Error Correction Mechanism and Determinants of Foreign Direct Investment in Pakistan

By

Adil Mahmood

Supervised by

Dr. Zahid Iqbal

Department of Mathematics & Statistics
Faculty of Basic and Applied Sciences
International Islamic University, Islamabad
Pakistan

2015

MS
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! Error Correction Mechanism—


بسم الله الرحمن الرحيم

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By

Adil Mahmood

A Dissertation
Submitted in the Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
IN
STATISTICS

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Certificate

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We accept this dissertation as conforming to the required standard.

1. _____
Dr. Muhammad Yousaf Shad
(External Examiner)

2. _____
Dr. Ishfaq Ahmad
(Internal Examiner)

3. _____
Dr. Zahid Iqbal
(Supervisor)

4. _____ 3/11/15
Dr. Rahmat Ellahi
(Chairman)

Department of Mathematics & Statistics
Faculty of Basic and Applied Sciences
International Islamic University, Islamabad
Pakistan
2015

DEDICATION

To my mother Yasmeen kusar and father Shoukat Ellahi whose debt is great in the form of inspiration, support and cooperation.

Forwarding Sheet by Research Supervisor

The thesis entitled **"Error Correction Mechanism and Determinants of Foreign Direct Investment in Pakistan"** submitted by **Adil Mahmood** (Registration # 06-FBAS/MSST/F12) in partial fulfillment of M.S degree in Statistics has been completed under my guidance and supervision. I am satisfied with the quality of his research work and allow him to submit this thesis for further process to graduate with Master of Science degree from Department of Mathematics and Statistics, as per IIU Islamabad rules and regulations.

Dr. Zahid Iqbal,

Assistant Professor

Department of Mathematics & Statistics

International Islamic University, Islamabad.

Date:_____

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Sovereignty is due to almighty ALLAH and none else. The Creator, the Invincible, the Universal, most Merciful, the most Beneficent and the Ultimate autonomous, whose blessing and adulation prospered my thoughts and enlightened me to conquer knowledge. Special admiration to the teachings of Holy Prophet Hazrat Muhammad (SAW) due to which I am able to understand veracities of the life and enabled me to contribute sincerely to the sacred wealth of knowledge.

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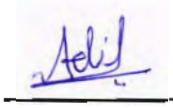
ADIL MAHMOOD

DECLARATION

I hereby declare that this thesis, neither as a whole nor a part of it, has been copied out from any source. It is further declared that I have prepared this dissertation entirely on the basis of my personal efforts made under the supervision of my supervisor **Dr. Zahid Iqbal.** No portion of the work, presented in this dissertation, has been submitted in the support of any application for any degree or qualification of this or any other learning institute.

Signature: 

Adil Mahmood
MS (Statistics)
Reg. No. 06-FBAS/MSST/F-12
Department of Mathematics and Statistics,
Faculty of Basic and Applied Sciences,
International Islamic University Islamabad, Pakistan.

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LIST OF ABBREVIATIONS

GDP	Gross Domestic Product.
FDI	Foreign Direct Investment
INF	Inflation
EX	Exchange Rate
TROP	Trade openness
IR	Interest Rate
GFCF	Gross Fixed Capital Formation
IFS	International Financial Statistics
WDI	World Develop Indicators
UNCTAD	United Nations Conference on Trade and Development
ADF	Augmented Dickey-Fuller
OLS	Ordinary Least Square
VAR	Vector Auto Regressive
SBC	Schwarz Bayesian Criterion
AIC	Akaike Information Criterion
MNC's	Multi-National Companies
ECM	Error Correction Mechanism
PP	Philips Perron
JB	Jarque Bera
ARDL	Auto Regressive Distributed Lag
BPG	Breusch-Pagan-Godfrey
CUSUM	Cumulative Sum
BG	Breusch-Godfrey
BPG	Breusch-Pagan-Godfrey

LM	Lagrange Multiplier
RWM	Random Walk Model
J.J	Johansen and juselius
CEC	Conditional Error Correction

ABSTRACT

The objective of this study is to empirically investigate the determinants of Foreign Direct Investment (FDI) inflow in Pakistan for the duration of 1961-2013. The FDI is taken as dependent variable whereas Gross Domestic Product (GDP), Exchange Rate (EX), Inflation (INF), Interest Rate (IR) and Trade Openness (TROP) are used as independent variables. The Augmented Dickey Fuller (ADF) unit root analysis concludes that the variables lnFDI, lnINF and lnEX are stationary at level with trend. While the other variables lnGDP, lnIR and TROP are stationary at their first difference, and none of the variable is integrated of order two. So we use Auto Regressive Distributed Lag (ARDL) Bounds test for the long run association among the variables. The study recommends that ARDL (102222) Error Correction Mechanism (ECM) model is more appropriate than ARDL (101000) ECM model on the basis maximum R-square (0.72) and minimum value of Akaike Information Criterion (AIC) (2.33), Schwarz Information Criterion (SIC) (2.75) and Hannan Quinn (HQ) (2.49) Criterion. The Breusch Godfrey (BG) serial correlation test describes that there is no problem of serial correlation as Probability Value (P-value 0.10) greater than 5% level of significance. The Breusch-Pagan- Godfrey (BPG) test concludes that there is no problem of heteroscedasticity as P-value (0.06) greater than the level of 5% significance. Moreover, the Jarque Bera (JB) test satisfies all the conditions of normality. From the ARDL (102222) long run estimates we concludes that lnGDP, lnEX, lnIR and TROP are positive and have a significant impact on lnFDI, while lnINF have a negative influence on the lnFDI. From the ARDL (102222) ECM model estimates, we determine that TROP, lnINF, and lnEX with one period lag have a negative effect on the lnFDI in short run. While lnGDP and lnIR have a positive influence on the FDI.

Keywords: ECM, FDI, Pakistan, Unit Root, Co-Integration

CHAPTER 1

INTRODUCTION

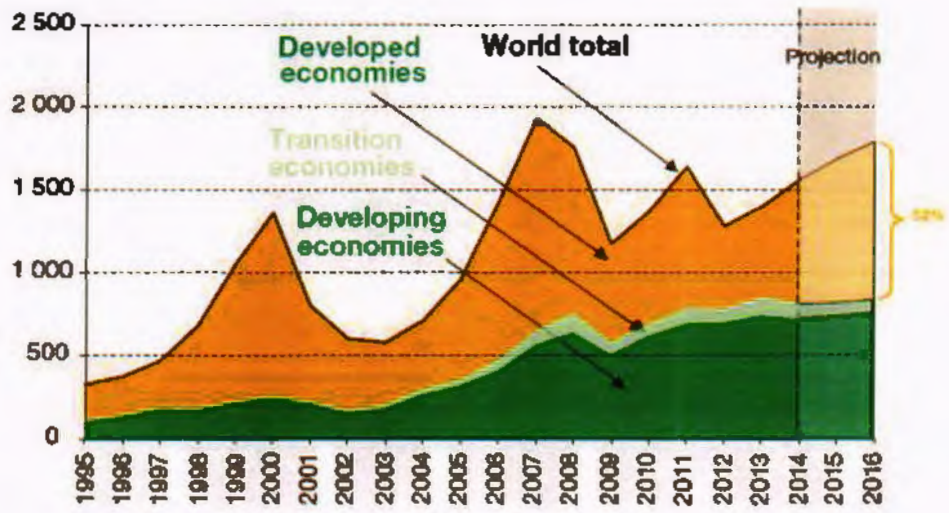
The FDI is the investment in the business or the production activity in a country by a company or an individual of outside of the country. FDI is exceptionally useful for the economic growth and the modernization of invested country. FDI is very essential element for world business in the light of fact that it is actually a fundamental source from which the economies of diverse countries can be incorporated at production level. FDI has an immediate impact on the financial development of the beneficiary country. FDI is helpful in providing new and less expensive sources of production in the business sector, for the adoption of new innovated technologies, to increase the production of items, to enhance the aptitude of administration and financing in the country which receive the foreign investment, all such factors are necessary in economic advancements (Rasheed et al., 2012).

The FDI is exceptionally vital for the economic growth of both the developing as well as the developed countries by giving distinctive benefits to the host country. Developing countries confront the issue of shortage of capital thus FDI is a path for the investment of capital in developing countries. On the other hand the developed countries look for the high profit for their investment (Aqeel and Nishat, 2005).

As claimed in the World Investment Report 2014, the world inclination towards investment is growing. In 2013, worldwide investment inflows expanded by 9 percent by examination with the investment in 2012 and turn into 1.45 trillion dollars. FDI is increasing in all the major economic groups that are named as developed economies, developing economies and transition economies. From the Figure 1.1 United Nations

Conference on Trade and Development (UNCTAD) assessed the premise of present inclination that FDI inflows could go up at the top of 1.6 trillion dollars in 2014, 1.75 trillion dollars in 2015 and 1.85 trillion dollar in 2016. From Figure 1.1 we can observe the projections for 2014-2016.

Figure 1.1 Global FDI inflows of Different Economies



Source: United Nations Conference on Trade and Development (UNCTAD)

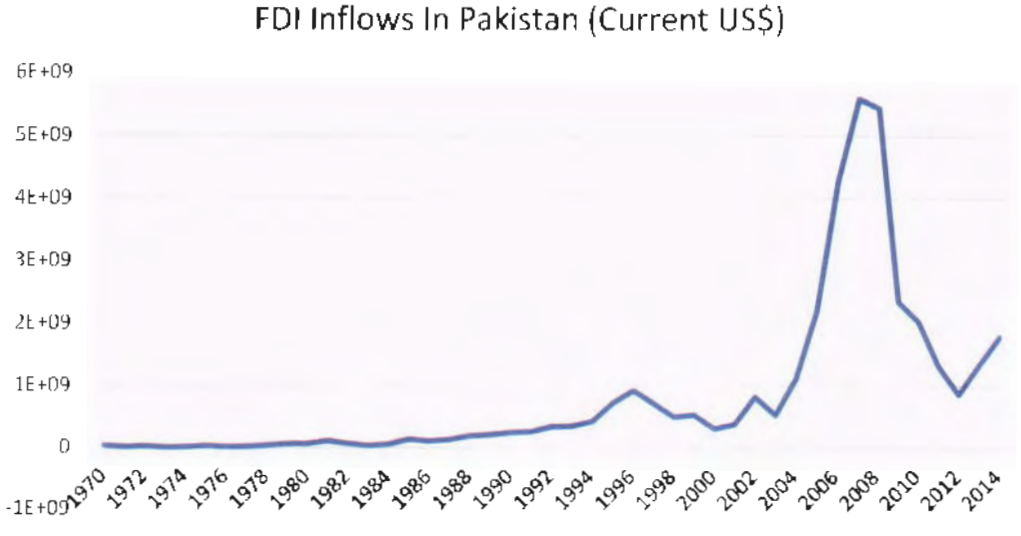
From the beginning of 1980, the Pakistani management announced economic modifications for business area and since then the government has opened its trade and investment. They encouraged the foreign investors with various fiscal concession, credit facilities, by reducing tariff and also eased foreign trade control (Khan and Kim, 1999).

In 1990, the government of Pakistan decided to further liberalize the policy in the field of cultivation, telecommunication, energy and the sector of assurance for the FDI. The investment policy of 2013 present different new encouragements to fascinate foreign investors by decreasing the cost of business in Pakistan (Board of Investment, 2015).

But because of the political turmoil in the country and irregularity of the policies, the level of FDI in Pakistan is lower than that of the other developing countries. With a specific end to pull the healthy foreign investment in Pakistan, the government has to pay attention on political stability, a serene lawfulness, specialized work power, natural resources and liberal policies (Nishat and Aqeel, 1998). The World Development Indicator (WDI) demonstrated that FDI in Pakistan has been going down during the last 6-7 years due to safety reasons and domestic aggravation.

Figure 1.2 illustrates that in 2008 foreign investment was $5438 million, whereas in 2014 it was $1778 million. Furthermore, the local businessmen and industrialists are also moving their business activity to the adjacent countries like Nepal, Bangladesh, and India due to their appropriate and receiving policies about foreign investors. In Pakistan, FDI inflow are extreme in the sector of telecommunications, in the oil and gas findings, but other financial businesses and the sector of infrastructure is almost disregarded (Javed et al., 2013)

Figure 1.2 FDI inflows in Pakistan (Thousand $)



SOURCE: WORLD DEVELOPMENT INDICATOR (WDI)

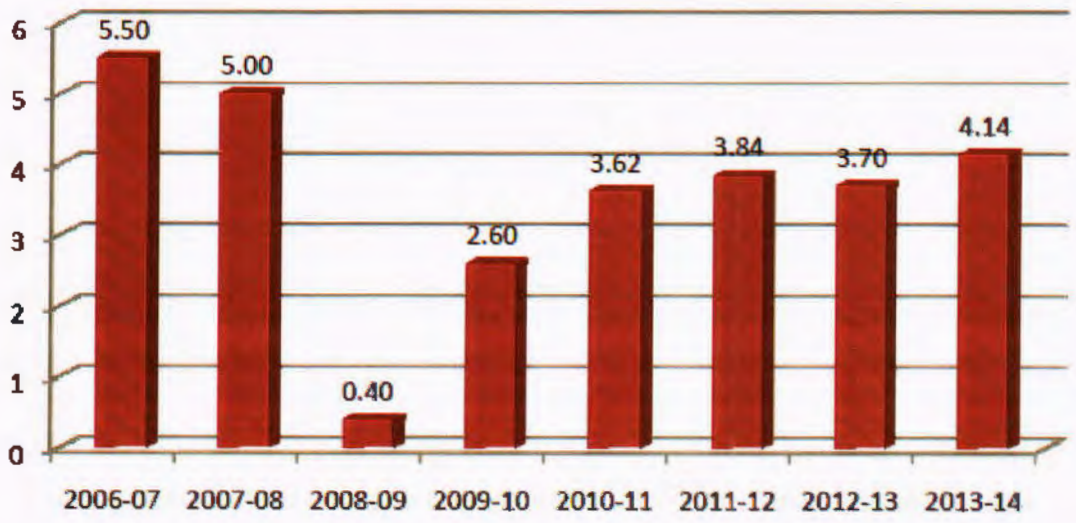
Pakistan economic conditions are seriously falling back as a result of security issues. Since 2003, Pakistan has been confronting a war against terrorism. During this war

20639 people and 6274 security persons are killed between the period of 2003 to 2015 (South Asia Terrorism Portal, 2015). This war additionally caused devastation of infrastructure, and Internally Dispersed Persons (IDP's) are increasing in Pakistan. So foreign investors are not being fascinated to put their resources in our country due to such anxieties (Pakistan Economic Survey, 2011). There are numerous different factors which could upset FDI in every country. The Multi-National Companies (MNC's) are fascinated in the country for their investment which is more settled politically, thus the political unpredictability is one of the critical features for MNC's to pick an area for their investment (Thompson and Poon, 2000). The Political instability is consistently happening in Pakistan, so foreign investors find no charm in Pakistan on the grounds that they are unreliable about the future policies (Akhtar, 2002). The load shedding and gas scarcity influenced depressingly all the sectors of Pakistan including FDI and the government of Pakistan is unsuccessful in getting rid of the load shedding and the issues of gas deficiency. Thus the investors from the foreign are hesitating to put their resources in Pakistan (Anwar and Afza, 2014). Economic growth investigated as an important variable to boost the FDI in a country so many researchers described the effect of economic growth on FDI. The Researchers used the diverse method for their study and finished up different results. Most of researcher reported that economic growth surely has positive impacts on FDI inflows in a country.

The Figure 1.3 Given on next page showed that in Pakistan, the economic growth in 2013-14 is 4.14 % against the growth 3.70% in 2012-13. The economic growth in 2013-14 signifies that the policies of the government are improving economic movement in Pakistan. The sector as agriculture, industry and services helped to stimulate the economic growth at the top. In 2013-14 growth of GDP in agriculture

sector is 2.12% against the growth 2.88% in fiscal year 2012-13. The branch of Industry sector increased 5.84% in 2013-14 whereas in 2012-13 growth is 1.37%. The service sector grew up 4.85% in 2012-13 against the 4.4% growth in 2011-12 while in 2013-14 growth rate is 4.3%, the service sector has great potential to grow up in Pakistan. (Pakistan Economic Survey 2013-14).

Figure 1.3 Economic Growth of Pakistan



Source: Economic Survey of Pakistan 2013-14

1.1 Research Objectives:

The basic targets of the research study are following

- To look upon the long run relationship among the variables like GDP, Trade Openness (TROP), Interest rate (IR), Inflation (INF), Exchange rate (EX) and FDI.
- To measure the association among independent variables and response variable FDI in the short run.
- To identify the significant determinants that can improve FDI in our country.

1.2 Motivations

- For the investigation of the long run relationship between FDI and the independent variables in the model we use co-integration technique. If the series of variables are not co-integrated then there is no equilibrium relationship among the variables and conclusions are worthless.
- There are two reasons of employing co-integration technique. Firstly, when the variables are co-integrated then we can use ECM model from which we can find out the short run impacts of the variables. Secondly, the existence of co-integration between the variables ensure that the Ordinary Least Square (OLS) regression in level yields consistent parameters estimates.
- If all the variables are stationary at level then the OLS is more appropriate to look upon the long and short run relationship among the variables like GDP, IR, TROP, INF and EX with the FDI. On the contrary in many cases time series data are non-stationary and become stationary after their first difference, in this situation J.J co-integration technique is commonly used for long run relationship and ECM model is used for the short run adjustment.
- The FDI provided support for developing countries in the field of foreign trade, profits, management and technology holes between developing and developed countries. The developing countries affectively scanning for polices to attract FDI as well as Pakistan.

CHAPTER 2

REVIEW OF LITERATURE

There are many factors present in different research papers which are influencing FDI in an economy.

Brima (2015) employed in his study ADF unit root test, J.J Cointegration and ECM technique for data analysis from 1990 to 2013. He concluded that market size, trade openness, exchange rate and natural resources are positively associated with the FDI, while inflation and money supply are negatively associated with FDI in the long run. The short run model indicated that market size, openness of trade, inflation and natural resources are main sources which have influenced FDI.

Acheampong and Osei (2014) examined the important issues of FDI in Ghana for the time period 1980 to 2010. The fundamental point of the study is to look at the impact of infrastructure and natural resources on FDI in Ghana. The study revealed that in the short run natural resources positively pull FDI, but in the long run natural resources influenced FDI inflow adversely in the situation of Ghana. This research concluded that better transportation and more political solidity had a positive and significant factors of FDI inflow in Ghana. Whereas market size found insignificant variable for the FDI inflow in Ghana.

