

UNIVERSITY OF GHANA

**THE EFFECTS OF EXCHANGE RATE MOVEMENT ON FOREIGN DIRECT
INVESTMENT (FDI) INFLOWS INTO GHANA**

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DECLARATION

I hereby declare that this long essay is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere. All references cited in the work have been fully acknowledged.

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CERTIFICATION

I hereby certify that the preparation and presentation of this long essay was supervised in accordance with the guide lines on supervision of long essay laid down by the University of Ghana.

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SAINT KUTTU (PhD)
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.....
DATE

DEDICATION

This long essay is dedicated to ALLAH ALMIGHT, for providing me with wisdom to apply the knowledge and understanding he has conferred on me. Also, I dedicate this work to my wonderful and loving family for their overwhelming prayers and support.

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ABSTRACT

The study examined the effects of exchange rate movement on foreign direct investment (FDI) inflows into Ghana. Specifically, the study examined the trends in FDI inflows and exchange rate in Ghana, investigated the impact of exchange rate volatility on FDI inflow and determined the impact of FDI inflow on exchange rate volatility. The study also examined the impact of economic growth on FDI inflows to Ghana. For the purpose of this research, secondary data sourced from World Development Indicators (WDI, 2018) was used. The study adopts a quantitative methodology framework and specifically employs econometric technique (Auto-Regressive Distributed Lag Models) to investigate the interrelationship between FDI and exchange rate in Ghana using two models. Stationarity test done using the Augmented Dickey Fuller (ADF) and Philips Perron tests reveals that the variables under study were stationary at the levels and first difference hence justifying the use of the Auto-Regressive Distributed Lag Models (ARDL). The ARDL technique to cointegration reveals a long run relationship among the variables for both models. The long run results reveal a negative and significant impact of real effective exchange rate movement on FDI. Similarly, FDI had a negative and significant impact on real effective exchange rate movement. However, in the short run real effective exchange rate although negatively related to FDI had no significant impact on FDI. In addition, lag 1 of real effective exchange rate had a positive and significant impact on FDI. Also, in the short run FDI was negative however, not significantly related to real effective exchange rate. The estimated ECM coefficients of -0.703 and -0.489 for models I and II reveals that about 70.3% and 48.9% of the errors in the short run are corrected in the long run. The study therefore recommends that government should create the necessary environment that would be favorable for foreign investors.

CHAPTER ONE

INTRODUCTION

1.1 Background of Study

Foreign Direct Investment (FDI) refers to the establishment of production facility in a country other than the home country of the investor in question (Blonigen, 2005). According to Alfaro et al. (2004), the World Bank defines FDI as the summation of equity capital as well as other long – term capital and short-term capital, which are shown in the balance of payment.

In recent times, Foreign Direct Investment (FDI) has become a major source through which developing countries rely to expand their economy. The Organization for Economic Co-operation and Development (OECD) stated in its Third Edition Benchmark Definition of FDI (BD3) as “FDI reflects the objective of obtaining a lasting interest by a resident entity in one economy in an entity resident in economy other than that of the investor” (OECD, 1996, p7). Notwithstanding the above, Foreign Direct Investment (FDI) has become a centre of debate with regards to its contribution towards economic development. However, some researchers posit that, FDI does not make any significant impact on the host country’s economy growth, pointing to the fact that, growth of an economy depends on the host country economic and prudent measures instituted to accelerate economic growth. For instance, according to (De Mellow, 1996; Herzer et al., 2008), FDI may affect economy through reducing investment opportunities for local investors or depleting the scarce resources of the host country.

There has been diverse views with regards to the contribution of FDI to the development of emerging economies, some scholars argued for the need for consistent call for increased effort to attract more FDI hinges on the ideology that FDI has several positive impacts which include

productivity gains, technology transfer, the introduction of new processes, managerial skills and competence, and know – how in the domestic market, employee training, international production networks, and access to markets (Caves R., 1996). Three major factors also contribute to the reasons why some countries receive more FDI than other countries are, recipient country policies (including applicable regulation to FDI), measures adopted by countries to encourage and facilitate investments and finally general economic characteristics (Sane, M. 2016).

Existing literature works and researchers have demonstrated that, FDI contribute immensely towards economic growth of host country. FDI has become a global investment portfolio through which countries across the globe are shafting their focus in order to enhance and promote sustainable economic growth. According to the United Nations on Trade and Development (UNCTD, 2015), the increase of FDI in some countries has been interpreted as a sign that openness of Africa to the international trade could lead to quick “economic renaissance” at the continental scale. Even the world most powerful economies like the USA, China, UK, Russia, Japan and Germany have deeply relied on FDI to sustain their economy. The flow of FDI to developing countries and the world at large has experience a persistent decline over the years. Africa suffered a dramatic decline in FDI inflows from \$ 19 billion in 2001 to \$ 11 billion in 2002. In view of the dramatic downturn, the region’s share of the global FDI flows fell from 2.3% to 1.7% (UNCTD, 2003). However, inflows of FDI around the world increased to \$ 916 billion, with more than half of these flows received by businesses within developing countries in 2005, (UNCTD, 2005). The Ghana Investment Promotion Centre(GIPC) stated in their third-quarter report for 2015 that “...the provisional FDI projects registered by the GIPC for the first nine months in 2015 had reached 2.0 billion US dollars out

