	0.722351551
2007	1.2387E+12	25482651962	41.34853333	0.448761903	0.79758966
2008	1.2241E+12	43406277076	43.50518333	0.522694861	0.854677618
2009	1.36106E+12	35595861689	48.40526667	0.456374378	0.843990684
2010	1.68432E+12	24159180720	45.72581212	0.496928128	0.96548754

Curriculum Vita

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