Anwar and Afza (2014) used unit root analysis and OLS procedure to explore the impact of variables such as the political instability, the deficiency of gas (proxy as gas production), exchange rate (local currency unit according to the dollar), trade openness, inflation (as a percentage), GDP deflator, terrorism (proxy as costs of war) and incentive taken by the government for investors on the FDI. The study found that

political turmoil, terrorism and inflation were negatively influenced on the FDI. Whereas gas shortage, GDP deflator, trade openness, incentives for foreign investors positively and significantly fascinated the FDI in Pakistan.

Ulllah et al. (2014) in his study considered variables like Domestic investment (Gross fixed Capital Formation), Economic growth and Foreign Direct Investment for the time period of 1976 to 2010. This study revealed that there was a long term association among the variables.

Haq (2013) isolated data in to two classes military periods from 2000 to 2007 and elected periods from 1990 to 2000. The study used Philips Perron unit root test and cointegration techniques to attain the required inferences. The study revealed that in the short run FDI is cointegrated with trade openness, size of government, level of output whereas domestic investment is not cointegrated in short run.

Antwi and Zhao (2013) employed J.J cointegration method for data extending from 1980 till 2010. The intention of the study was to look at the association between Economic growth conditions and FDI. The model of the study contained Gross National Income (GNI) and GDP as independent variables whereas FDI appeared as the dependent variable. The study concluded that the long term negative association existed between GDP and FDI, moreover the positive association existed between FDI and GNI. While in the short run behavior of variables GNI and GDP at various lags on the FDI are different.

Jha et al. (2013) considered six Asian nations (India, Bangladesh, Nepal, Pakistan, Maldives) and analyzed the determinants of FDI and utilized variables such as real effective exchange rate, trade openness, direct investment (capital formation), real interest rate and labor force as parameters. This study utilized time series data from 1990 to 2010 and empirically displayed that trade openness, direct investment

and GDP had supportive influence on FDI, while labor had no supportive role on the FDI. The study recommended that to attract FDI in South Asia they should concentrate on strengthening GDP, enhancing infrastructure and should also focus on expanding trade openness.

Khathlan (2013) utilized co-integration and ECM to investigate FDI inflow and Saudi Arabia economic growth from 1980 to 2010. The J.J techniques for cointegration is employed and it concluded that FDI and government expenditure were positive and significant factor for the economic growth in the long term. While the ECM technique explored that variables such as domestic investment and labor force had an encouraging and significant influence on the economic growth in the short run.

Iqbal et al. (2013) investigated key factors like FDI, exports, exchange rate, terrorism and political unpredictability on the economic growth in Pakistan on the basis of data 1973 to 2010. They empirically indicated by utilizing J.J technique to look at affectability of the variables for the long term dynamic. The study revealed that exports, exchange rate and FDI positively had a positive influence on the growth of economic in the region of Pakistan, while political instability and terrorism are adversely affecting the economic growth.

Javed et al. (2013) used time series data 1973 to 2011 to discover the most significant determinants of FDI in the long run and short run time period. For his study, he used J.J co-integration technique and ECM model for data analysis. This study considered six variable such as GDP, political instability(POI), consumer price index , population(POP) and exchange rate and determined that in the long run all the variables were statistically significant, however GDP in Pakistan was most

significant predictor of the FDI. While in the short run GDP, POI and POP are most significant determinants of FDI in Pakistan.

Koojaroenprasit (2013) observed in his empirical studies by employing OLS technique that market size (GDP per Capita), lower customs duty and depreciation of the exchange rate (nominal exchange rate) are key factors that could attract the FDI in Australia, whereas more trade openness and higher corporate tax rate had a negative impact on the FDI inflow in Australia.

Anwar et al. (2013) studied the important components of FDI inflow in the agriculture sector by using time series data from 2000 to 2010. In his study, they used variables FDI in million rupees, GDP in million rupees, annual inflation rate expressed as %, trade, government debt in millions rupees, exchange rate (rupees/$). They concluded that GDP and trade openness had a positive and significant association with the FDI, however government debt had a negative and significant relationship in the field of agriculture. In his study, they also found that inflation and exchange rate had a negative but insignificant association with FDI in Pakistan in the sector of agriculture.

Khan and Hassan (2013) considered six variables such as market size (GDP per capita), inflation (annual percentage of GDP), external debt (annual debt of GDP), trade openness, return on investment (one divided by GDP) and utilized time period data from 1981 to 2010. In this study J.J cointegration and ECM technique used for the data analysis. The research paper narrated that return on investment and market size had positive influenced on the FDI. While the variables like trade openness, inflation and external debt are adversely impacted the FDI.

Antwi et al. (2013) utilized time arrangement data from 1980-2010 and OLS method employed for data analysis. The study used variables like GDP,

manufacturing value added, GDP growth rate, gross national income (GNI), GDP per capita, external debt stock, trade, industry value added, inflation and FDI (% of GDP). They concluded that independent variables GDP, GDP growth rate, GNI, manufacturing value added, GDP per capita, trade are all significant factors to explain the FDI.

Anfofum et al. (2013) measured the relationship in the middle of FDI and the economic growth in Nigeria. This study suggested that the OLS model is decomposition of five models. In this paper J.J cointegration revealed that there is long run association exist between FDI and economic growth. The study revealed that gross fixed capital formation, exports and economic growth are the key factors that could boost up FDI in Nigeria. The study also suggested that good roads, better power supply and security condition could attract FDI in Nigeria.

Ahmad and Mayowa (2012) conducted their study in Nigeria to look at the vital determinants of FDI using data 1970 to 2009. In this study, they used the ECM technique for data analysis. The study concluded by J.J Cointegration method that variable interest rate, inflation openness and exchange rate of Nigeria economy are key aspects for FDI inflow in the association of the long run. The empirical study revealed that the variables like government size and GDP were helpful to pull up the FDI in Nigeria but had insignificant role. From the ECM estimates, we noticed that one lagged period of government size, trade openness and GDP had a positively effect on the FDI, however exchange rate had negative influence on the FDI.

Ullah et al. (2012) utilized time series arrangements for variables like FDI, exchange rate volatility, exchange rate, inflation and trade openness from data ranging 1980-2010. The fundamental point of study is to identify the effect of FDI with exchange rate volatility and exchange rate. The test for stationary analysis, co

integration technique and causality analysis had been employed for data analysis. The study concluded that FDI increases with devaluation of the rupee and exchange rate volatility obstructed the FDI inflow in Pakistan, while trade openness encouraged the FDI.

Rasheed et al. (2012) observed by the ECM and J.J co-integration method using time series data from 1975 to 2011 that FDI was significantly influenced by GDP, trade openness, indirect taxes, and exchange rate, while transportation and communication system are insignificant aspects for the FDI. The most vital factor which really influenced FDI was indirect taxes.

Mughal and Akram (2011) used time series data ranging from 1984 to 2008 the basic objective of their research work was to inspect the influence of market size (proxy GDP current US $), exchange rate (official exchange rate) and corporate taxes on FDI inflow in Pakistan. The Auto regressive distributed Lag (ARDL) approach to cointegration and ECM technique is utilized to examine the relationship among the variables. In their study, they concluded that market size played a key role to fascinate FDI in Pakistan.

Iqbal et al. (2010) utilized cointegration analysis and granger causality test in their study for data from 1980 to 2009. The study revealed that the long term association existed among the variables like FDI, export, import, GDP per capita. Additionally the study noticed that there was a bidirectional causal link between FDI, export and economic growth. The study suggested that the government of Pakistan had to pay attention on security control.

Azam (2010) used log form of economic model and applied least square method; he considered three countries of central Asia (Armenia, Kyrgyz Republic and Turkmenistan). In his study, he concluded that official development assistant and

market size had a positive effect on the FDI, while inflation had a negative impact on the FDI. He proposed that market size and official development assistance were needed to be encouraged, and inflation should be controlled to attract FDI.

Azam and Lukman (2010) analyzed various economic aspects of FDI inflow in India, Indonesia and Pakistan. The outcomes exhibited that trade openness, market size, physical infrastructure, external debt and domestic investment are the main elements for the FDI. The study recommended that the administration authorities needed to make sure economic and political solidity, peace, security and the rule of law, to encourage the domestic investment and to curtail external debt in order to enhance the FDI. Because all these factors are essential for FDI inflow in India, Indonesia and Pakistan.

Aw and Tang (2010) showed empirically the role of corruption and the impact of China is joining the WTO in 2001 on inward FDI in Malaysia. From the observational tests, he suggested that FDI and its explained determinants (interest rate, openness, the joining of China into WTO, inflation rate, and the level of corruption) are co-integrated and had a significant role on FDI inflow in Malaysia in the long run and short run dynamics as well. The study revealed that Infrastructure had a significant role in the short run. However, in the long run dynamic had no significant impact on FDI inflow.

Azam and Naeem-ur-Rehman (2009) investigated variables such as domestic investment, market size, trade openness, external debt and return on investment to inspect the effects of these variables on the FDI. This study used log- linear regression model and OLS technique on data ranging from 1971 to 2005. The study concluded that market size, domestic investment, trade openness and return on investment had a positive and significant impact on the FDI. The variables like external debt and taxes

are found significant with negative signs. The study suggested that the government of Pakistan should provide well infrastructure, minimizing the external debt, give fiscal and financial incentive and this study additionally recommended that there must be regularity in government policies.

Mughal (2008) studied the FDI flows in Pakistan during the period of 1961 to 2005 using ECM model and J.J co-integration method and established that the FDI had an encouraging effect on growth rate mainly in the short term. He found that the local investment is more important than the foreign investment.

Yousaf et al. (2008) employed J.J Co integration and the ECM technique on time series data ranging 1973 to 2004. The result of the study showed that demand for import had a positive influence on foreign direct inflows of the country in the long run and short run as well. On contrary, real export had a negative impact on FDI both in the long run and short run. In his study, he suggested that government should provide a friendly environment for foreigner investors.

Aqeel and Nishat (2005) empirically examined the key factors for the growth of the FDI in Pakistan for the time period of 1961 to 2003. They utilized variables like growth in FDI inflow, GDP per capita, average annual wages of the factory, tariff (ratio of custom duties to total import), credit (share of credit of the private sector in total credit to public and private sector), exchange rate (exchange rate as rupees/$), index (general share price index) and J.J cointegration and the ECM technique for data analysis in their study. They established that tax rate, tariff rate, credit to private sector, exchange rate, GDP per capita had a significant impact on FDI, while wages rate and share price index are insignificant.

Asiedu (2002) showed with his result that higher return on investment and good infrastructure had very important role to attract the FDI in Non-Sub Saharan

Africa (SSA), while in Sub Saharan African (SSA) countries had no significant role. Additionally, he proved that trade openness had a very effective role in attracting the FDI in Non-SSA; however trade openness had less effective role in SSA.

Erdal and Ekrem (2002) analyzed the location associated determinants of FDI inflow in the Turkish economy. They proved that infrastructure, size of host market and openness of the economy had a significant impact on the FDI inflow. They also proved that exchange rate instability and economic instability had a negative effect on the FDI.

Balasubramanyan et al. (1996) used cross sectional data and OLS technique for their study and showed that the economic growth stimulated the FDI positively. So GDP growth is an important indicator for the economic health.

CHAPTER 3

METERIAL AND METHODS

3.1 Source of Data

The secondary data for empirical investigation is accessed from World Development Indicator (WDI) and International Financial Statistic (IFS) that covers annual data from 1961 to 2013. The annual time series data for variables as FDI (million US$), GDP (million US$), EX (local currency unit according to US$), TROP (Trade % of GDP) and INF (annual percentage increase) is obtained from WDI and the variable IR is collected from IFS.

3.2 Description of variables

3.2.1 Foreign Direct Investment (FDI)

The dependent variable FDI net inflow in million dollars is assembled from the WDI. According to the World Bank FDI net inflow is the measure of the sum of own capital, the reinvestment, the capital (short term and long term capital) as indicated in the balance of payment.

3.2.2 Market size (GDP)

Gross Domestic Product (GDP) million dollar used as a proxy to demonstrate the size of the market and data acquired from WDI. GDP is the aggregate cash value of goods and services inside the country delivered by the residents of that country. The market size of any economy indicated the internal residential demand and financial condition of any economy. The investors are fascinated on these economies which have the bigger size of the market in the light of fact that it provides the bigger profit on nearby

sales as opposed to sales in the export (Koojaroenprasit, 2013). The expected sign of GDP is positive such as it has a positive effect on FDI.

3.2.3 Exchange Rate (EX)

The Official Exchange rate (local currency unit according to US dollar) is utilized as a substitute for exchange rate and the data is collected from WDI. The Exchange rate can be defined as the price of national currency in which currency of another country can be traded (Wikipedia).

Froot and Stein (1991) narrated that the devaluation of exchange rate expanded FDI in host country whereas the valuation for the host currency decreased FDI. Aqeel and Nishat (2005) described that Exchange rate has a positive effect on FDI if investors are considering their minimal cost in host country while if they are considering high profit on their investment than exchange rate negatively influence on FDI.

3.2.4 Trade Openness (TROP)

Trade Openness (trade % of GDP) measures the economic policies in which any economy allows the other economies to trade with each other (Khan and Hassan, 2013). The variable trade openness is obtained by dividing sum of imports and exports to GDP. Ioannatos (2003) concluded that TROP has positive influenced on FDI.

3.2.5 Inflation (INF)

Inflation rate is the rate in which the price of goods and services are rising in a country and it is measured as an annual percentage. The foreign investors are not interested to put their resources into the countries having a high inflation rate as it is indication of the economic instability. On the other hand foreign investors are attracted towards the countries having a low inflation rate and more stable economy (Koojaroenprasit, 2013). In this study the expected sign of INF is negative.

3.2.6 Interest Rate (IR)

In this study "Discount rate" used as a proxy for the interest rate. The discount rate is the interest rate to which the national banks charged to member banks for their loan to accomplish the lack of their treasuries. Haroon and Nasr (2011) concluded that IR had a negative influenced on the investment.

3.3 Estimation Procedure

If all the variables under study are stationary at level then OLS estimator can give consistent estimates. But practically, most of time series are not stationary at a level, so that OLS is not appropriate at this situation. When time series is not stationary at a level we transform the variables in first difference to attain stationarity. The most popular method which we use to check the stationary or level of stationary is ADF and PP test of stationarity. For the optimal lag length we use the Vector Auto-Regressive (VAR) model for this purpose we utilized AIC and SBC criterion. Next we investigate J.J co-integration among the variables for the long run relationship existence. Finally we estimate the ECM model for the short run dynamic.

3.4 Test For Unit Roots

Suppose the random walk model (RWM) can be written as:

$$Y_t = \rho y_{t-1} + u_t \qquad -1 \leq \rho \leq 1 \qquad \ldots\ldots\ldots\ldots \quad (3.1)$$

If the value of ρ=I then there is a problem of unit root. Now if we are facing the problem of unit root then it is symptom of the non-stationary of time series. In practical work it is necessary to find out the answer about the stationary condition of a given series. Because if the given time series is stationary we may predict future values of time series otherwise it is not possible.

The term stationary means that if the mean and variance of time series data does not depends on time, and covariance depends on lag not on time. Then we say that the time series data under study is stationary.

3.4.1 The Augmented Dickey Fuller (ADF) Test

If the ρ=1 then RWM (3.1) have the unit root problem in this situation we cannot apply OLS on equation (3.1), we subtract y_{t-1} from both sides of the equation and we get

$$Y_t - Y_{t-1} = (\rho - 1)Y_{t-1} + u_t$$

$$\Delta Y_t = \delta Y_{t-1} + u_t \quad \ldots\ldots\ldots\ldots\ldots\ldots (3.2)$$

In the model (3.2) the first difference of the model regressed on the lag value of the original variable. If the null hypothesis of δ=0 is accepted then time series data under study is not stationary or have unit root. In order to test the null hypothesis we cannot apply usual t-test even for large sample. Dickey and Fuller suggested tau statistics to test the null hypothesis δ=0 and develop critical values for tau (λ) statistics on the basis of Monte Carlo simulation.

One point to bear in mind that there are two forms of RWM i) RWM with drift (ii) RWM with drift and trend. While utilizing Dickey Fuller Test it is considered that residual terms are not correlated. Dickey and Fuller developed the ADF test when residual terms are correlated. In the ADF test different lag values of the dependent variables are included in the model to avoid the problem of serial correlation. The ADF test consists of estimating the following regression:

$$\Delta Y_t = \alpha_o + \alpha_1 t + \delta Y_{t-1} + \sum_{i=1}^{m} \beta_i \Delta Y_{t-i} + u_t \quad \ldots\ldots\ldots\ldots\ldots\ldots (3.3)$$

Eviews has option that automatically select the lag length based on AIC and SC.

3.4.2 Philips Perron (PP) Test

PP unit root test is the modification of the Dickey Fuller Test. The problem appears in the Dickey Fuller test is serial correlation which is removed in the test of the ADF by taking the optimal lag of the first difference of a variable. Whereas the test of PP solved the problem of serial correlation and heteroskedasticity in the error terms non-parametrically.

Philips Perron (PP) unit roots test implies the model:

$$Y_t = \alpha + \rho Y_{t-1} + \varepsilon_t \quad \text{..... (3.4)}$$

In this test we estimate the model by OLS and results of model are used for test-statistics Z_ρ and Z_T, these two statistics can be calculated as

$$Z_\rho = n(\widehat{\rho_n} - 1) - \frac{1}{2}\frac{n^2\hat{\sigma}^2}{s_n^2}(\hat{\lambda}_n^2 - \hat{\gamma}_{0.n}) \quad \text{..... (3.5)}$$

Where

$$\widehat{\gamma_{j.n}} = \frac{1}{n}\sum_{i=j+1}^{n} \widehat{u_i}\,\widehat{u_{i-j}} \quad \text{..... (3.6)}$$

$$\widehat{\lambda_n^2} = \hat{\gamma}_{0.n} + 2\sum_{j=1}^{q}\left(1 - \frac{j}{q+1}\right)\widehat{\gamma_{j.n}} \quad \text{..... (3.7)}$$

$$s_n^2 = \frac{1}{n-k}\sum_{i=1}^{n} \widehat{u_i^2} \quad \text{..... (3.8)}$$

And

$$Z_t = \sqrt{\frac{\widehat{\gamma_{0.n}}}{\widehat{\lambda_n^2}}}\,\frac{\widehat{\rho_n}}{\hat{\sigma}} - \frac{1}{2}\left(\widehat{\lambda_n^2} - \widehat{\gamma_{0.n}}\right)\frac{1}{\widehat{\lambda_n}}\frac{n\hat{\sigma}}{s_n} \quad \text{..... (3.9)}$$

Where Ut is the error term of the model (3.4) by using OLS, "q" is Newey-West lags and $\hat{\sigma}$ is the standard error of $\hat{\rho}$.