of the total of 2.29 billion US dollars, worth of projects in Ghana”. This indicates that FDI contributed 87.34 percent out of total registered projects in Ghana within the period. This amount captured projects registered with the centre by foreign investors; an 18 percent increment (GIPC, 2015) Provisional Foreign Direct Investments (FDI) figures for Ghana from January to September has hit 1.3 billion dollars (GIPC 2018). In recent years, FDI flows to Ghana have been increasing steadily, up to 2016. However, in 2017, inflows of FDI declined by 6.6% from 3.5 to 3.2 billion dollars. Ghana has been ranked as the 4th largest recipient of FDI in Africa which sees its stock of FDI rise from \$ 29.9 billion to \$ 33.1 billion between 2016 and 2017 (77.5% of GDP in 2017), UNCTAD ([Global Investment Report 2018](#)).

In line with the above, UNCTAD (2012), attributed the massive inflow of FDI to the Ghana’s economy arises from the fact that, the cedi continue to fall in recent years.

Ghana as a developing country has implemented several policies and programs such as the Economic Recovery Program (ERP) and the Ghana Investment Promotion Centre Act, (GIPC Act 2013) to attract and regulate foreign direct investments into the country. Several researches have revealed that, there are many factors that influences the flow of FDI into the host country. One of the factors that influences the FDI activity is the behavioral pattern of the exchange rate. Exchange rates, defined as the price of a nation’s currency in terms of another currency, ([Investopedia](#)). Research has demonstrated that, the total amount of foreign direct investment and allocation of this investment spending across a range of countries is influence by Exchange rates.

Where currency depreciation exists in the host country, which involve the decline in value of currency relative to the value of another currency. This depreciation has two potential implications for FDI; First it reduces that country’s wages and production costs relative to those

of its foreign counterparts and secondly a depreciation of the destination market currency raises the relative wealth of source country agents and can raise multinational acquisitions of certain destination market assets (Linda S. Goldberg). External factors, such as the robust economy of the United States of America and Government inability to control the black market for exchange rate are responsible for the poor performance of the cedi. (Isser Report 2017).

The performance of the Ghanaian Cedi on the financial market is a major concern for Ghanaian businesses, government and policymakers in recent years. Greater part of Businesses and individuals in Ghana engaged in importation from other countries and therefore are much more concern about the exchange rate in the country, since depreciation of the cedi, will cost Ghanaian importers and businesses more to import by injecting more cedi in buying of USD and thereby causing devastating impact on Ghanaian businesses.

1.2 Problem Statement

Ghana's currency over the years has witnessed dramatic depreciation, since the adoption of floating exchange rate regime in the country. Some financial analysts argue that, country with depreciating currency experience massive inflow of foreign direct investment (FDI). For instance, a depreciating currency serve as an incentive for attracting tremendous investors (Goldberg & Klein, 1996, Aizenman 1992). On the other hand, appreciation of the home country currency will increase costs of production compare to the host country, which will simultaneously lead to reduction in inflows of FDI into host country (Goldberg & Kolstad, 1995; Froot & Stein, 1991). Therefore, this study seeks to establish the effects of exchange rate on FDI; whether exchange rate influences the inflow of FDI into host country.

Examination of existing literature and papers on the effects of exchange rate shows that the focus has been on the effect of FDI inflows on the economy and determinant of FDI in Ghana at large, but less attention on the effect of exchange rate on FDI inflows in Ghana. The study therefore, seeks to expand the frontier by going extra miles to investigate the effect of exchange rate on inflows of FDI.

1.3 Objectives of the Study

The aim of this research is to investigate whether or not the exchange rate movement has effect on foreign direct investment (FDI) in Ghana. Specifically, the study seeks:

1. To examine the trends in FDI inflows and exchange rate in Ghana.
2. To test the impact of exchange rate movement on FDI inflow.
3. To determine the impact of FDI inflow on exchange rate movement.
4. To examine the impact of economic growth on FDI inflows to Ghana.

1.4 Hypotheses

The study tests the following hypothesis;

H₁: There exist a relationship between exchange rate movement and FDI inflows.

H₂: There exist a relationship between FDI inflows and exchange rate movement.

H₃: Economic growth has a positive impact on FDI inflows to Ghana.

1.5 Significance of the Study

This study is aimed at addressing the critical issue of FDI inflows to Ghana influenced prominently by exchange rate and economic growth. Specifically, the significance of this study is in four-folds.

First and foremost, the rational to conduct this research is that, most companies are owned foreign businesses (Multinational Enterprises) and international investors in Ghana, which means a chunk of capital are flown into the country through these investors, and therefore exchange rate plays a key role in determining the quantum of FDI inflows. Furthermore, the profit of these multinational enterprises rely heavily on the exchange rate and therefore these enterprises and investors pay much attention on the exchange rate. This work seeks to identify knowledge gap and further enhance transparency on the effect of exchange rate on FDI in Ghana. The result of this study would contribute immensely to existing literature and serve as a means of direction for multinational enterprises and investors abroad when it comes investment decision due to fluctuation of the cedi in Ghana.

Secondly, Ghana is a member of International Monetary Fund (IMF) and other international bodies, which means Ghana is subject to borrow from these international bodies for developmental purposes, these loanable amounts are contracted in United States Dollar (USD), but are injected into the country using the local currency (cedi) for economic stability, therefore pressure is exerted on the cedi. Again, when the loan is due for payment, a cedi equivalent in USD is require to service the loan and therefore exert pressure on the cedi. The government, policy analyst and economic managers can further rely on the outcome of the study to enhance their economic decision.

Also, this study will play a tremendous role in the forex trading for the industry players, such as government, companies, as well as Ghana Stock Exchange (GSE) to deal with the current challenges facing Ghana's forex exchange.

Lastly, the findings of the study when published could fill the gap in the extant literature and may be of great use to researchers both in academia and in industry who might further want to build knowledge in this area.

1.6 Scope and Limitations of the Study

The study used annual time series data spanning a period of thirty-seven years from 1980 to 2017 to model the nexus between FDI inflows and exchange rate. Data for the study was sourced from the World Bank, World Development Indicator (WDI, 2018) database. The time period for the study was chosen based on the significance and most importantly the availability of data.

Since FDI is a recent phenomenon, available data turns to be scanty. The study primarily relies on secondary data from the Ghana Investment promotion centre (GIPC) and other online data base which provide very little information on FDI inflows to Ghana. Time series data was also obtained on exchange rate from Bank of Ghana (BOG) data base and that also provide a major challenge, since not much information was maintained on the exchange rate against core currencies. Another major setback was the fact that, literature on the effects of exchange rate on FDI in Ghana is very scanty.

1.7 Organization of the Study

This study comprises of five chapters. Chapter one is made up of the introduction of the study, problem statement, objectives, hypothesis, scope of the study and organization of the study. The second chapter which is chapter two deals with the review of relevant literature; both the theories and empirical works that underpin exchange rate and FDI. Chapter three focuses on the methodological framework and techniques employed in the study's estimations and analysis. Chapter four is dedicated to data analysis with the various tool necessary and the interpretation of the study results. The final chapter which is chapter five deals with the summary of major findings, conclusions and policy implications.

1.7.1 Chapter Summary

This section provides a background argument of the study followed by aim and objectives. The rationale for the study is well coherent and research gap identified backed by previous literature. The limitation of the study was recognized as well as plan of the dissertation in the remaining chapters. The subsequent chapter is to review both theoretical and empirical literature to enhance and support the identified gaps

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter review various relevant theoretical and empirical literature on the subject. The literature review is undertaking based on the guidance from the research aim and objectives. The chapter seeks to review existing journals, articles and working papers published by researchers on the topic area. The chapter is divided into three sections. The first section deals with review of theoretical literature followed by empirical review as well as summary of the chapter.

2.1 Theoretical Review

FDI is a recent phenomenon that evolved across the globe and therefore emerging theories have been developed to provide factors that influence FDI inflows and therefore serve as a framework for empirical investigation into FDI inflows determinants. This section provides an insight into some of theories of FDI from literature.

2.1.1 Differential Rate of Return Hypothesis

The differential rate of return among the several theories attempts to demystify the flows. This theory posits that, the capital flows from countries with low rate of return to countries with high rates of return move in a process that leads eventually to the equality of real rates of return. The assumption behind the theory is that, firms considering FDI appears to equate the marginal return on and marginal cost of capital. The hypothesis clearly asserts risk neutrality, making the rate of return the only variable upon which the investment decision rests. It suffices to say

that, direct investment in any country, including the home country, is a perfect substitute for direct investment in any other country. One of the major setbacks of the differential rate of return is that, is not in line with observation that countries experience inflows and outflows of FDI simultaneously (Watkins, 1916).

2.1.2 The Portfolio Diversification Hypothesis

The theory is a build up to the differential rate of return which state that, the differential rate of return expected is not the only variable for investment decision and therefore suggested that risk is another major variable upon which the FDI decision is made. If this assumption is agreed, then the differential rate of return becomes inadequate and therefore adjust to portfolio diversification hypothesis to explain FDI. The theory portfolio diversification is linked to (Markowitz 1959) is a theoretical framework for analysis of risk and return and their inter-relationships. Thus, investors will only invest where the return is high with risk in mind. Hence higher return with higher risk.

The portfolio diversification hypothesis has three major setbacks (1) risk and return are obtained from reported profit that is unlikely to be similarly to actual profit for reasons including transfer pricing and accounting procedure. (2) Risk variable cannot quantify accurately from data if it is taken to be standard deviation and the degree of control which Multi-National Companies (MNCs) prefer FDI over portfolio investment because FDI has upper arm over foreign investment.

2.1.3 The Imperfect Capital Market Theory

Froot and Stein, (1991) postulate that, the imperfection market makes cost of external borrowing to be more expensive than internal borrowing for the host country and further argue

that, the depreciation of the host country currency is accompanied by drastic increase in foreign direct investment (FDI) in the host country. Thus, firms are able to increase their assets and possibly, wealth, through higher bids on these assets in the host country. Antras et al. (2009) argue that, multinational activity will increase in host country with stronger investor protection. Cushman (1985, 1988) posit that, uncertainty is also an influencing factor on FDI and further argue that, real exchange rate increase, boost FDI made by the host country and hence appreciation will lead to reduction of FDI in host country.