3.5 Lag Selection For the Model

3.5.1 Vector Auto Regressive (VAR) Model

The VAR model of Order 'p' can be written as:

$$Y_t = c + \Pi_1 Y_{t-1} + \Pi_2 Y_{t-2} + \Pi_3 Y_{t-3} \ldots \Pi_1 Y_{t-p} + \varepsilon_t \quad \text{..... (3.10)}$$

Where

Y_t = (n X 1) vector and Π_t = (n x n) coefficient matrix.

For the specification of the lag length of the VAR model we used two statistical criteria such as AIC and SIC.

3.5.2 Akaike's Information Criteria (AIC)

AIC is a method used to find out the optimal lag for VAR model of the order 'p'. If we are comparing the two or more models, AIC criteria tells that the minimal value of AIC favored the model. Thus we concluded that AIC criterion measures the comparative efficiency of the model. AIC criteria can be defined as

$$AIC = e^{\frac{2k}{n}}\{\frac{\sum_{i=1}^{n}\hat{\mu}_{i=1}^{2}}{n}\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.11)$$

Log form is;

$$lnAIC = \frac{2k}{n} + \{\frac{\sum_{i=1}^{n}\hat{\mu}_{i=1}^{2}}{n}\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.12)$$

Where

K=No of Regressors

n=Total no of observations

K/n= Penalty Factors

3.5.3 Schwarz's Information Criteria (SIC)

SIC criterion also used for lag selection of the statistical model. In SIC criteria the lower value of SIC indicates that it is better model in comparison to other models. The SIC criteria can be defined as under

$$SIC = n^{\frac{k}{n}}\{\frac{\sum_{i=1}^{n}\hat{\mu}_{i=1}^{2}}{n}\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.13)$$

Log form is

$$lnAIC = \frac{2k}{n} + \ln\{\frac{\sum_{i=1}^{n}\hat{\mu}_{i=1}^{2}}{n}\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.14)$$

3.6 Test for co-integration

The two variables are co-integrated if the variables individually follows the unit root process but they jointly move simultaneously in the long run. The Individual movement of the variable appears unsystematic and unpredictable, but location of one can give information about the others. In this study the co-integration measures the long run relationship between variables like GDP, IR, EX, TROP, INF in case of Pakistan.

The two main methods for testing of co-integration are:

1) The Engle- Granger two step method
2) The Johansen and Juselius (JJ) cointegration test

3.6.1 Johansen and Juselius (JJ) Method of Cointegration

Engle and Granger two step methods is more suited if two variables are included in the model of regression. The J.J cointegration (1990) maximum likelihood method was used when more than two variables are included in the model. In this situation it can be possible that there is more than one cointegration relationship that exists in the model, thus the J.J cointegration test is more apt for more than one cointegrated association. Thus the main advantage of test of J.J technique is that it is the test for the co-integration which takes into account more than one co-integration relationship.

The starting point of J.J technique is VAR model of order 'P'

$$Y_t = \mu + A_1 Y_{t-1} + A_2 Y_{t-2} \dots\dots\dots\dots A_p Y_{t-p} + \epsilon_t \qquad \dots\dots\dots\dots\dots (3.15)$$

In J.J procedure the VAR Model uses the AIC and SBC to choose the most favorable lag length on the basis of least value of these criterions. Here Y_t is integrated of order one and n x 1 vector and VAR of order P can be written as under

$$\Delta y_t = \prod Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + e_t \qquad \dots\dots\dots\dots\dots\dots (3.16)$$

Here

$$\prod = -I - (\sum_{i=1}^{p} A_i) \quad \text{..... (3.17)}$$

And

$$\Gamma_i = -I - (\sum_{j=1}^{p-1} A_j) \quad \text{..... (3.18)}$$

The ranks of matrix "∏" is used to determine the linear association of Y_t that are stationary. The matrix "∏" can be represented as below:

$\prod = \alpha.\beta`$

Where α and β are the matrices of order (n x r). If the Rank (∏) =0 means that there is no stationary linear association exists and if Rank (∏) =n it concluded that all the linear combinations are stationary. The ranks are determined by the trace and maximum eigen value test statistics. In J.J co-integration technique we use two types of statistics trace statistics and maximum eigen value to observe the co-integration among the variables.

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln(1 - \hat{\lambda}_i) \quad \text{..... (3.19)}$$

And

$$\lambda\_\max(r, r+1) = -T ln(1 - \hat{\lambda}_i) \quad \text{..... (3.20)}$$

The null hypothesis under trace test is "there is 'r' equal to some specific value r_o linear association exists" against the alternative hypothesis 'r' greater than r_o.

(i.e.) H_o: r=r_o versus H_1: r ≥ r_o

While the eigen test under the null hypothesis of 'r' co integrating vector against alternative "there is 'r+1'cointegrating vectors holds".

(i.e.) H_o: r=r_o versus H_1: r ≥ r_o+1

We can discover the number and existence of co-integrated vector among the variables in the model using the trace test, maximum eigen value test.

3.7 Error Correction Mechanism (ECM) Model

If there is a long run relation exists among different variable it explains that observation moving together over time. Once we confirmed the long run relationship among different variables, our next step is the short run attitude of the variables. The ECM model narrates the short term growth or changes in FDI inflows in Pakistan. Firstly, we estimated the ECM from co-integration regression: we lagged it and then became the following regression.

$$DFDI_t = \alpha ECM_{t-i} + \sum_{i=1}^{n} \beta_1 D(FDI)_{t-i} + \sum_{i=1}^{n} \beta_2 D(LNGDP)_{t-i} +$$

$$\sum_{i=1}^{n} \beta_3 DLNEX_{t-i} + \sum_{i=1}^{n} \beta_4 D(LnINF)_{t-i} + \sum_{i=1}^{n} \beta_5 D(LnIR)_{t-i} +$$

$$\sum_{i=1}^{n} \beta_6 D(TROP)_{t-i} + \beta_7 + \mu_t \qquad \text{..... (3.21)}$$

3.8 Diagnostic Test for Serial Correlation

In time series data the problem of **serial correlation** occurs when the residual in a current time associated with the future time periods. In the problem of serial correlation OLS estimator still remained unbiased and consistent but the efficiency of the estimator is affected. The BG test for serial correlation is used for this study.

3.8.1 The Breusch Godfrey (BG) Test

The BG test is also familiar as the LM test. There are following steps for conducting BG test of serial correlation. In the first step we estimate the model as under:

$$\Delta FDI_t = \beta_1 + \sum_{i=1}^{p} \beta_2 \Delta FDI_{t-i} + \sum_{i=1}^{p} \beta_3 \Delta LNGDP_{t-i} + \sum_{i=1}^{p} \beta_4 \Delta IR_{t-i} + \sum_{i=1}^{p} \beta_5 \Delta INF_{t-i} + \sum_{i=1}^{p} \Delta LNTROP_{t-i} + \sum_{i=1}^{p} \beta_7 \Delta LNEX_{t-i} + \alpha ECM_{t-i} + \mu_t \quad (3.22)$$

For lag one regression becomes as under

$$DLNFDI_t = \beta_1 + \beta_2 DLNFDI(-1) + \beta_3 DLNGDP(-1) + \beta_4 DLNIR(-1) + \beta_5 DLNINF(-1) + \beta_6 DLNEX(-1) + \beta_7 DTROP(-1) + \beta_8 ECT(-1) + \mu_t \quad (3.23)$$

From the model (3.22) we attain the errors by utilizing OLS method. In the next step of BG test we regress error terms on the explanatory variables plus an appropriate lagged term of residuals of the model (3.22) and estimate the following regression:

$$\hat{u}_t = \beta_1 + \sum_{i=1}^{n} \beta_2 \Delta FDI_{t-i} + \sum_{i=1}^{n} \beta_3 \Delta LNGDP_{t-i} + \sum_{i=1}^{n} \beta_4 \Delta LnIR_{t-i} + \sum_{i=1}^{n} \beta_5 \Delta LnINF_{t-i} + \sum_{i=1}^{n} \beta_6 \Delta TROP_{t-i} + \sum_{i=1}^{n} \beta_7 \Delta LNEX_{t-i} + \alpha ECM_{t-i} + \sum_{i=1}^{p} \rho\, \hat{u}_{t-1} + e_t \quad (3.24)$$

And for lag one i.e. p=1

$$\hat{u}_t = \beta_1 + \beta_2 DLNFDI(-1) + \beta_3 DLNGDP(-1) + \beta_4 DLNIR(-1) + \beta_5 DLnINF(-1) + \beta_6 DLNEX(-1) + \beta_7 DTROP(-1) + \alpha ECT(-1) + \rho \hat{u}_{t-1} + e_t \quad (3.25)$$

From equation (3.24) we calculate R^2. The test statistic of BG test is (n-p) R^2, which follows the chi-square distribution with 'p' degree of freedom. The null hypothesis of the test procedures is that there is no serial correlation against the alternative there is a serial correlation. If the value of test statistic falls in the chi-square critical region then it rejects the null hypothesis otherwise accepts it.

3.9 Diagnostic Test for Heteroskedasticity

The problem of heteroskedasticity occurs, when the variance of errors terms are not constant. The BPG test is used for the diagnostic test of heteroskedasticity.

3.9.1 Breusch-Pagan-Godfrey (BPG) Test

The following procedure is conducted for the BPG test:

Step#1. In the first step we estimate the regression model (3.26) by the method of OLS and obtained the error terms of the model (3.26).

$$\Delta LnFDI_t = \beta_1 + \sum_{i=1}^{p} \beta_2 \Delta LnFDI_{t-i} + \sum_{i=1}^{p} \beta_3 \Delta LnGDP_{t-i} + \sum_{i=1}^{p} \beta_4 \Delta LnIR_{t-i} + \sum_{i=1}^{p} \beta_5 \Delta LnINF_{t-i} + \sum_{i=1}^{p} \Delta TROP_{t-i} + \sum_{i=1}^{p} \beta_7 \Delta LnEX_{t-i} + \alpha ECM_{t-i} + \mu_t \quad (3.26)$$

Step#2. In the next step of BPG test we estimate the variance of error ($\widehat{\sigma^2}_e$) by using the formula

$$\widehat{\sigma^2}_e = \frac{\sum \widehat{u^2}}{n} \quad (3.27)$$

Step # 3. In this step we formulate another variable say 'P' by dividing each squared error term to variance of error as calculated in step #2 and can be defined as

$$P_i = \frac{u_i^2}{\widehat{\sigma^2}_e} \quad (3.28)$$

Step # 4. We regress newly generated variable 'P' on all the explanatory or some of the explanatory variables.

Step#5. In this step we calculate R^2 of the model in step 4. The LM test statistic in the BPG procedure is nR^2 which follows the chi-square distribution with (m-5) degree of freedom. If the value of the test statistics falls in critical region we reject the null hypothesis of no heteroskedasticity in the error variance.

3.10 Diagnostic Test For Normality

3.10.1 Jarque Bera (JB) Test of Normality

The JB test based on the residuals obtained from the method of OLS. According to JB test, first we compute kurtosis and skewness of the OLS residuals.

The JB test statistics is given below:

$$JB = n[\frac{S^2}{6} + \frac{(k-3)^2}{24}] \quad \text{.....} \quad (3.29)$$

S= Skewness Coefficient

n= Sample Size

K= Kurtosis Coefficient

The null hypothesis under the JB test is that the residuals are normal against the alternative hypothesis in which residuals are not normal.

3.11 Autoregressive Distributed Lag (ARDL) Approach

3.11.1 ARDL Model

ARDL model is used when some of the variables are stationary at a level and some of the variables become stationary after first difference. In the ARDL approach there must be none of the variable that is integrated of order two.

The regression model of ARDL is:

$$LnFDI_t = \beta_1 + \sum_{i=1}^{p} \beta_{2i} LnFDI_{t-i} + \sum_{i=0}^{q} \beta_{3i} LnGDP_{t-i} + \sum_{i=0}^{r} \beta_{4i} LNEX_{t-i}$$

$$+ \sum_{i=0}^{s} \beta_{5i} LnIR_{t-i} + \sum_{i=0}^{t} \beta_{6i} LnINF_{t-i} + \sum_{i=0}^{u} \beta_{7i} TROP_{t-i} + \mu_t \text{.....} \quad (3.30)$$

The long run coefficient of the model is:

$$LnFDI_t = \frac{\beta_1}{1-\sum_{i=1}^{p}\beta_{2i}} + \frac{\sum_{i=0}^{q}\beta_{3i}}{1-\sum_{i=1}^{p}\beta_{2i}} LnGDP_t + \frac{\sum_{i=0}^{r}\beta_{4i}}{1-\sum_{i=1}^{p}\beta_{2i}} LnEX_t + \frac{\sum_{i=0}^{s}\beta_{5i}}{1-\sum_{i=1}^{p}\beta_{2i}} LnIR_t +$$

$$\frac{\sum_{i=0}^{t}\beta_{6i}}{1-\sum_{i=1}^{p}\beta_{2i}} LnINF_t + \frac{\sum_{i=0}^{u}\beta_{7i}}{1-\sum_{i=1}^{p}\beta_{2i}} TROP_t \quad \text{.....(3.31)}$$

3.11.2 Bounds Testing Procedure for Cointegration

For bounds test first we develop the model as

$$\Delta LnFDI_t = \beta_1 + \sum_{i=1}^{p-1}\beta_{2i}\Delta LnFDI_{t-i} + \sum_{i=0}^{q-1}\beta_{3i}\Delta LnGDP_{t-i} + \sum_{i=0}^{r-1}\beta_{4i}\Delta LNEX_{t-i}$$

$$+ \sum_{i=0}^{s-1}\beta_{5i}\Delta LnIR_{t-i} + \sum_{i=0}^{t-1}\beta_{6i}\Delta LnINF_{t-i} + \sum_{i=0}^{u-1}\beta_{7i}\Delta TROP_{t-i} + \emptyset_1 LnFDI_{t-1} +$$

$$\emptyset_2 LnGDP_{t-1} + \emptyset_3 LnEX_{t-1} + \emptyset_4 LnIR_{t-1} + \emptyset_5 LnINF_{t-1} +$$

$$\emptyset_6 TROP_{t-1} + u_t \quad \text{..... (3.32)}$$

The optimal lag for the above model can be chosen by different "Information Criterion" like AIC, SIC, HQ. Assumptions of the model are given below and these assumptions are helpful for the appropriate lag length of the model.

i) According to Pesaran et al. (2001) the error terms of the equations must be serially independent.

ii) The model must be stable dynamically.

Now we can perform "Bounds Testing Procedure". The null hypothesis of the model is that there is no long run association among variables i.e. $H_o = \emptyset_1 = \emptyset_2 = \emptyset_3 = \emptyset_4 = \emptyset_5 = 0$ against the alternative in which there is long run association. Pesaran et al. (2001) developed upper and lower bounds in his paper. The Bounds test follows the F-statistic if, the value of the F-statistic is greater than the upper bound than we reject the null hypothesis of no long run relationship.

If the "Bounds Test" concluded that there is a long run association among the variables then we can estimate **Error Correction Mechanism (ECM) model**.

$$\Delta LnFDI_t = \beta_1 + \sum_{i=1}^{p} \beta_{2i} \Delta LnFDI_{t-i} + \sum_{i=0}^{q-1} \beta_{3i} \Delta LnGDP_{t-i} + \sum_{i=0}^{r-1} \beta_{4i} \Delta LNEX_{t-i}$$

$$+ \sum_{i=0}^{s-1} \beta_{5i} \Delta LnIR_{t-i} + \sum_{i=0}^{t-1} \beta_{6i} \Delta LnINF_{t-i} + \sum_{i=0}^{u-1} \beta_{7i} \Delta TROP_{t-i} + \alpha ECM_{t-i} +$$

μ_t..... (3.33)

3.12 Model Specification

Asiedu (2006) and Brima (2015) used log -log specification to estimate the coefficient of the variables. They used log log model because of the two reasons firstly the relationship between two or more variables not necessarily linear, secondly result can be discussed in percentage rather than unit. The functional form can be written as below:

FDI=f{Gross Domestic Product (GDP), Exchange Rate(EX), Trade Openness(TROP), Interest Rate(IR) and Inflation(INF)}.

The estimated econometric model is represented by the following equation:

$$LnFDI = \alpha + \beta_1 LnGDP + \beta_2 LnEX + \beta_3 LnTROP + \beta_4 LnIR + \beta_5 LnINF +$$

μ..... (3.34)

Where

LnFDI =Log of Foreign Direct Investment

LnGDP =Log of Gross Domestic Product

LnIR =Log of Interest rate

LnINF =log of Inflation

LnEX =Log of Exchange Rate

LnTORP =Log of Trade Openness

μ = Error terms

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Descriptive Statistics

The first stage of data analysis in this study is the short descriptive summary of the variables. The main feature of descriptive summary is the measure of central location, the measure of spreads, the measure of skewness, kurtosis and JB test which states the normality condition of the variables. The short descriptive summary of the variables are given in Table 4.1.

Table 4.1: Descriptive Statistics

Variables	FDI	GDP	IR	TROP	EX	INF
Mean	650.06	57123.60	9.4811	31.7	30.200	52.3586
Median	145.20	33351.53	10.00	032.9	17.3988	25.2060
Max	5276.6	232286.8	20	38.9	101.6289	238.9778
Min	0.50	4054.599	4	19.9	4.7619	3.756
S.D	1206	61248.34	3.75	4.57	27.761	59.832
Skewness	2.667	1.4973	0.58	-0.71	0.975	1.575
Kurtosis	9.56	4.30	3.28	2.805	2.750	4.79
Jarque Bera	158.04	23.54	3.19	4.481	*8.5376*	28.97
Prob	0.000	0.000	0.020	0.106	0.01399	0.000

In the Table 4.1 JB test indicated that all the variables are not normal except TROP, so we transformed the variables in log form and the summary is given in the Table 4.2.

Table 4.2: Descriptive Statistics with Log Transformation

Variables	lnFDI	lnGDP	LnIR	LnTROP	lnEX	LnINF
Mean	4.744	10.36	2.1674	3.446	2.944	8.729
Median	4.9781	10.415	2.3026	3.4946	2.856	8.701
Max	8.5710	12.356	2.9957	3.6612	4.6213	11.77
Min	-0.6931	8.308	1.3862	2.9923	1.561	6.051
S.D	2.285	1.1715	0.4211	0.1554	1.0139	1.72966
Skewness	-0.419	-0.0935	-0.3878	-1.019	0.055	0.044
Kurtosis	2.5591	1.957	2.4732	3.4517	1.6662	1.847
Jarque Bera	1.9811	2.47185	1.9410	9.6228	3.955	2.9519
Prob	0.3713	0.2895	0.3789	0.008	0.13838	0.2286

From the Table 4.2 we observed that the standard deviation of the variables like LnGDP, TROP, LnEX, LnIR and LnINF are sufficiently close to zero, which indicates that the observations are not much more distant from its center. However, the standard deviation of LnFDI is high, this shows that the observations are not too close to its center. The skewness of the LnGDP, LnFDI and LnIR are negatively skewed however, the value of skewness is nearer to zero. The skewness of lnEX and lnINF is positive, but the value of skewness of both variables is close to zero. The value of kurtosis for LnIR, LnFDI, and TROP are very close to '3' which indicates that these distributions are nearer to normality. By the JB test of normality we conclude that LnFDI, LnGDP, LnIR, LnEX, TROP and LnINF were normal as p-value greater than 5%. Furthermore, the median and mean of the variables are close enough to each other.