2.1.4 The Internationalization Theory

The internationalization theory attempts to elaborate the expansion of transnational companies and the driving forces behind their foreign direct investment (FDI) achievement. Buckley and Casson (1976), propounded the theory of internationalization and suggested that internationalization companies are administering their activities so as to create competitive advantages and capitalized on these advantages. Again the theory of internationalization further developed by Hennart in 1982 and Casson, in 1983. However, Hymer (1976) launched the theory in an international context and further came up with two major determinants of FDI. (1) Was removal of competition (2) Some competitive advantage firms have in a particular activity.

2.1.5 Currency Exchange-rate and FDI Theory (Campa, 1993)

Campa (1993), postulate a theory contrary to what Froot and Stein, (1991), suggested, that depreciation of the host country currency is accompanied by drastic increase in foreign direct investment (FDI) in the host country, Campa (1993), rather argue that, the depreciation of the host country currency will further decrease the inflows of FDI to host country and that, no such

relationship exist between such variables. Furthermore, he suggested that, both international investors and corporations make investment decision with the assumption of future expectation returns and hence reasons multinational companies invest in host country

with robust currency. Campa (1993), furthermore, currency devaluation would impede FDI inflow. The assumption is that, overseas investment decisions by multinational corporations and investors abroad hinges future expected earnings. Thus, multinational corporations and investors abroad are likely to invest in the host country with stronger currency due to higher future earnings expectations, the rational here is that, the more robust the currency is in the host country, the more multinational corporations and investors abroad will invest in the market of the host country, which translate into more FDIs.

2.2 Review of Empirical Literature and Hypotheses Development

A substantial number of empirical literature have investigated the effect of exchange rate movement on foreign direct investment (FDI) with each literature garnering different empirical results. While some consider volatility in exchange rate as a key factor affecting FDI and investors abroad, others are of the view that there are several other factors affecting the flow of FDI. Establishing a causal relationship between trade openness and exchange rate has been challenging tasks across the globe and therefore resulted in divergent empirical results. Trade openness also known as trade liberalization is the process of reducing or removing restrictions on international trade and this may include reduction or removal of tariffs, abolition or enlargement of import quotas, abolition of multiple exchange rates, and removal of requirements for administrative permits for imports or allocations of foreign exchange (Bhaskar, 2005).

Gorg and Wakelin (2001) analysed the effect of exchange rate movements on FDI by considering both inward FDI and outward FDI, and also direct investment from United States of America to 12 countries and investment from these 12 countries to the United States of America. He made astonishing discovery with first result having a positive relationship between United States of America outward investment and appreciation in the host country currency while there is a negative relationship between United States of America inward investment and appreciation in the dollar.

Dornbusch (1976) posit that, trade openness and exchange rate are positively related.

(Peree and Steinherr, 1989, Obstfeld, 1995, and Cho et al, 2002), found that longer-run changes in exchange rate present more tremendous effects on trade than do short-run exchange rate fluctuations that can be hedge at low cost. But according to Vianne and de Vries, (1992), they argue that, with the availability of hedging instruments, short run exchange rate volatility impacts trade due to increases in risk of premium in the forward market.

Husek and Pankova (2008), in their examination, discover that, depreciation of the host country currency has the tendency to garner FDI inflows due to currency depreciation resulting in low cost of production (domestic labour and other productive inputs) as compare to foreign production costs, hence attracting FDI due to production efficiency. Furthermore, the depreciation currency reduces value of assets in host country due to currency depreciation in relation to other currencies. Therefore, the cost of investing in terms of FDI reduces in host country, attracting FDI.

Dornbusch (1973; 1974; 1976), Argue that the appreciation or depreciation of real exchange rate rely on whether capital inflows are fund capital or domestic expenditure in the traded or non-traded sector. For instance, argue further, that in the short-run prices and wages tend to be

stiff, hence, the need for investors to equalize the expected returns across the countries is viewed as the major determinant of the short-run exchange rates, whereas goods market arbitrage is viewed as relevant to exchange rate determination in the medium and long-run. For instance, an increase in interest rate may adversely affect the future export performance which would reduce the future flow of foreign exchange reserves and thereby, leads to depreciation of currency.

Again, Sargent and Wallace (1981) also posits that, a high interest rate policy may result to a reduction in money demand, increase in price level and government debt which, will result in seignorage financing. Hence causing exchange rate depreciation. Again, Sargent and Wallace (1981) also posits that, a high interest rate policy may result to a reduction in money demand, increase in price level and government debt which, will result in seignorage financing. Hence causing exchange rate depreciation. However, Basurto and Ghosh (2000) came with a sharp contrast in their examination of Indonesia, the Republic of Korea, Thailand, and Mexico during 1990s by dividing the determinants of exchange rate into two types: changes in the risk premium and everything else. The main purpose is to find out the influences of everything else on exchange rate by isolating the effect of changes in the risk premium and to analyze the impact of real interest rate on risk premium. The result revealed that, tighter monetary policy resulted in appreciation of exchange rate.

According to (Furman and Stiglitz, 1998). Argue that the high interest rates imperil the ability of the domestic firms and banks to pay back the external debt and thereby reduces the probability of repayment, as a result, high interest rates lead to capital outflows and thereby depreciation of the currency. According to Ray (1989) and Stevens (1998) considered exchange rate as a factor in their studies and concluded that, exchange rate is insignificant FDI flows.

Kraay (1998) examined whether an increase in interest rate policy can ward off the speculative attack by using monthly data for seventy-five developed and developing countries over the years 1960-99 and detected that the high interest rates policy doesn't protect the currencies against speculative attacks. Hence, finalized that there is no any systematic relationship between interest rates and the result of speculative attack.

Furman and Stiglitz (1998) analyzed the impact of an increase in interest rate on exchange rate for nine developing countries using data over a period of 1992-98 and found that the high interest rate resulted in significant depreciation of nominal exchange rate, but concluded that, the Impact was more predominant in low inflation country as compare to high inflation country.

Goldfajn and Baig (1998) have examined the linkage between real interest rate and real exchange rate for the Asian countries using Vector Auto Regression (VAR) methodology over a period from July 1997 to July 1998. Their result reveal astonishing conclusion that, there is no significant impact on the relationship between interest rate and exchange rate and therefore insignificant.

Goldfajn and Gupta (1999) in their examination of eighty currency crisis episodes between 1980 and 1998, found that, an increase in interest rate has corresponding increase in nominal exchange rates.

According to Keminsky and Schumukler (1998), in their examination of time series correlation between daily exchange rates and interest rates for Indonesia, Korea, Malaysia, the Philippines, Thailand, and China based on data during the second half of 1997, concluded that, the signals of these correlations resulted in unstable interest rates in those countries as a result of exogenous variable.

Gould and Kamin (2000) analysed the relationship between interest rate and exchange rate by studying the effect of interest rate, risk premium, and default probabilities on the exchange rates for Indonesia, South Korea, Malaysia, the Philippines, Thailand, and Mexico. The result of their studies revealed that, the exchange rates was influenced by credit spreads and stock prices rather than interest rates.

West. (2004), using VAR model for New Zealand found that, if output and inflation volatility is increased by margin of 10-15% and 0- 15% proportionately, real exchange rate will decrease by approximately by 25%.(Kosteletou and Liargovas, 2000) also analyse the relationship between FDI flows and ERRs using simultaneous equation model for a large sample of data from industrial countries over ninety seven period and the result shows that, for most countries, real exchange rate increment is associated with flexible ERR which influences FDI inflows. (Nyarko and Amponsah, 2011) concluded that, there is no significant correlation between the exchange rate regime for foreign direct investment in Ghana.

Tsikata et al. (2000) using Ordinary Least Square (OLS) statistical estimation in their examination of FDI determinants in Ghana. The study with the period (1984-2000) concluded that exchange rate, trade openness and land are factors that influence FDI inflows into Ghana.

Olumuyiwa's (2003) using OLS estimation in Nigeria found variations in the official exchange rate significant for agricultural sector FDI but insignificant for the manufacturing sector.

Udomkerdmongkol et al. (2009) using a panel of 16 emerging countries across Latin America, Asia and Africa, using data from period 1990 to 2002, to analyze the effect of the exchange rate and exchange rate volatility on United States of America FDI outflows to the selected countries. With the aid of Fixed Effects estimator and putting measures to control for GDP per

capita, GDP growth rate, portfolio investment, shares of exports, shares of the manufacturing sector as well as telephone main lines, the result revealed that, there is a negative effect of exchange rate volatility on FDI.

Ullah et al. (2012) examine the relationship between FDI, exchange rate and exchange rate volatility using time-series data on Pakistan over the period 1980–2010, with the aid ARCH and GARCH model estimator and using Local currency, depreciation of the currency resulted in positive impact on FDI inflows, with exchange rate volatility having negative effect. However, statistically insignificant for Price volatility.

Dhakal et al. (2010) and Chaudhary et al. (2012) examine Asian and East Asian economies and came up with mixed results on the effect of the exchange rate and price volatility.

2.3 Conclusions

This section contains the summary made from relevant theoretical and empirical review. Empirical review of relevant and existing literature falls in line with the research aims and objectives. Following the comprehensive and broader review of the various theories, the currency exchange – rate and FDI and the imperfect capital market theory were preferred for the study. These theories provide much more insight into the studies, because it entails the interrelated factors the influence flow of FDI. The currency exchange rate and FDI theory argue that, a fall in host country currency encourages drastic increase FDI inflows, whereas the imperfect capital market theory argues contrary to the effect that, a fall in the host country currency negatively affect the FDI inflows. Regarding the empirical review, an in-depth results indicated that, a substantial number of empirical studies conducted in Ghana, examined the

relationship between exchange rate and FDI from the unidirectional or bi-directional perspective. Hence, this study seeks to unravel the effect, exchange rate has on the inflow of FDI into Ghanaian economy. Therefore, the current study does not only explore the rational on exchange rate and FDI, but examine the bi directional and unidirectional relationship between exchange rate and FDI using the Auto Regressive Distributed Lag (ARDL) model on an annual time series data over the period 1980 to 2017. The next chapter models the methodology that provides the findings in an attempt to achieve the objectives.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This section presents the methodology that is systematically employed to get answers on how exchange rate affects Foreign Direct Investment (FDI) inflows. Hence, this section highlights the following themes: model specification, the various definitions of the variables employed in the study. The third section discusses the a priori expectations and data sources. The final section looks at the estimation techniques utilized in the study as well as the diagnostic tests that validates the model for policy recommendations.