4.2 The Test for Stationary

4.2.1 Philips Perron (PP) Unit Root Test

Our Null Hypothesis (H_o) for the PP test is that the variable has a unit root against the hypothesis (H_1) that has no unit root.

Table 4.3-1: Result of (PP) Unit Root Test

Variables	AT LEVEL		AT DIFFERENCE	
	With Intercept	With Trend	With Intercept	With Trend
LnFDI	-2.039	-5.1737*	-16.099*	-16.7979*
LnGDP	-0.4418	2.6497	-6.057*	-5.977*
LnEX	0.2519	-3.1485	-5.7748*	-5.7457*
LnIR	2.0346	-1.902829	-5.51899*	-5.6306*
lnINF	0.6930	-2.7430	-3.5453*	-3.4632**
TROP	-2.4149	2.8933	-10.166*	10.8133*

*Significant at 1 % and ** significant at 5 %

In Table 4.3-1 PP test exhibited that lnIR, lnGDP, TROP, lnINF and lnEX are nonstationary at a level and become stationary at 1% after transformation of their first difference. The variable lnFDI is stationary at a level with the trend and the first difference of lnFDI is also stationary at 1% level of significance.

4.2.2 Augmented Dickey Fuller (ADF) Test

The ADF test is another process for testing the stationary level of the variables. The AIC information criteria is utilized for selecting the lag length of the variables. Our Null Hypothesis (H_o) is that variable has a unit root against the hypothesis (H_1) of no unit root.

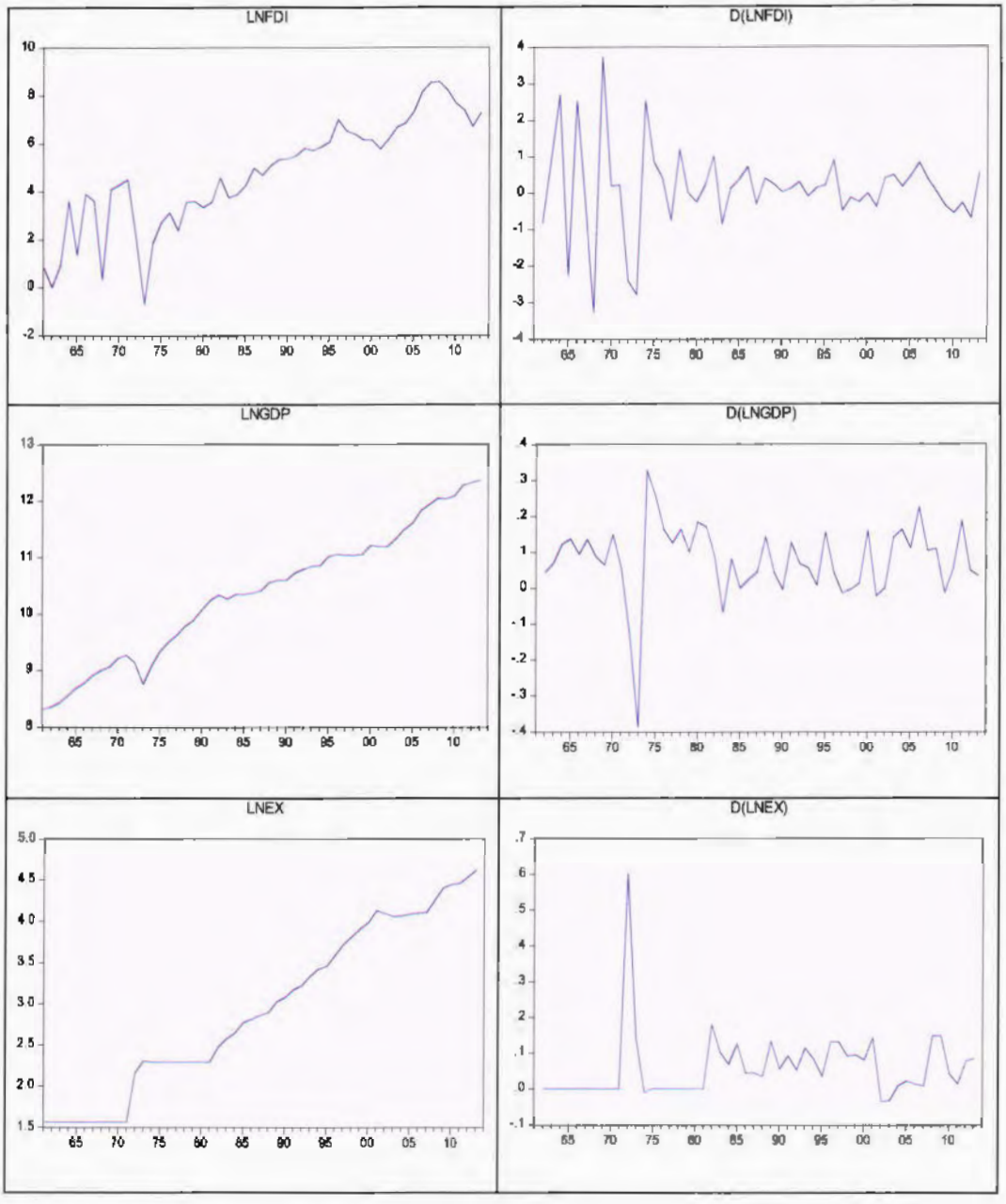
Table 4.3-2: Result of (ADF) Unit Root

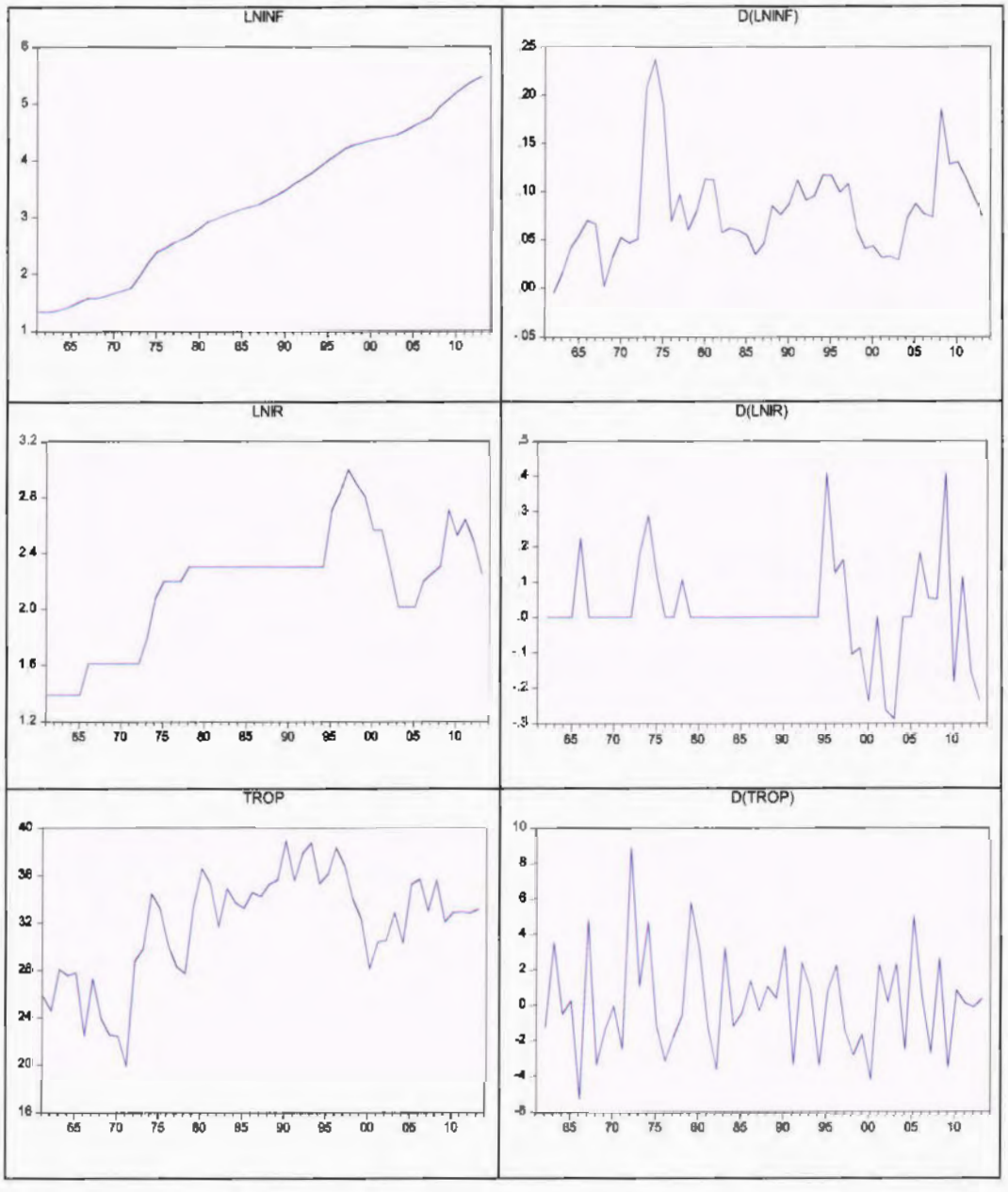
Variables	AT LEVEL		AT DIFFERENCE	
	With Intercept	With Trend	With Intercept	With Trend
LnFDI	-2.2021	-4.682*	-7.639*	-7.624*
LnGDP	-0.4603	-2.4490	-6.0710*	-6.0124*
LnEX	0.3328	-3.5751*	-5.8576*	5.8329*
LnIR	-2.5344	-2.5100	-5.4460*	-5.5668*
LnINF	-0.1524	-3.5026**	-3.5366*	-3.4498*
TROP	-2.507	-2.84	-8.97*	-8.93*

*Significant at 1 % and ** significant at 5 %

In Table 4.3-2 ADF test demonstrated that lnIR, lnGDP and TROP are non-stationary at a level and turn into stationary at 1% after taking their first difference. The variables like lnEX and lnFDI were stationary at a level with the trend at 1% level of significance. While the variable lnINF is also stationary at a level with trend at 5%. From the ADF we conclude that the variables are stationary at different level of integration.

Figure 4.1: Graphical representation of variables at Level and First Difference





From the Figure 4.1 we observed that the variables such as lnFDI, lnGDP and lnINF are displaying an increasing trend at a level while their first difference become more stable with no trend and relatively more constant variance over the time with no seasonality. From the graph of lnINF, lnIR and TROP we noticed that these series are not demonstrating any actions, it moves haphazardly up & down with no inclination at any specific point. So, the first difference of lnINF, lnIR and TROP become stationary.

4.3 Vector Auto Regressive (VAR) Lag Selection Criteria:

For the choice of ideal lag length for the ECM model we estimate the VAR model. From the Table 4.4 we noticed that according to the SIC, AIC, FPE, and HQ criteria the optimal lag length is ONE. The optimal lag length of the variables could create suited model with no correlated and homoskedastic residuals.

Table 4.4 Lag Selection Criterion

Lag	Log L	LR	FPE	AIC	SC	HQ
0	23.07	NA	1.98e-08	-0.711	-0.477	-0.923
1	108.08	145.23	2.6e-09*	-2.75*	-1.116*	-2.135*
2	133.29	36.763	4.37e-09	-2.30	0.737	-1.155
3	176.06	51.69*	3.99e-09	-2.586	1.858	-0.9066
4	214.63	36.96	5.38e-09	-2.693	3.1544	-0.4833

4.4 Johansen & Juselius Cointegration Test Results with Lag One

Although the variable LnFDI is stationary with intercept and trend in the PP test, but all the other variables become stationary after their first difference, so we are considering that all the time series variables are integrated of order one . Now we can utilize the Johansen and Juselius (1990) technique for cointegration among the variables. The J.J method based on two test statistic:

i) Trace test

ii) Maximum Eigen value test.

The results of trace test and maximum eigen value test are given in the Tables 4.5-1 and 4.5-2.

Variables: LNFDI LNGDP LNEX LNINF TROP LNIR
Trend assumption: linear deterministic trend

Table 4.5-1 Unrestricted Trace Test of Cointegration with Lag One

Hypothesis		Eigen values	Trace test	critical values	p-value
Null	Alternative				
r=0*	r ≥1	0.668	103.74	95.75	0.0126
r ≤1	r ≥2	0.347	47.508	69.819	0.7414
r ≤2	r ≥3	0.222	25.755	47.86	0.8970
r ≤3	r ≥4	0.16	12.9398	29.797	0.8943
r ≤4	r ≥5	0.075	4.015	15.4947	0.9023
r ≤5	r ≥6	0.0006	0.031	3.8415	0.8611

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
** denotes rejection of the hypothesis at the 0.05 level*

Table 4.5-2: Unrestricted Maximum Eigen Value Test with Lag One

Hypothesis		Eigen Values	Eigen Statistics	Critical values	p-value
Null	Alternative				
r=0*	r =1	0.668	56.235	40.0776	0.0004
r ≤1	r =2	0.347	21.752	33.8768	0.6268
r ≤2	r =3	0.222	12.816	27.5843	0.8948
r ≤3	r =4	0.16	8.92	21.1316	0.8385
r ≤4	r=5	0.075	3.984	14.265	0.8609
r ≤5	r=6	0.0006	0.0306	3.84147	0.8611

Trace test indicates 1 cointegrating eqn(s) at the 0.05
** denotes rejection of the hypothesis at the 0.05 level*

The value of a trace test statistic in the Table 4.5-1 is 103.74 which is more than the critical value of 95.75 at five percent of level of significance. So the trace test statistic rejects the null hypothesis of no cointegration (Ho; r=0) against the alternative hypothesis of at least one cointegrating equation exists in the system of equation. On the other hand the null hypothesis of at most one cointegrating equation is accepted as the value of a trace test statistic (47.50) is less than the critical value of 69.819 at the 5% level of significance.

Variables: LNFDI LNGDP LNEX LNINF TROP LNIR
Trend assumption: linear deterministic trend

Table 4.5-1 Unrestricted Trace Test of Cointegration with Lag One

Hypothesis		Eigen values	Trace test	critical values	p-value
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r≤2	r≥3	0.222	25.755	47.86	0.8970
r≤3	r≥4	0.16	12.9398	29.797	0.8943
r≤4	r≥5	0.075	4.015	15.4947	0.9023
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The value of a trace test statistic in the Table 4.5-1 is 103.74 which is more than the critical value of 95.75 at five percent of level of significance. So the trace test statistic rejects the null hypothesis of no cointegration (Ho; r=0) against the alternative hypothesis of at least one cointegrating equation exists in the system of equation. On the other hand the null hypothesis of at most one cointegrating equation is accepted as the value of a trace test statistic (47.50) is less than the critical value of 69.819 at the 5% level of significance.

According to the Table 4.5-2 the null hypothesis of none cointegrating vectors is rejected, as the maximum eigen value test statistic is 56.23 which is the more than the critical value of 40.0776 at the 5% level of significance. However, the null hypothesis of at most one cointegrated equations is accepted as the test statistic value of 21.75 does not have a fall in the critical region. So, in short both test statistic (trace & max eigen) indicated that there is one cointegrated equations exist in a whole system of equation. From the results of both test statistic we concluded that there is a long run association among the variables.

Table 4.6 The long Run Cointegrated Equation with Lag One

Variables	Coefficient	Standard Error	t-statistic
lnGDP	4.47	1.26775	4.05
lnEX	4.18	1.20643	3.46
LnIR	0.52	0.47675	1.106
TROP	0.0056	1.91857	0.207
LnINF	-5.77	1.91857	3.02

The long run impact of the variables like lnGDP, lnEX, lnIR, TROP, lnINF are given in the Table 4.6. From the long run coefficient of GDP it is observed that there is a positive and significant association between FDI and GDP. The coefficient of GDP is 4.47 narrates that 1 percent increase in GDP can grow FDI up to 4.5% approximately. From the long run coefficient of EX we conclude that it has a positive influence on the FDI. So, from the coefficient of 4.18 we make inference that 1% increase in annual exchange rate can increase the FDI in Pakistan approximately 4.2 percent. Moreover, the coefficient of lnIR is positive, from which we mean that the countries with high interest rate encourage the foreign investors. From the coefficient of IR we can describe that 1 percentage point increase in IR can increase the FDI approximately 0.52 percent but the coefficient of IR is insignificant. Similarly, if the high inflation rate in country

MNE's are not interested to invest in such countries. In this study the coefficient of the INF is negative, from which we means that 1 percentage point increase in INF reduces the FDI approximately 5.7 percent.