3.1 Model Specification

To model the interrelationships between exchange rate volatility and FDI inflows the study adopts the model propounded by Gorg, and Wakeliu (2001) and Husek and Pankova (2008). However, in relation to the current study, some modifications were done to the aforementioned authors models, thus the new model specified to suit the current study is as follows;

$$FDI_t = f(REER_t, V_t) \quad (1)$$

$$REER_t = f(FDI_t, V_t) \quad (2)$$

Where, FDI is a function of exchange rate (REER) and REER is a function of FDI. Also, V represents the control variables that can have an effect on FDI inflows overtime.

Equation (1) and (2) then becomes estimable in a log linear form as

$$\ln FDI_t = \beta_0 + \beta_1 REER_t + \beta_2 \ln Y_t + \beta_3 \ln ExVol_t + \beta_4 \ln INT_t + \beta_5 \ln TO_t + \beta_6 \ln INF_t + \varepsilon_t \quad (3)$$

$$\ln REER_t = \beta_0 + \beta_1 FDI_t + \beta_2 \ln Y_t + \beta_3 \ln ExVol_t + \beta_4 \ln INT_t + \beta_5 \ln TO_t + \beta_6 \ln INF_t + \varepsilon_t \quad (4)$$

$\ln FDI$ = natural log of Foreign Direct Investment which is also the dependent variable, while the explanatory variables are; $\ln REER$ = natural log of Exchange rate which is the dependent variable in equation (4), $\ln ExVol$ = natural log of Exchange rate volatility, $\ln TO$ = natural log Trade openness, $\ln INT$ = natural log of Interest rate, $\ln INF$ = natural log of Inflation, $\ln Y$ = natural log of economic growth. The error term, ε_t is assumed to be independent and identically distributed and t =time subscript. The variables employed in the model are estimated in their natural logarithm form. This is to generate interpretation more meaningful and robust. Again, it helps to explain the coefficients of the cointegrating vector as long-term elasticities (this shows the extent of effect of an independent variable on a dependent variable).

3.2 Definition of Variables, Measurement and a Priori Expectation

This section on the methodological approach of the study defines the variables used in the study, their measurement and a priori expected sign based on the theoretical and empirical reviews. The outcome of this discussion is summarized in Table 3.1.

Foreign Direct Investment: FDI inflows used in this study refers to the inflows of FDI investments brought into the country to acquire a lasting management interest in either existing enterprises or Greenfield establishments. According to Dar et al., (2004), FDI is expected to have an adverse effect on the real effective exchange rate; the more the FDI inflows into the country, the more the currency appreciates. The measure is FDI net inflows measured in US\$.

Real Effective Exchange Rate: It is defined as the number of units of one currency that is exchange for a unit of another currency. In other words, it is the value of one country's currency in terms of another currency. The difference between the volume and value of a country's import and export affects its level of exchange rate with other countries. This variable is needful in order to measure the potential of a county's currency to attract FDI inflows (inward FDI).

3.2.1 Control Variables

Economic Growth: Economic Growth generally refers to the sustained increase in an economy's real gross domestic product over a period of time. The study follows standard practice and measures economic growth as real per capita GDP (Y). It is obtained by taking the ratio of real gross domestic product to the working population in an economy.

Exchange rate volatility (ERV): This variable is defined as the adjusted relative change in exchange rate squared taken from Gujarati and Dahkal (2010). It is measured as the standard deviation of the exchange rate.

Interest Rate (INT): It is simply defined as the interest rate investors expect to receive after investment which is approximately the prime rate or bank rate. A very high level of interest rate in an economy makes doing business in that economy very unattractive. It has the potential of driving away investors.

Trade Openness: It shows a country's ability to take significant advantage of opportunities to trade with other countries (Outward orientation) as well as showing that countries inability to take hold of opportunities to trade with other countries (Inward orientation). It is measured by taking ratio of sum exports and imports to GDP.

Inflation (INF): Inflation is the persistent increase in the general price level of goods and services or the reduction in the purchasing power per unit of money; measured by the Consumer Price Index (CPI) reflecting the annual percentage change in the cost to the average consumer of acquiring a fixed basket of goods and services that may be fixed or changed at specified intervals, such as yearly.

Table 3.1: Variables, description and a priori expectation

Variable	Description	A Priori
Dependent variable = Foreign Direct Investment (FDI)		
Real effective exchange rate	Real effective exchange rate (REER) is the weighted average of a country's currency relative to an index or basket of other major currencies, adjusted for inflation	Negative
Exchange Rate Volatility	It is measured as the standard deviation of the exchange rate.	Negative
Economic Growth	Ratio of real gross domestic product to the working population in an economy.	Positive
Interest Rate	Real interest rate (%) measured as lending interest rate adjusted for inflation as measured by the GDP deflator.	Negative
Trade Openness	Economic Openness measured as (exports + imports) to GDP ratio	Positive
Inflation	Measured as percentage change on consumer price index (CPI)	Negative
Dependent variable = Real Effective Exchange Rate (REER)		
FDI	FDI net inflows measured in US\$	Mixed
Exchange Rate Volatility	It is measured as the standard deviation of the Mixed exchange rate.	
Economic Growth	Ratio of real gross domestic product to the working population in an economy.	Negative
Interest Rate	Real interest rate (%) measured as lending interest rate adjusted for inflation as measured by the GDP deflator.	Mixed
Trade Openness	Economic Openness measured as (exports + imports) to GDP ratio	Positive
Inflation	Measured as percentage change on consumer price index (CPI)	Positive

3.3 Sources of Data

Secondary data spanning from 1980 to 2017 was used to investigate the interrelationships between FDI and exchange rate. The choice of the data coverage was informed by the fact that it is impossible to log negative values for FDI. FDI recorded many negatives values for periods below 1980. Secondary data on all the variables used in this study was sourced from the World Bank's World Development Indicators (WDI, 2018).

3.4 Estimation Strategy

The time series modeling strategies adopted to estimate the parameters in the model specified in equation 3 above in order to achieve the set objectives is discussed in this section. Modern econometric analysis outlines three sequential steps to achieve any meaningful results from a time series data. The steps are as follows: The first step establishes the order of integration using the Argumented Dickey Fuller (ADF) and Philips-Perron (PP) tests. The next step is to investigate the existence of a long run equilibrium relationship between FDI and its covariates using a standard cointegration testing procedure. The first two steps aforementioned provide a guide on the appropriate data transformation and choice of estimator that ensures efficient and consistent identification of model parameter. The final step involves the estimation of the long and short run outputs.

3.4.1 Unit Root Tests

If one regresses a time-series of variable Y , which is not stationary and therefore has unit root, on regressors that are also non-stationary (have unit roots), the estimated regressions gives a statistically significant relationship/coefficients, even if that is not the case. When such happens, it is termed as spurious regression.

The study employs the ADF and PP unit root tests to help prevent spurious regression results. Zhu and Peng (2012) posit that the ADF test is used to investigate the stationarity of time series observations, in which a high-order autoregressive model with an intercept term is established.

The ADF test specifies a null hypothesis which states that ‘the series have unit root’ as contrary to the alternate hypothesis which states that ‘the series have no unit root, and it is therefore stationary. The study first tests the series at the levels, if the computed ADF test statistic is less than its 5% critical value, then the decision is that we fail to reject the null hypothesis. On the other hand, if the ADF test statistic exceeds its respective 5% critical value, the null hypothesis of the presence of unit root is rejected and the alternative hypothesis is accepted.

3.4.2 Stationary Test

As aforementioned, the time series characteristics of the variables in the study were analyzed using the ADF and PP tests to check the non-stationarity of the variables. The Phillips-Perron test was used as complement to the ADF test to also check the stationarity of the factors. The ADF check for stationarity of the variables was developed as follows:

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \delta Y_{t-1} + \beta_t \sum_{k=1}^p \gamma_k \Delta Y_{t-k} + \varepsilon_t \quad \dots\dots\dots (3.3)$$

Where,

- Ø Y_t is the variable in question.
- Ø t is the time trend
- Ø Δ is the difference operator.
- Ø ε_t is the stochastic process.

For all $t=1,2,\dots,34$

Using equation (3.3) the following hypothesis was tested for stationarity.

$$H_0: \delta = 0 \text{ (} Y_t \text{ is non-stationary)}$$

$$H_1: \delta < 0 \text{ (} Y_t \text{ is stationary)}$$

Dickey and Fuller employed τ -statistic in place of the t-statistic which they showed to be inappropriate. If the computed τ -statistic is below the critical values generated by MacKinnon (1996), the null assumption is rejected and the alternate hypothesis of stationarity of the variable is accepted. The Phillip-Perron (PP) test was also used as an alternative to confirm the outcomes of the ADF-test which is fallacious in the presence of structural breaks. The stationarity properties of the variables analyzed using the PP tests is similar to that of the ADF test.

3.5 The ARDL Cointegration Framework

The study found vast models and estimation techniques that can be employed to analyze the relationship between FDI and exchange rate.

The study chanced upon significant works that employed either OLS based multiple linear regression or the residual based Engle-Granger test approach, incorporation with Johansen (1991) maximum likelihood tests. However, for developing economies with data series not available for longer periods, the study found the Autoregressive Distributed Lag (ARDL) approach to be popular (Chen, 2013; Pesaran and Smith (1998)).

The ARDL technique is less rigid, and can be employed on variables with different integration orders. In addition, the ARDL approach modelling can take sufficient lags in capturing the relationship among the time series data (Pesaran and Shin, 2003). More so, according to Pesaran and Shin, (2003), one can derive an error correction term (ECT) via simple linear transformation. The ARDL modelling helps to capture both short-run and long-run relationships, and helps evade stationarity problems with time series data.

Based on this premises the study therefore models the interrelationships between FDI and exchange rate using the ARDL estimation technique specified by Pesaran et al., (2001) which can be employed even if the variables are integrated of different orders specifically $I(0)$ and $I(1)$.