4.5 Error Correction Mechanism (ECM) Model With Lag One:

The short run dynamic of explanatory variables with lag one are given below

Dependent Variable: D (ln FDI)
Method: Least Square

$$D(lnFDI) = -0.94\{lnFDI(-1) - 4.47lnGDP(-1) - 4.18lnEX(-1) - 0.5205lnIR(-1) + 5.7710lnINF(-1) - 0.0056TROP(-1) + 36.44\} - 1.410\ D\{lnGDP(-1)\} - 2.2161\ D\{lnINF(-1)\} - 8.47\ D\{lnEX(-1)\} + 2.12\ D\{lnIR(-1)\} - 0.044\ D\{TROP(-1)\} + 0.9733$$

Table 4.7: The Short run ECM Model Estimates with Lag One

Variables	Coefficient	Std.Error	t-statistic	Probability
ECM(-1)	-0.936816	0.181502	-5.161477	0.0000*
D Ln GDP(-1)	-1.410190	0.937816	-1.503696	0.1398
D LnINF(-1)	-2.216175	2.810657	-0.788490	0.4346
D LnEX(-1)	-8.473185	1.222752	-6.929603	0.0000*
D LnIR(-1)	2.120214	0.802335	2.642555	0.0114**
D TROP(-1)	-0.044343	0.050982	-0.869782	0.3891
Constant	0.973321	0.341651	2.848872	0.0066*

'' significant at 1% '**' significant at 5% '***' significant at 10%*

R-squared	0.598345	Mean dependent var	0.142695
Adjusted R-squared	0.543574	S.D. dependent var	1.212951
S.E. of regression	0.819461	Akaike info criterion	2.566533
Sum squared Resid	29.54669	Schwarz criterion	2.831686
Log likelihood	-58.44659	Hannan-Quinn criter.	2.667856
F-statistic	10.92448	Durbin-Watson stat	2.303996
Prob (F-statistic)	0.000000		

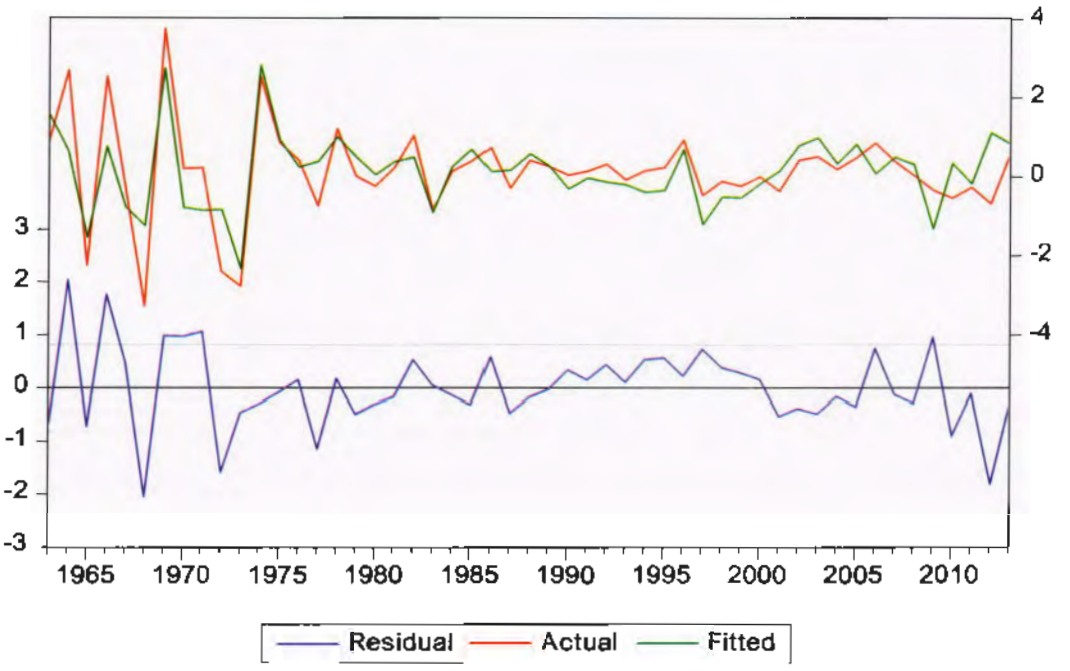
In the Table 4.7 the adjusted R-square of the estimated short run ECM model is 0.59 approximately which reports that Regressors jointly explained the variation in FDI approximately 59 percent. The F-Statistic for the short run model is 10.92 and p-value of the F-Statistic is 0.0000 which showed that estimated model is over all significant.

Moreover, the value of standard error of regression is 0.82 which indicates that the observed value of data is close to fitted regression line. The coefficient ECM is negative as expected and also significant at 1%. The negative sign of ECM confirms that the long run association exists among the variables. From the co-efficient of ECM we concluded that the short run variability of lnFDI from the long run association between FDI and its explained factors would be restore back to its equilibrium level with the speed of 94% in the next period.

In the short run GDP with lagging one has a negative and insignificant influenced on the FDI. Specifically, a one percent increase in GDP reduces the FDI by 1.4 %. The INF has a negative but insignificant impact on the FDI. In the short run estimates 1 percentage point boost up in a level of inflation may decrease in FDI by 2.21 percent with one period lag. The EX has a negative and significant impact on the FDI in Pakistan with lag one as 1 % percent increase in the rate of exchange can decreases the FDI by 8.5 percent approximately. In the short run estimated model IR has a positive and significant influenced on the FDI at first order lag. Specifically, a one percent rise in IR can improve FDI approximately 2.1%.

The TROP has a negatively but insignificant impact on the FDI at the 1% level of significance .In the short run, one percentage point increase in TROP may expected to decrease FDI by 4.4% with lag one.

Figure 4.2. Actual and Fitted Graph for ECM Model With lag One



From the Figure 4.2 we noticed that the actual value and the fitted values in the graph are close enough to each other. The residuals are obtained by the difference of actual and estimated values, the blue line in the graph is introducing residuals. From the residuals line, we concluded that the most of errors are not significantly different from zero.

4.6 Diagnostic Test of Residuals for The ECM Model with lag One

4.6.1 Test of Serial Correlation

In this study the BG test used for serial correlation under the null hypothesis that the residuals are not serially correlated against the hypothesis that there is a serial correlation. The BG test follows the chi-square distribution. The result of BG test is given in Table 4.8.

Table 4.8: The BG Serial Correlation Test for ECM Model with Lag One

F-statistic	1.820614	Prob. F(3,41)	0.1585
Obs*R-squared	5.995328	Prob. Chi-Square(3)	0.1118

From the above table 4.8 we observed that p-value is more than 1 percent, so we cannot reject the null hypothesis of no serial correlation.

4.6.2 BPG Test for Heteroskedasticity

From the BPG test in Table 4.9 we observed that there is no problem of heteroskedasticity as the P-value is more than 5% level of significance, so on the basis of P-value we accept the null hypothesis of no heteroskedasticity.

Table 4.9: The BPG Test of Heteroskedasticity for ECM Model with Lag One

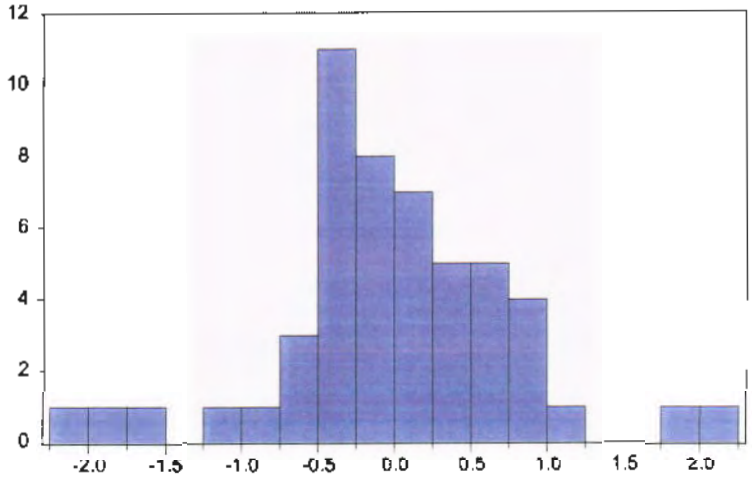
F-statistic	1.352457	Prob. F(6,44)	0.2550
Obs*R-squared	7.941166	Prob. Chi-Square(6)	0.2424
Scaled explained SS	9.114388	Prob. Chi-Square(6)	0.1672

4.6.3 Test of Normality

For a test of normality JB test is employed. The null hypothesis of JB test is that error terms are normal against alternative hypothesis in which error terms are not normal. The JB statistic follows the chi-square distribution. From the Figure 4.3 we observed

that p-value of the JB statistic is more than 5%, but the mean and median of residuals are not equal. So from the JB test we conclude that the residuals are normal.

Figure 4.3 Jarque Bera Normality test For ECM Model with Lag One



4.7 Johansen and Juselius Cointegration Test With Lag Two

Variables: LNFDI LNGDP LNEX LNINF TROP LNIR
Trend assumption: linear deterministic trend

Table 4.10-1 Unrestricted Trace Test of Cointegration with Lag Two

Hypothesis		Eigen values	Trace test	critical values	p-value
Null	Alternative				
r=0*	r≥1	0.6577	103.79	95.75	0.0125
r≤1	r≥2	0.403156	50.1811	69.819	0.6299
r≤2	r≥3	0.2303	24.37622	47.86	0.9342
r≤3	r≥4	0.0812	11.2845	29.797	0.9539
r≤4	r≥5	0.075	4.244	15.4947	0.8829
r≤5	r≥6	0.00014	0.0072	3.8415	0.9319

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
** denotes rejection of the hypothesis at the 0.05 level*

Table 4.10-2: Unrestricted Maximum Eigen Value Test with Lag Two

Hypothesis		Eigen Values	Eigen Statistics	Critical values	p-value
Null	Alternative				
r=0*	r =1	0.6577	53.611	40.0776	0.0009
r≤1	r =2	0.4031	25.805	33.8768	0.3328
r≤2	r =3	0.2303	13.092	27.5843	0.8789
r≤3	r =4	0.0812	7.041	21.1316	0.9523
r≤4	r=5	0.075	4.2367	14.265	0.8336
r≤5	r=6	0.00014	0.00722	3.84147	0.9319

Trace test indicates 1 cointegrating eqn(s) at the 0.05
** denotes rejection of the hypothesis at the 0.05 level*

According to the Table 4.10-1, the trace statistic rejects the null hypothesis of no cointegration as the value of the trace test statistic (103.79) is greater than the critical value (95.75) at 5% of level of significance. While the trace statistic accepts the null hypothesis of at most one cointegration, as the value of test statistic 50.18 is not more than the critical value of 69.82 at 5%. From the trace test we conclude that there is one cointegration equation in the system of equations. In Table 4.10-2 the maximum eigen value test statistic also confirms that there is one cointegration equation at 5% level of

significance, as the value of the test statistic 25.80 does not fall in the critical region, so the model with lag two indicates that there is a long run association exist among the variables.

Table 4.11 The Long Run Cointegrated Equation with Lag Two

Variables	Coefficient	Standard Error	t-statistic
lnGDP	3.85	0.863	4.46
lnEX	4.22	1.039	4.06
LnIR	0.19	0.416	0.47
LnINF	-5.289	1.654	3.198
TROP	0.0544	0.0233	2.332

The Table 4.11 demonstrated that lnGDP, lnEX, lnCPI and TROP have a significant influenced on the FDI, whereas lnIR has insignificant impact on the FDI with unexpected sign. From the coefficient of GDP (3.85) we conclude that a one percent increase in level of GDP increase the level of FDI inflows in Pakistan by 3.9 % approximately. Specifically, the coefficient of lnEX can be interpreted as a 1 % increase in Exchange rate increases FDI by 4.3% approximately. While from the long run coefficient of lnINF we conclude that one percentage point increase in level of INF decrease the FDI by 5.2%. From the coefficient of TROP we observed that one percentage point increase in the level of TROP can boost up FDI inflows by 5.4 %.

4.8 Error Correction Mechanism (ECM) Model With Lag Two

Dependent Variable: D (ln FDI)
Method: Least Square

$$D(lnFDI) = -1.34\{lnFDI(-1) - 3.85lnGDP(-1) - 4.22lnEX(-1) - 0.19lnIR(-1) + 5.28lnINF(-1) - 0.054TROP(-1) + 32.47\} - 3.389\ D\{lnGDP(-1)\} - 1.073\ D\{lnGDP(-2)\} + 4.028\ D\{lnINF(-1)\} - 11.39\ D\{lnINF(-2)\} - 10.26\ D\{lnEX(-1)\} - 6.603\ D\{lnEX(-2)\} + 3.73\ D\{lnIR(-1)\} + 2.47\ D\{lnIR(-2)\} - 0.1725\ D\{TROP(-1)\} - 0.0584\ D\{TROP(-2)\} + 1.994$$

Table 4.12: The Short run ECM Model Estimates with Lag Two

Variables	Coefficient	Std.Error	t-statistic	Probability
ECM(-1)	-1.34	0.195091	-6.854559	0.0000*
D Ln GDP(-1)	-3.389	-3.989528	-1.831452	0.0749***
D Ln GDP(-2)	-1.073	1.018451	-1.053620	0.2987
D LnINF(-1)	4.028	2.857065	1.409875	0.1667
D LnINF(-2)	-11.39	3.513195	-3.242235	0.0025*
D LnEX(-1)	-10.26	1.539336	-6.668978	0.0000*
D LnEX(-2)	-6.603	2.661366	-2.481153	0.0176*
D LnIR(-1)	3.73	0.612449	6.093089	0.0000*
D LnIR(-2)	2.47	1.059647	2.331333	0.0251**
D TROP(-1)	-0.1725	0.048478	-3.559624	0.0010*
D TROP(-2)	-0.0584	0.036336	-1.608261	0.1161
Constant	1.994	0.424630	4.695922	0.0000*

'' significant at 1% '**' significant at 5% '***' significant at 10%*

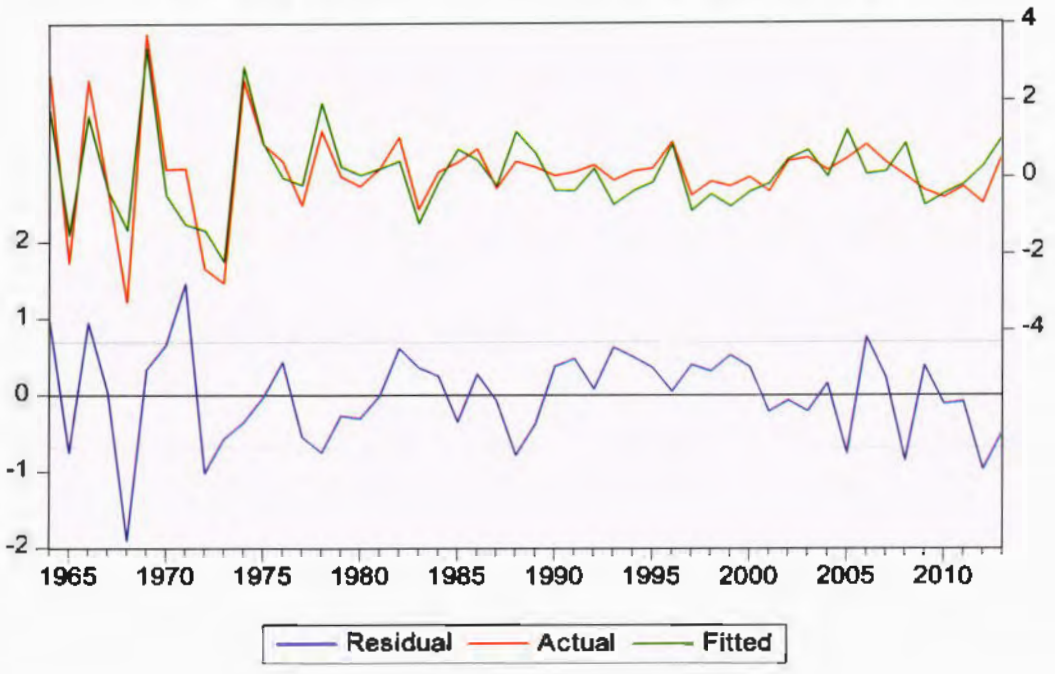
R-squared	0.752500	Mean dependent var	0.127223
Adjusted R-squared	0.680855	S.D. dependent var	1.220171
S.E. of regression	0.689310	Akaike info criterion	2.299311
Sum squared Resid	18.05562	Schwarz criterion	2.758196
Log likelihood	-45.48277	Hannan-Quinn criter.	2.474057
F-statistic	10.50322	Durbin-Watson stat	1.959587
Prob (F-statistic)	0.000000		

In Table 4.12 the R-square of the estimated short run model is 0.75. The F-Statistic for short run model is 10.50 and p-value of F-Statistic is 0.0000 which revealed that estimated model is over all significant. Moreover the value of standard error of regression is 0.69 which indicates that the observed value is close to fitted regression line. As we noticed that all these characteristic is better than the ECM model with lag

one in Table 4.11. So ECM model with lag two is better one on the basis of these specification. Additionally AIC, SC and HQ criteria is lowered than the ECM model in the Table 4.11. The coefficient of ECM is negative as expected and also significant at 1%. The negative sign of ECM confirms that there is long run association holds among independent variables and independent variables. The co-efficient of ECM (-1) = -1.33 showed that the quick speed of adjustment of short run disequilibrium of lnFDI towards the long run equilibrium association in the next period.

In short run dynamic model the first difference of lnGDP with lag one significant with negative sign, white lag two insignificant with negative sign. So we can inferred by the short run coefficient that one percent rise in lnGDP decreases the FDI inflows by 3.39 % with lag one. The coefficient of Exchange rate narrates that in short run it has negative and significant influence on FDI inflows in Pakistan. From the coefficient of first difference of lnEX we conclude that 1 % rise in level of lnEX reduces the FDI by 10.26% with lag one and 6.6% with lag two. The Interest Rate positively and significantly affected on FDI inflows in short run dynamic. On percent increase in level of lnIR can grows up FDI by 3.73 % with lag one and 2.47% with lag two. The coefficient of INF narrates that in short run model lnINF negatively influence on FDI with lag two, from the coefficient we concluded that 1 % increase in level of INF reduces the FDI by 11.39%. Trade openness in short run negatively and significantly influenced on FDI inflows with one period lag. One percentage point increase in level of TROP can reduces FDI by 17.26%.

Figure 4.4 Actual and Fitted Graph for ECM Model with Lag Two



From Figure 4.4 we saw that observed and predicted values in the graph are sufficiently close to each other. The error terms which are attained by difference of actually observed and estimated values, the blue line in the diagram presented residuals. From the residuals line, we conclude that the most of residuals are not significantly different from zero.

4.9 Diagnostic Test of Residuals for ECM Model With Lag Two:

4.9.1 Test of Serial Correlation

From the BG test in Table 4.13 we concluded that there is no problem of serial correlation, as the P- value of Chi-square is greater than five percent.

Table 4.13: The BG Test for ECM Model with Lag Two

F-statistic	0.781952	Prob. F(2,36)	0.4651
Obs*R-squared	2.081657	Prob. Chi-Square(2)	0.3532

4.9.2 Test of Heteroskedasticity

In Table 4.14 we observed that the BPG test indicates that there is no problem of heteroskedasticity because the P- value of chi-square greater than 5% of significance.

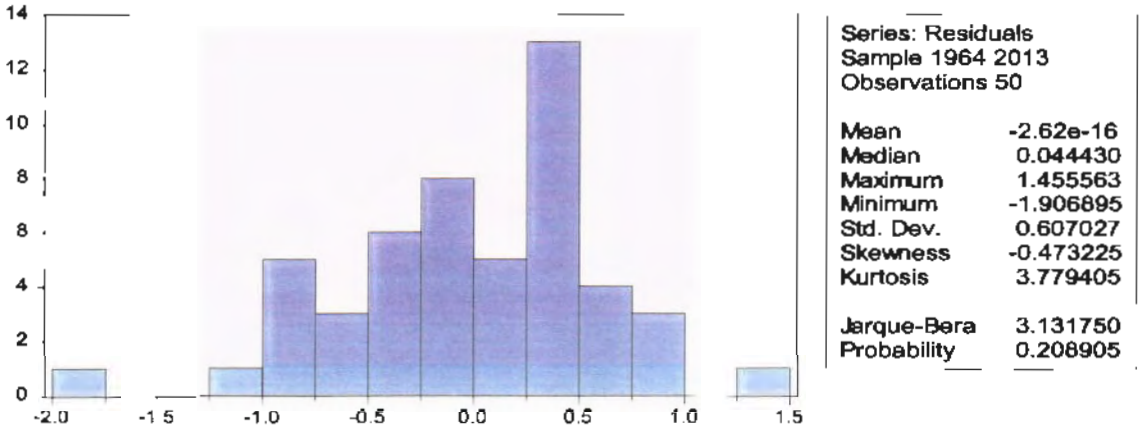
Table 4.14: The BPG Test for ECM Model with Lag Two

F-statistic	1.312394	Prob. F(11,38)	0.2553
Obs*R-squared	13.76558	Prob. Chi-Square(11)	0.2462

4.9.3 Test of Normality

The JB statistic and its p-value is greater than the 5% of level of significance in Figure 4.5 indicates that the residuals are normal.

Figure 4.5 Jarque Bera Normality Test for ECM Model with Lag Two



4.10 Auto Regressive Distributed lag Model with Maximum Lag One

4.10.1 Model Selection

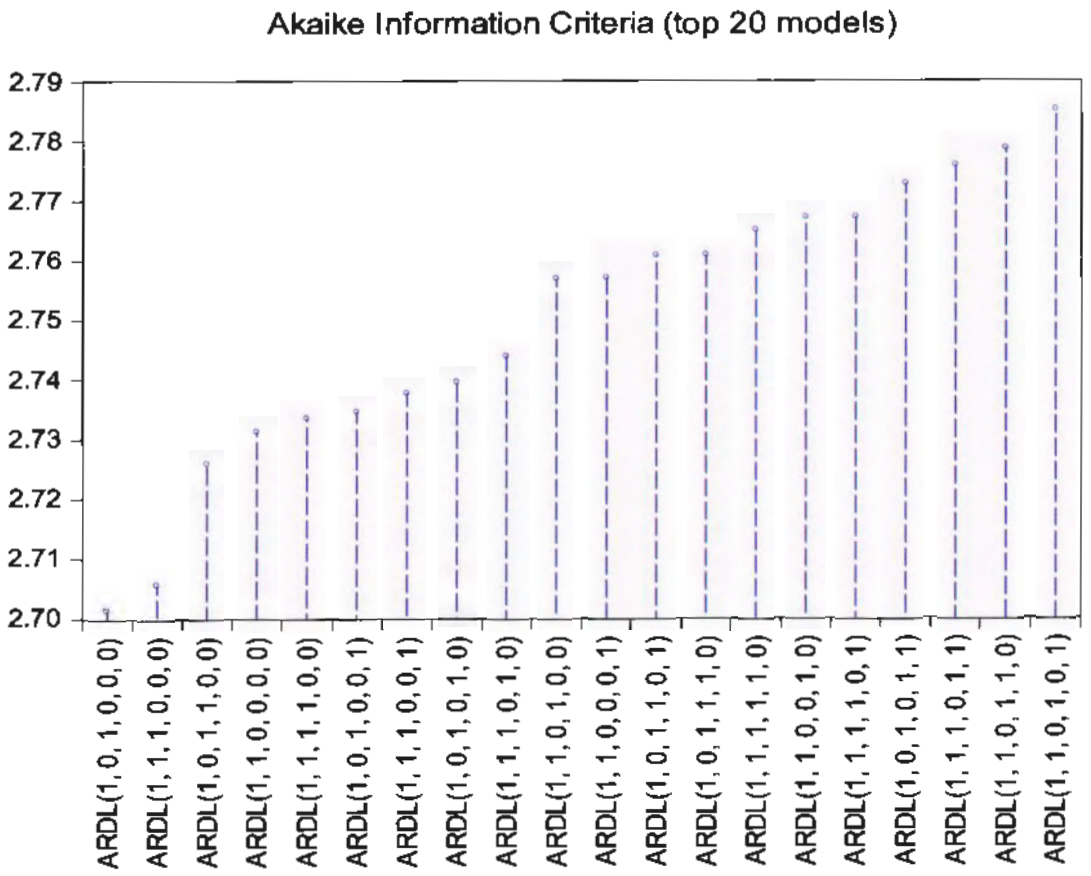
In this study, the least value of AIC criteria used for the ARDL specification by using eviews9. In the Table 4.15 top twenty ARDL specifications are given below. On the basis of AIC the optimal lag for the variables is ARDL (101000).

Table 4.15 ARDL Model Selection on Basis of AIC with Maximum Lag One

Model	Specification	Log L	AIC*	BIC	HQ	Adj-R^2
1	**ARDL(101000)**	-62.2369	**2.7014**	**3.0016**	**2.8165**	0.8489
2	ARDL(111000)	-61.3483	2.7057	3.0434	2.8351	0.8506
3	ARDL(101100)	-61.8757	2.7259	3.0637	2.8554	0.8476
4	ARDL(110000)	-63.015	2.7313	3.0315	2.8464	0.8443
5	ARDL(111100)	-61.0741	2.7336	3.1089	2.8774	0.8486
6	ARDL(101001)	-62.1026	2.7347	3.0724	2.8614	0.8462
7	ARDL(111001)	-61.1826	2.7377	3.1130	2.8816	0.8480
8	ARDL(101010)	-62.2313	2.7396	3.0774	2.8691	0.8454
9	ARDL(111010)	-62.3424	2.7439	3.1192	2.8877	0.8471
10	ARDL(110100)	-62.6809	2.7569	3.0947	2.8864	0.8428
11	ARDL(110001)	-62.6855	2.7571	3.0947	2.8866	0.8427
12	ARDL(101100)	-61.784	2.7609	3.1362	2.9047	0.8444
13	ARDL(101110)	-61.7863	2.7610	3.1363	2.9048	0.84444
14	ARDL(111110)	-60.8937	2.7651	3.1779	2.9233	0.8460
15	ARDL(110010)	-62.9506	2.7673	3.1050	2.8968	0.8411
16	ARDL(111101)	-60.9515	2.7673	3.1801	2.9256	0.8457
17	ARDL(101011)	-62.0968	2.772	3.148	2.9168	0.8426
18	ARDL(11101)	-61.176	2.7760	3.1887	2.9342	0.8443
19	ARDL(110110)	-62.2509	2.7788	3.1541	2.9227	0.*8416
20	ARDL(110101)	-624213	2.7854	3.1606	2.9292	0.8406

The Figure 4.6 is a graphically presentation of top twenty optimal model are given below by using AIC. From the Figure we observed that at the ARDL (101000) model the value of AIC is 2.7014 which is least than any other model.

Figure 4.6 Graph of Top Twenty ARDL Model with Maximum lag one



4.10.2 Bounds test For Cointegration

The bounds test based on the F-statistic with the null hypothesis of no cointegration. First, we estimate the model (4.1) given below by using the OLS method and results are given in Table 4.16. Pesaran et al. (2001) named the model (4.1) as Conditional Error Correction (CEC) in his paper.

$$\Delta LnFDI_t = \beta_1 + \sum_{i=1}^{1} \beta_{2i} \Delta LnFDI_{t-i} + \sum_{i=0}^{1} \beta_{3i} \Delta LnGDP_{t-i} + \sum_{i=0}^{1} \beta_{4i} \Delta LNEX_{t-i}$$

$$+ \sum_{i=0}^{1} \beta_{5i} \Delta LnIR_{t-i} + \sum_{i=0}^{1} \beta_{6i} \Delta LnINF_{t-i} + \sum_{i=0}^{1} \beta_{7i} \Delta TROP_{t-i} + \emptyset_1 LnFDI_{t-1} +$$

$$\emptyset_2 LnGDP_{t-1} + \emptyset_3 LnEX_{t-1} + \emptyset_4 LnIR_{t-1} + \emptyset_5 LnINF_{t-1} + \emptyset_6 TROP_{t-1} + u_t \ldots\ldots (4.1)$$

We ignored the insignificant coefficient of D(lnGDP), D(TROP) and D(lnINF) to avoid the over parametrized and run again the above model (Pesaran et al., 2001).

Table 4.16 Conditional EC Representation of ARDL (101000) Model

Variables	Coefficients	Std. Error	t-Statistic	Prob.
lnFDI(-1)	-0.8974	0.1465	-6.1225	0.0000*
D(lnEX(-1))	-8.2433	2.1359	-3.8593	0.0004*
D(lnIR)	1.8914	1.0282	1.8395	0.0731***
LnGDP(-1)	4.7128	1.8560	2.5392	0.0150*
lnEX(-1)	4.1539	2.0537	2.0226	0.0497**
lnIR(-1)	1.04277	0.8319	1.2533	0.2172
lnINF(-1)	-6.3458	3.2562	-1.9487	0.0582***
TROP(-1)	0.0067	0.04159	0.1619	0.8722
C	-37.8557	15.3029	-2.4737	0.0176**

'' significant at 1% '**' significant at 5% '***' significant at 10%*

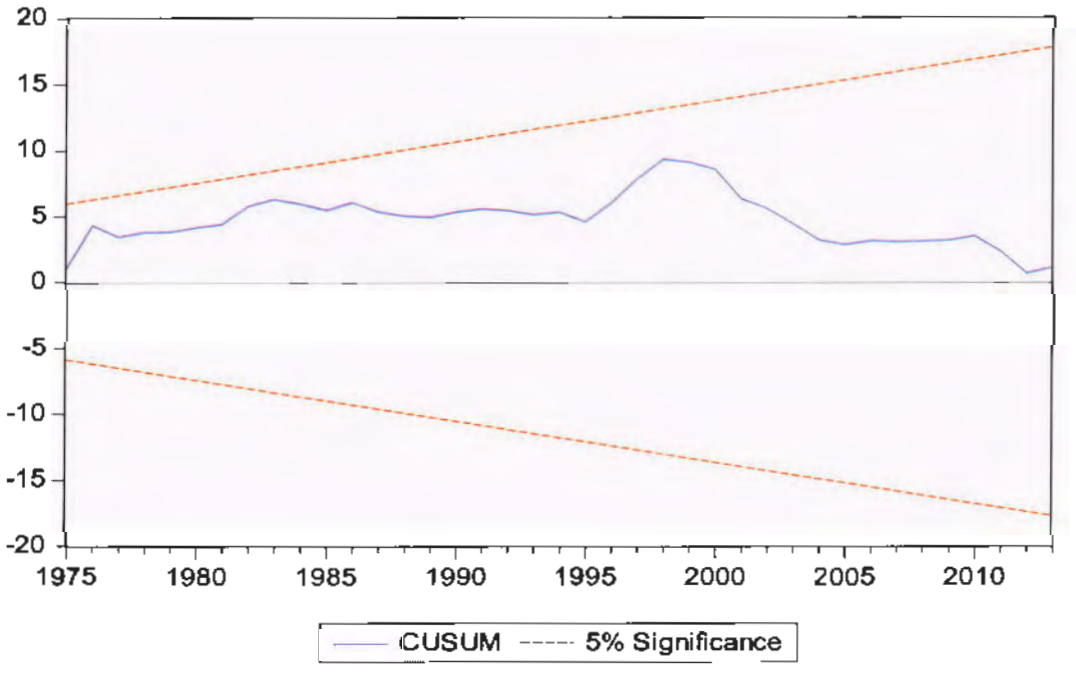
In the next step we will make sure that the above model is serially uncorrelated and dynamically stable. The BG test used for serial correlation and results are given in Table 4.17. The results showed that there is no problem of serial correlation.

Table 4.17: The BG Test for Conditional EC of ARDL (101000) Model

F-statistic	0.634620	Prob. F(2,39)	0.5355
Obs*R-squared	1.607461	Prob. Chi-Square(2)	0.4477

We used CUSUM test for the stability of the ARDL (101000) model. From Figure 4.7 we concluded that CUSUM statistic lies between the critical bounds at the 5% level of significance.

Figure 4.7 CUSUM Test for Conditional EC of ARDL (101000) Model



Now we can conduct the F-statistic test to check the significance of the coefficient of variables at the level with lag one.

Table 4.18 The Wald Test for Conditional EC of ARDL (101000) Model

Test-Statistic	Value	Lags
F-statistic	6.6024	Lags(101000)
Critical values Bounds	Pesaran et al (2001)	
Significance	I0 Bounds	I1 Bounds
5%	2.62	3.79
1%	3.41	4.68

As the value of F-statistic 6.6024 in Table 4.18 greater than the critical upper value bound so we concluded that there is a long run association among the variables.

4.10.3 ARDL (101000) Long Run Coefficient

The long run coefficients of the ARDL (10100) model by using OLS are given in Table 4.19.

Table 4.19 ARDL (101000) Estimates

Variable	Coefficient	Std.Error	t-statistic	Prob.
lnFDI(-1)	0.08386	0.01447	0.5792	0.5654
lnGDP	6.330	1.6325	3.8774	0.0003*
lnEX	-0.4957	1.5193	-0.3262	0.7458
lnEX(-1)	4.866	1.8609	2.6149	0.0122*
lnIR	1.221	0.6874	1.7772	0.0824
lnINF	-7.9676	2.8523	-2.7933	0.0077*
TROP	-0.01335	0.03898	-0.3426	0.7335
C	-50.055	13.42	-3.7278	0.0005*

''significant at 1% '**' significant at 5% '***'significant at 10%*

R-squared	0.8696	Mean dependent var.	4.8196
Adjusted R-square	0.8489	S.D dependent var.	2.2400
S.E of Regression	0.8706	Akaike info criterion	2.7014
F-statistic	41.9472	Durbin-Watson stat	1.9630
Prob (F-statistic)	0.00000		

From Table 4.19 we estimate the long run coefficients by using the given equation:

$$LnFDI_t = \frac{\beta_1}{1-0.08} + \frac{6.33}{1-0.08} LnGDP_t + \frac{4.866-0.49}{1-0.021} LnEX_t + \frac{1.221}{1-0.021} LnIR_t +$$

$$\frac{-7.9675}{1-0.021} LnINF_t + \frac{-0.0135}{1-0.021} TROP_t \quad \ldots\ldots (4.2)$$

Table 4.20 ARDL (101000) Long Run coefficient

Variables	Coefficients	Std.Error	t-Statistic	Prob.
lnGDP	6.9098	1.5904	4.3445	0.0001*
lnEX	4.7707	1.9282	2.4743	0.0173*
lnIR	1.3335	0.7470	1.7850	0.0811
lnINF	-8.6969	2.9823	-2.9161	0.0056*
TROP	-0.014579	0.042345	-0.3443	0.7323
C	-54.6371	13.249	-4.1237	0.0002

'' significant at 1% '**' significant at 5% '***' significant at 1%*

From Table 4.20 we noticed that lnGDP, lnEX, and lnINF significantly influenced lnFDI with expected sign. From the coefficient of lnGDP we conclude that 1 % increase in level of GDP can increase the FDI by 6.91 percent in the long run. While 1 % up in the level of EX can boost up FDI inflows in Pakistan by 4.77 percent. From the negative sign of INF we determine that a one percentage point increase in the level of INF can reduce the FDI inflows in Pakistan by 8.69%. The sign of lnIR is positive and TROP is negative while both are insignificant.

Table 4.21 ARDL (101000) ECM Model Estimates

Variables	Coefficients	Std.Error	t-statistic	Prob.
D(lnFDI(-1))	0.0324	0.101734	0.319312	0.7510
D(lnGDP)	7.3885	1.4400	5.131	0.0000*
D(lnEX)	0.1641	0.6658	0.24653	0.8064
D(lnIR)	1.97267	0.6049	3.2611	0.0021*
D(lnINF)	-9.1249	2.6326	-3.4661	0.0012*
D(TROP)	-0.031	0.0290	-1.0645	0.2929
ECM(-1)	-0.8777	0.2542	-3.4520	0.0012*

''significant at 1% '**' significant at 5% '***'significant at 1%*

R-squared	0.5718	Mean dependent var.	0.142695
Adjusted R-square	0.5134	S.D dependent var.	1.212951
S.E of regression	0.8460	Akaike info criterion	2.63051
Durbin Watson stat	2.21369	Schwarz info criteria	2.89566
Hannan Quinn Criter	2.7318		

As in Table 4.21 we observed that the coefficient of ECM is negative and significant. From the co-efficient of ECM we concluded that the short run variability of lnFDI from the long run association between FDI and its explained factors would be adjusted to its equilibrium level with the speed of 87% in the next period.

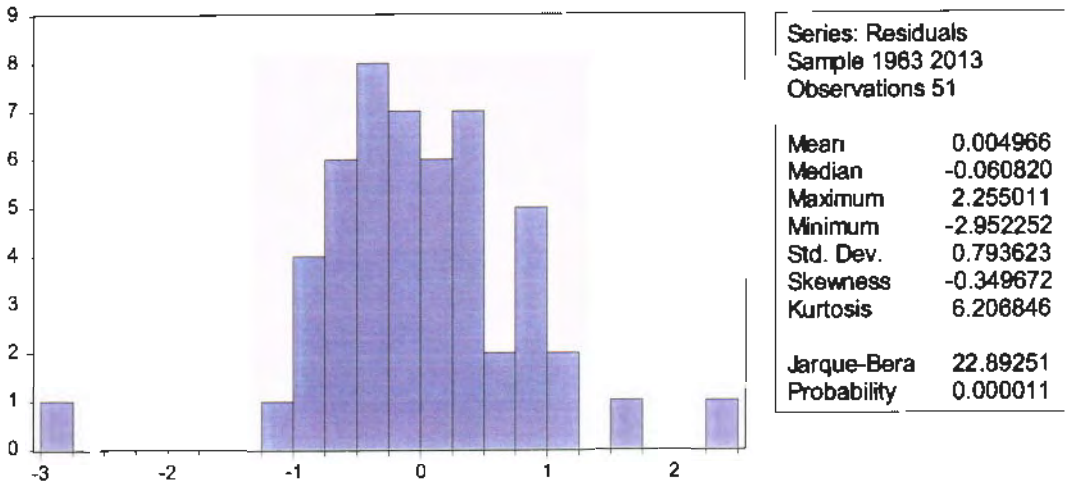
In the short run GDP has a positive and significantly influence on the FDI. While LnINF has a negative and significantly impact on FDI in the short run. The coefficient of lnIR is positive in the short run estimates and influenced on the FDI significantly. From the negative sign of TROP we concluded that in the short run Trade Openness has a negative impact on FDI.

4.11 Diagnostic Test for ARDL (101000) ECM Model

4.11.1 Test of Normality

The JB test in Figure 4.8 indicates that error's terms are not-normal as the P-value less than 5 % Level of significance.

Figure 4.8 Jarque Bera Test for ARDL (101000) ECM Model



4.11.2 Test of Serial Correlation

From the BG test in Table 4.22, we concluded that there is no problem of serial Correlation as p-Value '0.1881' greater than 5% level of significance.

Table 4.22 The BG Test for ARDL (101000) ECM Model:

F-statistic	1.37323	Prob. F(2,42)	0.2644
Obs*R-squared	3.1283	Prob. Chi-Square(2)	0.2093

4.11.3 Test of Heteroskedasticity

The BPG test results showed in Table 4.23 and from the results we concluded that there is no problem of Heteroskedasticity as P-value of chi-square greater than 5%.

Table 4.23 The BPG Test for ARDL (101000) ECM Model:

F-statistic	2.090748	Prob. F(7,43)	0.0652
Obs*R-squared	12.95036	Prob. Chi-Square(7)	0.0733

4.12 Auto Regressive Distributed lag Model with maximum Lag Two

4.12.1 Model Selection

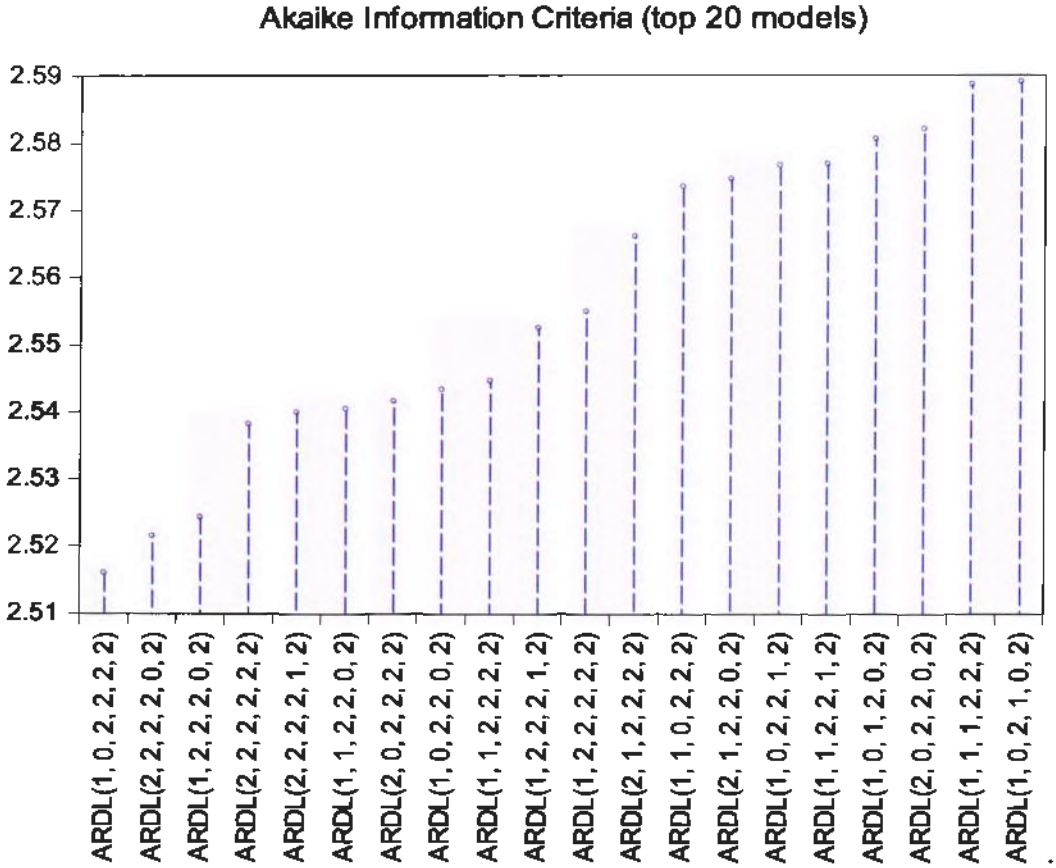
In this study, the minimum value of AIC utilized for the ARDL specification by utilizing eviews9. In the Table 4.24 top twenty ARDL specifications are given under. On the premise of AIC the optimal lags for variables is ARDL (102222).

Table 4.24 ARDL Model Selection on Basis of AIC with Maximum Lag Two

Model	Specification	Log L	AIC*	BIC	HQ	Adj-R^2
1	**ARDL(102222)**	-49.155	**2.516**	3.084	2.733	0.8772
2	ARDL(222202)	-48.30	2.52	3.13	2.75	0.8779
3	ARDL(122202)	-49.367	2.538	3.09	2.74	0.876
4	ARDL(222222)	-46.721	2.538	3.22	2.7986	0.878
5	ARDL(222212)	-47.7667	2.5398	3.183	2.785	0.8769
6	ARDL(112202)	-50.780	2.54	3.07	2.74	0.8769
7	ARDL(202222)	-48.8087	2.5415	3.1476	2.7731	0.8754
8	ARDL(102202)	-51.8535	2.5432	3.0357	2.7314	0.8707
9	ARDL(112222)	-48.885	2.5445	3.1505	2.7716	0.8750
10	ARDL(122212)	-49.0867	2.552	3.1584	2.7840	0.8740
11	ARDL(122222)	-48.1616	2.5549	3.1989	2.801	0.8750
12	ARDL(212222)	-48.4368	2.566	3.210	2.81229	0.8736
13	ARDL(110222)	-51.62	2.5734	3.1037	2.776	0.8684
14	ARDL(212202)	-50.6531	2.5746	3.1428	2.792	0.8698
15	ARDL(102212)	-51.7045	2.5766	3.1069	2.7792	0.8680
16	ARDL(112212)	-50.709	2.5768	3.145	2.794	0.8695
17	ARDL(101202)	-53.8026	2.5804	3.035	2.754	0.864
18	ARDL(202202)	-51.84	2.5819	3.1122	2.7846	0.8673
19	ARDL(111222)	-51.011	2.588	3.1569	2.8058	0.8679
20	ARDL(102102)	-54.02	2.5890	3.044	2.7627	0.8629

The Figure 4.6 is graphically representation of top twenty optimal ARDL model are given below by using AIC. From the figure we observed that at ARDL (102222) model the value of AIC is 2.5159 which is least than any other.

Figure 4.9 Graph of Top Twenty ARDL Model with maximum Lag Two



4.12.2 Bounds test For Cointegration

Initially we estimate the model (4.3) given below by utilizing OLS method and results are given in Table 4.25. Next, we conducted the bounds test based on the F-statistic with the null hypothesis of no cointegration.

$$\Delta LnFDI_t = \beta_1 + \sum_{i=1}^{1} \beta_{2i}\Delta LnFDI_{t-i} + \sum_{i=0}^{1} \beta_{3i}\Delta LnGDP_{t-i} + \sum_{i=0}^{1} \beta_{4i}\Delta LNEX_{t-i} + \sum_{i=0}^{1} \beta_{5i}\Delta LnIR_{t-i} + \sum_{i=0}^{1} \beta_{6i}\Delta LnINF_{t-i} + \sum_{i=0}^{1} \beta_{7i}\Delta TROP_{t-i} + \emptyset_1 LnFDI_{t-1} + \emptyset_2 LnGDP_{t-1} + \emptyset_3 LnEX_{t-1} + \emptyset_4 LnIR_{t-1} + \emptyset_5 LnINF_{t-1} + \emptyset_6 TROP_{t-1} + u_t \ldots (4.3)$$

We disregarded the insignificant coefficient of D(lnGDP), D(TROP) and D(lnINF) to escape the over parametrized and estimate the model above once again (Pesaran et al., 2001).

Table 4.25 Conditional EC Representation of ARDL (102222) Model

Variables	Coefficients	Std. Error	t-Statistic	Prob.
D(lnEX)	-2.017	1.494	-1.3499	0.1846
D(lnEX(-1))	-8.055	1.791	-4.498	0.0001
D(lnIR)	1.616	0.746	2.168	0.0364
D(lnIR(-1))	1.085	0.604	1.7959	0.0801
lnFDI(-1)	-0.914	0.1985	-4.605	0.0000
LnGDP(-1)	4.5233	2.029	2.23	0.0314
lnEX(-1)	3.886	1.671	2.326	0.0252
lnIR(-1)	0.7475	0.909	0.8665	0.3914
lnINF(-1)	-5.8589	2.941	-1.9922	0.0532
TROP(-1)	0.0047	0.041	0.1161	0.9081
C	-36.02	15.74	-2.289	0.0274

'' significant at 1% '**' significant at 5% '***' significant at 10%*

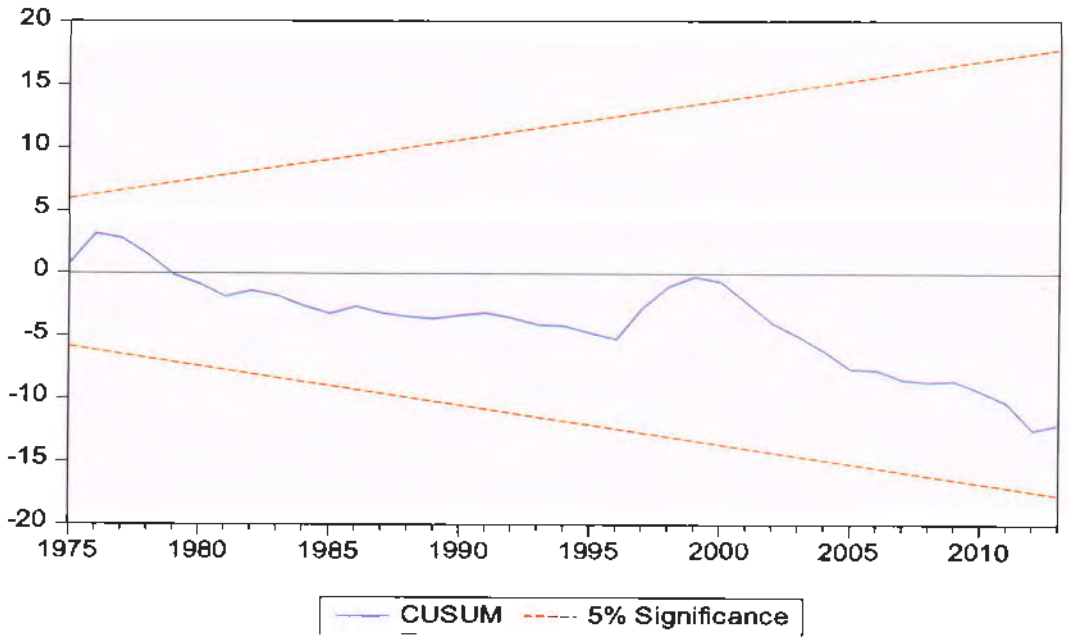
In the following step, we will verify that the above model is serially uncorrelated and dynamically stable. The BG test utilized for serial correlation and results are given in Table 4.26 on next page. The results revealed that there is no problem of serial correlation.

Table 4.26: The BG Test for Conditional EC Representation of ARDL (102222):

F-statistic	0.274745	Prob. F(2,38)	0.7613
Obs*R-squared	0.726961	Prob. Chi-Square(2)	0.6953

The Cumulative Sum (CUSUM) test is utilized for the stability of the model (4.3). From Figure 4.10, we concluded that CUSUM statistic lies between the critical bounds at 5% level, which indicated that model (4.26) is stable dynamically.

Figure 4.10 CUSUM Test for Conditional EC for ARDL (102222) Model



Now we can conduct F-statistic test to check the significance of the coefficient of variables at level with lag one.

Table 4.27 The Wald Test for Conditional EC Representation of ARDL (102222)

Test-Statistic	Value	Lags
F-statistic	9.1289	Lags(102222)
Critical values Bounds	Pesaran et al (2001)	
Significance	I0 Bounds	I1 Bounds
5%	2.62	3.79
1%	3.41	4.68

From the Table 4.27 we observed that the value of F-statistic is 9.128, which is greater than the critical upper bound, so we established that there is a long run relationship exists among the variables.

4.12.3 ARDL (102222) Long Run Coefficient

The coefficients of the ARDL (102222) model by using OLS method are given in Table 4.28.

Table 4.28 ARDL (102222) Estimates

Variables	Coefficient	Std.Error	t-statistic	Prob.
lnFDI(-1)	0.021	0.1468	0.14678	0.8841
lnGDP	4.600	1.9355	2.3771	0.0229
lnEX	0.6974	0.9211	0.7572	0.4539
lnEX(-1)	-0.10295	2.4524	-0.0419	0.9667
lnEX(-2)	3.5089	1.3064	2.6859	0.0109
lnIR	2.186	0.8521	2.566	0.0146
lnIR(-1)	0.7211	0.9853	0.7318	0.4690
lnIR(-2)	-2.6233	0.9197	-2.852	0.0071
lnINF	-4.0401	5.392	-0.7492	0.4586
lnINF(-1)	-9.3965	8.0677	-1.16469	0.2518
lnINF(-2)	7.5213	4.3154	1.74288	0.0899
TROP	-0.07337	0.0407	-1.8017	0.0800
TROP(-1)	0.0121	0.05674	0.2140	0.8317
Trop(-2)	0.10771	0.057	1.8829	0.0678
C	-37.085	15.85	-2.3397	0.0250

''significant at 1% '**' significant at 5% '***'significant at 10%*

R-squared	0.911623	Adjusted R-square	0.877254
S.D dependent var.	2.15514	S.E of Regression	0.755057
Akaike info criterion	2.51588	F-statistic	26.52478
Durbin-Watson stat	2.41105	Prob (F-statistic)	0.00000

From Table 4.28 we estimate the long run coefficients by using the equation given on the next page:

$$LnFDI_t = \frac{\beta_1}{1-0.021} + \frac{4.600}{1-0.021} LnGDP_t + \frac{0.69-0.103+3.508}{1-0.021} LnEX_t +$$

$$\frac{2.186+0.72-2.6233}{1-0.021} LnIR_t + \frac{-4.040-9.369+7.5212}{1-0.021} LnINF_t + \frac{-0.07337+0.012+0.1077}{1-0.021} TROP_t$$

..... (4.4)

Table 4.29 ARDL (102222) Long Run coefficient

Variables	Coefficients	Std.Error	t-Statistic	Prob.
lnGDP	4.7022	1.5783	2.979	0.0052*
lnEX	4.1937	1.769	2.371	0.0232**
lnIR	0.29022	0.7528	0.3855	0.7021
lnINF	-6.0457	2.854	-2.1180	0.0411**
TROP	0.0475	0.048	0.9895	0.3290
C	-37.902	13.107	-2.8917	0.0065*

'' significant at 1% '**' significant at 5% '***' significant at 10%*

From Table 4.29 we observed that lnGDP, lnEX, and lnINF has a significantly impacted on FDI with expected sign. From the coefficient of GDP we determined that 1 % increase in level of GDP increase the FDI by 4.70 percent in the long run. While 1 % up in the level of EX can support up FDI inflows in Pakistan by 4.20 percent. From the negative indication of lnINF we make interpretation that one percentage point upturn in level of inflation can decrease the FDI inflow by 6.04% in Pakistan. The sign of lnIR and TROP is positive but have insignificant impact.

Table 4.30 ARDL (102222) ECM Model Estimates

Variables	Coefficients	Std.Error	t-statistic	Prob.
D(lnFDI(-1))	0.1054	0.1214	0.8679	0.3906
D(lnGDP)	3.4295	1.9720	1.7390	0.0897***
D(lnEX)	0.4743	1.4013	0.3384	0.7368
D(lnEX(-1))	-4.4761	2.0944	-2.1371	0.0387**
D(lnIR)	2.3548	0.8320	2.7927	0.0080*
D(lnIR(-1))	2.5722	0.9297	2.7665	0.0085*
D(lnINF)	-3.5783	3.8752	-0.9233	0.3613
D(lnINF(-1))	-7.4112	3.4315	-2.1597	0.03687**
D(TROP)	-0.0802	0.0411	-1.9489	0.0583**
D(TROP(-1))	-0.1144	0.0396	-2.8870	0.0062*
ECM(-1)	-1.1018	0.1702	-6.4698	0.0000*

'' significant at 1% '**' significant at 5% '***' significant at 10%*

R-squared	0.7279	Mean dependent var.	0.142695
Adjusted R-square	0.6599	S.D dependent var.	1.212951
S.E of regression	0.7073	Akaike info criterion	2.333707
Durbin Watson stat	2.4088	Schwarz info Criter	2.750375
Hannan Quinn Criter	2.4929		

As in Table 4.30 we observed that the coefficient of ECM is negative and significant. The negative and significant coefficient of ECM (-1) =1.10 described that 110 percent of deviation from the long term equilibrium association between FDI and its explained factors are corrected in the next period.

The R-squared in the Table 4.30 is 0.72 which is more than the $R^2$of the ARDL (101000) ECM model which is 0.57 in the Table 4.21, the standard error of regression more close to zero than the model in Table 4.21. Moreover, the value of AIC, SC and HQ is less than the model ARDL (101000). The normality of residuals for the ARDL (102222) ECM model satisfied the all three properties like JB, Skewness and equal mean and median. On the basis of these characteristics we conclude that ARDL (102222) ECM model is more suitable than the ARDL (101000).

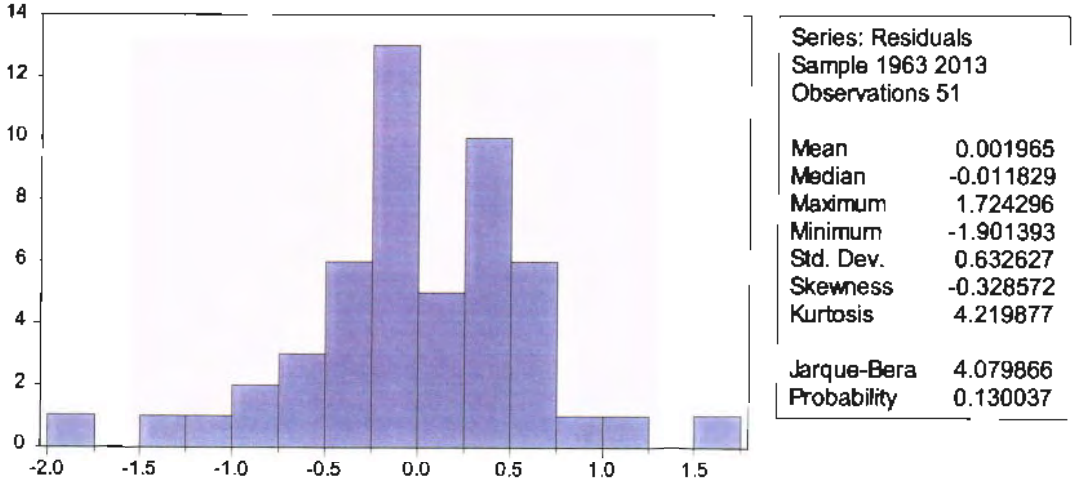
In the short run LnGDP has a positive and significant impact on the FDI in Pakistan. Whereas lnEX and LnINF adversely and significantly effect on the FDI in the short run with lag one. The coefficient of lnIR has positive and significant influenced on FDI in the short run with lag one. From the negative sign of TROP we concluded that in short run Trade Openness has a negative impact on the FDI.

4.13 Diagnostic Test for ARDL (102222) ECM Model.

4.13.1 Test of Normality

From the Figure 4.11 we noticed that JB test indicates that P-value greater than 5 % Level of significance. Additionally the skewness of the residuals are close to zero with equal mean and median. The residuals of ARDL (102222) ECM model are normal with satisfying all three conditions.

Figure 4.11 Jarque Bera Test for ARDL (102222) ECM Model



4.13.2 Test of Serial Correlation

From the BG test in Table 4.31 we decided from p-value '0.1058' which is greater than 5% level of significance so, there is no problem of serial correlation in ARDL (102222) ECM model.

Table 4.31 The BG Test for ARDL (102222) ECM Model:

F-statistic	1.631812	Prob. F(4,37)	0.1868
Obs*R-squared	7.638186	Prob. Chi-Square(4)	0.1058

4.13.3 Test of Heteroskedasticity

The BPG test showed in Table 4.22 and from the results we concluded that there is no problem of heteroskedasticity as P-value of chi-square greater than 5%.

Table 4.32 The BPG Test of ARDL (102222) ECM Model:

F-statistic	2.115177	Prob. F(11,39)	0.0424
Obs*R-squared	19.05689	Prob. Chi-Square(11)	0.0601
Scaled explained SS	18.84377	Prob. Chi-Square(11)	0.0640

CHAPTER 5

CONCLUSION

In this study, we investigated the effects of variables such as lnGDP, lnEX, lnIR, lnINF and TROP on the FDI inflow in Pakistan for the period of 53 years, from 1961 to 2013. Most importantly, we checked the stationary condition of the variables initially by utilizing PP and ADF unit root test. According to the PP unit root test we concluded that all the variables are stationary at the same level of integration, so we used J.J cointegration test for the long run association among the variables. From The ADF test we determined that the LnINF, LnFDI and LnEX are stationary at level, but all the other variables are become stationary after their first difference at 1 % level of significance. For the optimal lag length the VAR model was utilized in this study, on premise of AIC, SC and HQ we found that the optimal lag is one. From the trace test and maximum eigen test with lag one we presumed that there is a one cointegrated equation exists among the economic variables. From the long run coefficient we inferred that IR and EX can rise FDI inflow in Pakistan significantly. While INF has a negative and critical effect on the FDI inflows. For the short run coefficient ECM model estimated and from the short run coefficient we established that EX with one period lag has a negative and significant impacted on the FDI. While IR with one period lag has a positive and significant influenced on FDI.

Next, to look upon the significance of lag two of the variables we used lag two, and from the results of J.J cointegration we concluded that the long run association is found among the variables. The positive coefficients of GDP, EX and TROP in the long run cointegrated equation narrated that these variables can boost up FDI inflows in

Pakistan. From the short run coefficient of ECM model we observed that GDP, EX, and TROP with one period lag has a negative and significant impacted on FDI, while IR positive and significant role on the FDI in the short run with one period lagging. Moreover EX and INF with two period lagging has a negatively and significantly influenced on the FDI in the short run in case of Pakistan, while the IR has a positive and significant role with one and two periods lagging .

From another look of stationary condition of variables in ADF test, we noticed that all the variables become stationary after their first difference, but INF, FDI and EX are stationary at level at 5% of the level of significance. So we employed ARDL model for the long run and short run behavior of the variables after accepting that the variables are stationary at different levels. On premise of AIC criteria with maximum lag one the selected best model in Eviews 9 is ARDL (101000). From the long run coefficient of ARDL (10100) model we concluded that GDP & EX are positively and significantly boost up FDI inflows in Pakistan while INF has a negative impacted on FDI. From ARDL (101000) ECM short run estimates, we noticed that GDP and IR positively expand the FDI whereas INF had a negative and significant sign in the short run. The problem in ARDL (101000) ECM model is that residuals are not normal. Henceforth we estimate the model ARDL (102222) selected on the basis of AIC with maximum lag two. From the long run coefficient we decided that there is a long run coefficient exists among the variables. The long run coefficient of ARDL (102222) narrated that GDP and EX has a positive part to support up FDI, but INF has a negative effect on FDI. In ARDL (102222) ECM short run estimates GDP and IR are positive, however EX and INF with one period lag effects the FDI negatively.

CHAPTER 6

REFERENCES

Acheampong, P. and Osei, V. (2014). "Foreign Direct Investment inflows into Ghana: should Focus Be on Infrastructure or Natural Resources? Short Run and Long Run Analyses", *International Journal of Financial Research,* vol.5.

Ahmad, U. and Mayowa, G. (2012). "The Determinants and Impact of FDI in Nigeria", *International Journal of Business and Management,* Vol.7.

Akhtar, M.H. (2000). "The Determinants of FDI in Pakistan: An Econometric Analysis", *The Lahore Journal of Economics,* vol.5, pp.1-22

Alogoskoufis, G. and Smith, R. (1991). "On Error Correction Model, Specification, Interpretation, Estimation", *Journal of economic surveys,* vol 5.

Anfofum, A., Gambo, S. and Suleiman, T. (2013). "Estimating The Impact of FDI in Nigeria", *The International Journal of Humanities and Social Science,* vol.3.

Antwi, S., Ebenezer, M. and Xicang, Z. (2013). "Impact of Foreign Direct Investment and Economic Growth: Empirical Evidence from Ghana", *International Journal of business and social Research,* vol. 3, pp.64-74.

Antwi, S., Ebenezer, M., Gifty, A, M. and Xicang, Z. (2013). "Impact of Foreign Direct Investment on Economic Growth: Empirical Evidence from Ghana", *International Journal of Academic Research in Accounting, Financial and Management Science,* vol. 3, pp.18-25.

Anwar, Z. and Afza, T. (2014). "Impact of Terrorism, Gas Shortage and Political Instability on FDI Inflows in Pakistan", *Science International*, *26*(1).

Anwar, Z., Saeed, R., Khan, M.K. and Shan-e-Ahmad, S. (2013). "Determinants of Foreign Direct Investment (FDI) In Pakistan's Agriculture Sector", *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development,* vol 13, Issue 1.

Aqeel, A. and Nishat, M. (2005) "The Determinants of Foreign Direct Investment in Pakistan", *The Pakistan development Review,* vol 4, pp.651-664.

Asiedu, E. (2002). "On The Determinants Of Foreign Direct Investment To Developing Countries: Is Africa Different?" , *World Development,* vol 30, pp.107-119.

Asiedu, E. (2006). "Foreign Direct Investment in Africa: The Role Of Natural Resources, Market Size, Government Policy, Institutions and Political Instability", *The World Economy*, vol 21, pp.63-77.

Aw, Y. T. and Tang, T. C. (2010). "The Determinants of Inward Foreign Direct Investment: The Case of Malaysia", Monash Economics Working Paper22/09 ISSN: 1441-5429.

Azam, M. (2010). "Economic Determinants of Foreign Direct Investment In Armenia, Kyrgyz Republic and Turkmenistan: Theory and Evidence", *Eurasian Journal of Business and Economic*, vol. 3, pp.31-44.

Azam, M. and Lukman, L. (2010) "Determinants of Foreign Direct Investment in India, Indonesia and Pakistan", *Journal of Managerial Science*, vol 9, pp.31-44.

Azam, K.M. and Naeem-ur-Rehman, K. (2009). "Effect of Economic Factor On Foreign Direct Inflows: Evidence from Pakistan" *Sarhad J. Agric.* vol.25, pp.135-140.

Balasubramanyan, V. N., Sailisu, M. and Sapsford, D. (1996). "Foreign Direct Investment and Growth in EP and IS Countries", *The Economic Journal,* pp.92-105

Board of Investment,. (2015). *Trade Policy 2013 and Investment Strategy 2013-2017.* Retrieved from http://www.boi.gov.pk).

Brima, S. (2015). "Macroeconomic Determinants of Foreign Direct Investment in Sierra Leone: An Empirical Analysis" *International Journal of Finance*, vol.7.

De Melllo, L. (1999). "Foreign Direct Investment-Led Growth: Evidence from Time Series and Panel Data", *Oxford economic paper*, pp.252-276.

Dickey, D. A. and Fuller, W. A. (1979). "Distribution of The Estimator for Autoregressive Time Series with a unit Root", *Journal of American Statistical Association,* pp. 427-431.

Engle, R.F, and Granger, C. W. J. (1987). "Cointegration and Error Correction: Representation, Estimation, and Testing", *Econometrica*, vol.55, pp.251-276.

Erdal, F., and Ekram, T. (2002). "Locational Determinants of Foreign Direct Investment In An Emerging Market Economy: Evidence from Turkey", *Multinational Business Review*, vol 10.

Froot, K. A. And Stein, J.C. (1991). "Exchange Rate and Foreign Direct Investment: An Imperfect Capital Markets Approach", *Quarterly journal of Economics*, vol 106, pp.1191-1217.

Haroon, M. and Nasr, M. (2011). "Role of Private Investment in Economic Development of Pakistan" *International Review of Business Research Paper*, vol.7, pp.420-439.

Haq, A. (2013). "An Empirical Assessment of Determinants of Foreign Direct Investment in Pakistan", *International of Humanities and Management Science,* vol.1.

Iqbal, A., Azim, P., Akram, W. and Farooq, U. (2013). "Impact of Foreign Direct Investment and On the Economic Growth: A Case Study of Pakistan", *J. Asian Dev. Study, vol 2.*

International Financial statistics (IFS), International Monetary Funds (IMF).

Iqbal, M.S., sheikh, F.M. and Shar, H.A. (2010). "Causality Relationship between Foreign Direct Investment, Trade and Economic Growth in Pakistan", *Asian Social Science* vol 6.

Javed, M. R., Parvez, A. and Uzma, I. (2013). "Determinants Of Foreign Direct Investment: An Empirical Analysis of Pakistan", *J. glob. And Sci. Issue,* vol 1, Issue 3.

Jha, G.M., Agrawal A., Gupta, A. and Mishra, A.K. (2012). "Determinants of FDI in South Asia", *International Research Journal of Social Science,* Vol. 2(1).

Johansen, S. and Juselius, K (1990). "Maximum Likelihood Estimation and Inference on Cointegration with Application to the Demand for Money", *Oxford Bulletin Of Economic and Statistics*, vol 52, pp 169-210.

Khan, Ashfaque H. and Yun Hawan Kim (1999), *EDRC report series no.6.*

Khan, M.A. and Khattak, N. (2009). "Effect of Economic Factor on Foreign Direct Investment Inflows: Evidence from Pakistan (1971-2005)", *Sarhad J. Agric, vol 25.*

Khan, G.A. and Hassan, I. (2013). "Analyzing the Determinants of Foreign Direct Investment (FDI): A Study of Malaysia From 1980-2010", *Management and Administrative Science Reviews,* vol.1 pp.33-39.

Khathlan, K. (2013). "Foreign Direct Investment Inflows and Economic Growth in - Saudi Arabia: A Cointegration Analysis" *Review of Economic and Finance,* pp.70-80.

Koojaroenprasit, S. (2013). "Determinants of Foreign Investment in Australia", *journal of Business and Management Research,* vol 3, pp. 20-30.

Mughal, M. (2008). "Boon or Bane of FDI in Economic Growth of Pakistan", Munich Personal Repec Archive (MPRA) Paper no.16468.

Mughal, M. M. and Akram, M. (2011). "Does Market Size affect FDI", *Interdisciplinary Journal of Contemporary Research in Business,* vol 2.

Nishat, M. and Aqeel, A. (1998). "The Empirical Determinants of Direct Foreign Investment in Pakistan", *saving and Development, vol* 24.

Pakistan Economic Survey 2013-2014. (2014). Retrieved from http://www.finance.gov.pk/survey_1314.html.

Pesaran, M.H., Shin, Y. and Smith, R. J. (2001). "Bounds Testing Approaches to the Analysis Of level Relationship" *Journal of Applied Econometrics,*

Rasheed, K. M., Sabir, H .M. Tahir, S.H and Farooq, M.U. (2012). "The Determinants of The Investment in Pakistan over the Period 1975-2011", *Interdisciplinary Journal of Contemporary Research in Business,* vol 4, no 8.

Saeed, N. (2001). "Foreign Direct Investment and Its Impact on Trade and Growth of Pakistan", *Ph.d dissertation, Department of Economics Islamia University Bahawalpur.*

Shah, Z. and Ahmad Q. M. (2002). "Measurement of Cost of Capital for Foreign Direct Investment in Pakistan: A neoclassical approach", *The Pakistan Development Review,* vol *41:4,* pp. 807-23.

South Asia Terrorism Portal. (2015). *Fatalities in Terrorism in Pakistan 2003-2015.* Retrieved from http://www.satp.org/satporgtp/countries/pakistan/database/casualties.htm

Thompson, E.R. and Poon, P.H. (2000). "ASEAN after the Crisis: Links between Foreign Direct Investment and Regulatory Change", *ASEAN Economic Bulletin.*

Ullah, S., Haider, S.Z. and Pervez, A. (2012). "Impact of Exchange Rate Volatility on Foreign Direct Investment", *Pakistan Economic and Social Review* vol.50, pp.121-138.

Ullah, I., Shah, M. and Farid Ullah, k. (2014). "Domestic investment, Foreign Direct Investment and economic Growth Nexus: A case of Pakistan", *Hindawi Publishing Corporation Economic Research International.*

UNCTAD (2103)., *World Investment Report.* New York and Geneva: United Nations. Retrieved from http://www.unctad.org/fdistatistics.

Yousaf, M.M., Zakir, H. and Nasir, A. (2008). "Economic Evaluation of Foreign Direct Investment In Pakistan", *Pakistan Economic and Social Review,* vol 46, pp. 37-56.

Data Appendix

YEAR	LNEX	LNIR	LNGDP	LNFDI	TROP	LNINF
1961	1.560647	1.386294	8.307607	0.832909	25.83979	1.328598
1962	1.560647	1.386294	8.350689	0	24.58012	1.32342
1963	1.560647	1.386294	8.420799	0.916291	28.06721	1.33788
1964	1.560647	1.386294	8.54294	3.613617	27.55532	1.378826
1965	1.560647	1.386294	8.680113	1.360977	27.78046	1.433017
1966	1.560647	1.609438	8.774407	3.901973	22.50019	1.502801
1967	1.560647	1.609438	8.909752	3.613617	27.28263	1.568695
1968	1.560647	1.609438	8.998395	0.336472	23.93002	1.5704
1969	1.560647	1.609438	9.063339	4.077537	22.52955	1.601773
1970	1.560647	1.609438	9.213046	4.278054	22.43874	1.653889
1971	1.560647	1.609438	9.268803	4.50092	19.93229	1.700111
1972	2.161181	1.609438	9.138749	2.091864	28.75681	1.750645
1973	2.30201	1.791759	8.752247	-0.69315	29.83046	1.958229
1974	2.292535	2.079442	9.079438	1.84055	34.45788	2.194589
1975	2.292535	2.197225	9.336092	2.701361	33.24603	2.38442
1976	2.292535	2.197225	9.498409	3.113515	30.09562	2.453557
1977	2.292535	2.197225	9.624174	2.370244	28.30545	2.550075
1978	2.292535	2.302585	9.788082	3.569533	27.71982	2.609652
1979	2.292535	2.302585	9.888779	3.583519	33.44991	2.689082
1980	2.292535	2.302585	10.0728	3.339322	36.5872	2.801859
1981	2.292535	2.302585	10.24355	3.555348	35.32949	2.914115
1982	2.472114	2.302585	10.33286	4.584967	31.71009	2.971474
1983	2.573907	2.302585	10.26437	3.740048	34.89608	3.033152
1984	2.642361	2.302585	10.34663	3.871201	33.69653	3.092243
1985	2.768103	2.302585	10.34641	4.252772	33.23753	3.146872
1986	2.812261	2.302585	10.37033	4.978112	34.56735	3.181335
1987	2.856401	2.302585	10.41486	4.682131	34.23846	3.227085
1988	2.890555	2.302585	10.55771	5.08883	35.25661	3.311775
1989	3.022447	2.302585	10.6009	5.342334	35.63007	3.387293
1990	3.077652	2.302585	10.5969	5.376204	38.90949	3.473948
1991	3.169718	2.302585	10.72441	5.505332	35.55468	3.585412
1992	3.222182	2.302585	10.7921	5.814429	37.88786	3.676249
1993	3.336025	2.302585	10.84892	5.724891	38.74735	3.771319
1994	3.419908	2.302585	10.85697	5.869579	35.32705	3.88793
1995	3.454507	2.70805	11.01265	6.092214	36.13275	4.004322
1996	3.585702	2.833213	11.05596	7.00461	38.33013	4.103024
1997	3.716288	2.995732	11.04185	6.525176	36.85227	4.210762
1998	3.807699	2.890372	11.03798	6.399094	34.01173	4.271179
1999	3.901987	2.80336	11.05047	6.157614	32.31996	4.31177
2000	3.982448	2.564949	11.21118	6.15252	28.12961	4.354511
2001	4.125959	2.564949	11.18871	5.775793	30.37153	4.385508
2002	4.08973	2.302585	11.18867	6.18353	30.53763	4.417881
2003	4.056158	2.014903	11.32954	6.682109	32.8445	4.446606
2004	4.064879	2.014903	11.4925	6.85583	30.30013	4.518412
2005	4.08622	2.014903	11.6037	7.329094	35.25329	4.60517
2006	4.098857	2.197225	11.82966	8.1665	35.68173	4.6814
2007	4.106578	2.251292	11.93417	8.544731	32.99043	4.754638

2008	4.254307	2.302585	12.04401	8.571037	35.5942	4.939342
2009	4.403212	2.70805	12.03097	8.221452	32.07185	5.067275
2010	4.444929	2.525729	12.08484	7.673595	32.86893	5.19726
2011	4.458332	2.639057	12.2718	7.399276	32.93991	5.309846
2012	4.53684	2.484907	12.32111	6.710158	32.8055	5.402289
2013	4.621328	2.251292	12.35573	7.277455	33.14771	5.476371