3.5.1 ARDL Bounds Testing Procedure

The study follows the ARDL Bounds test approach to estimate the long run relationship between FDI and its covariates. With the bounds test, the null hypothesis is that, no long-run relationship exists among the series”. The bound test statistic is compared to two ranges of critical values, upper bound critical values $I(0)$, and lower bound critical values $I(1)$ at 5% level.

If the estimated bound test statistic lies between the critical 5% critical upper bound $I(1)$ and lower bound $I(0)$ value, then the decision is to not reject the null hypothesis that, ‘no long-run relationship exist’.

Should the estimated bound test statistic exceed the critical 5% critical upper bound $I(1)$ or lie below the lower bound $I(0)$ value, then the decision is to reject the null hypothesis, and not to reject the alternate hypothesis that ‘a long-run relationship does exist’.

On the other hand, should the estimated bounds test statistic lie between the critical upper bound $I(1)$ and lower bound $I(0)$ value, then the test is considered inconclusive.

3.6 Diagnostics Tests

In order for the model estimated to be used for analysis and policy recommendations it is essential to perform model diagnostic tests. Some of the diagnostics tests carried out included the Breusch-Pagan-Godfrey test for heteroscedasticity, Breusch-Godfrey Serial Correlation LM test for serial correlation, the Jacque-Berra test for normality and the Ramsey RESET Test for structural stability of the model. The stability of the regression coefficients is assessed using the Ramsey RESET Test suggested by (Pesaran and Pesaran 2001). This test tells whether the regression equation is stable over time. When the estimated model satisfies the entire stability tests mentioned above, then the model estimated is considered good and fit for analysis as well as policy recommendations.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

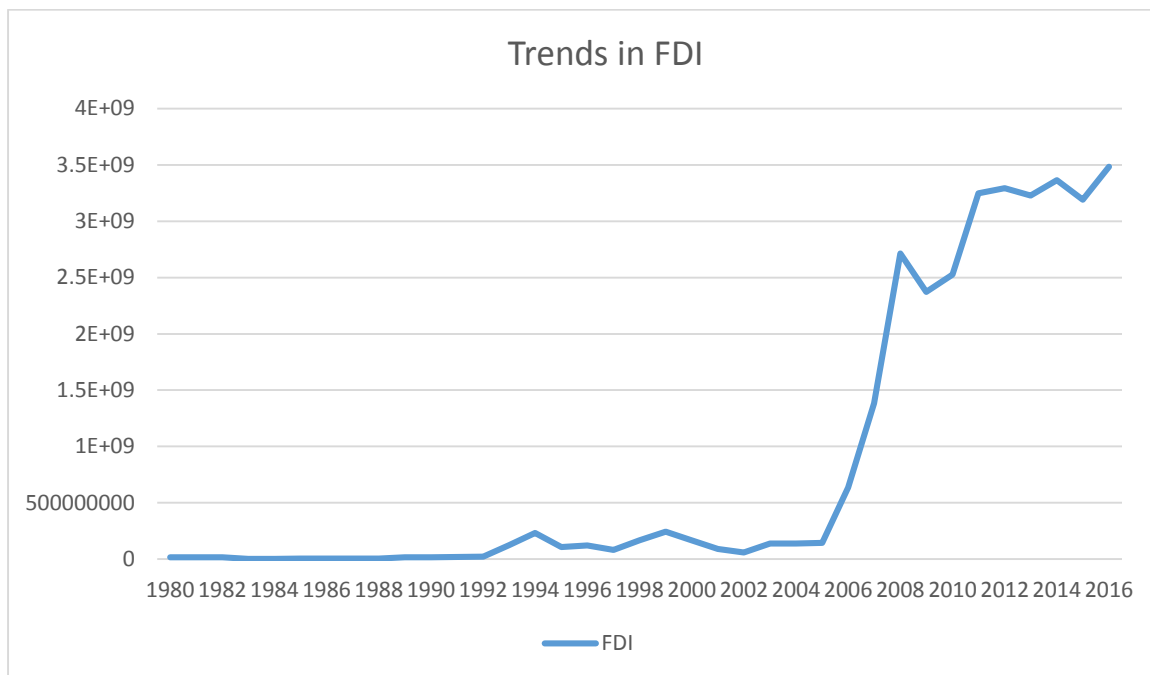
4.0 Introduction

The study sought to examine whether or not exchange rate movement has effect on foreign direct investment in Ghana using the ARDL estimation technique proposed by Pesaran et al., (2001). This chapter entails the analysis of the research in arriving at the findings. The chapter comprises of the trends in exchange rate movement and FDI, time series properties of the variables, the long-run and short-run results, granger causality tests, diagnostics and reliability tests. All estimations were done using EViews 9 software.

4.1 Trend Analysis

4.1.1 Trends in Foreign Direct Investment

This section examines the trends in foreign direct investment and real effective exchange rate. The trend in FDI as depicted in Fig 4.1 generally has been on the increase with series of fluctuations over the period under review.

Figure 4.1: Annual Trend of FDI inflows into Ghana from 1980 to 2016

After the political instability in the late 1970's, the then government adopted an anti-business stance and this resulted in a decline in growth to about -3.2% with an FDI inflow of \$2.8 million in 1981. The country further experienced a decline in growth rate of -3.2% in 1981 to -6.9% in 1982 however, FDI inflows remained constant recording values of \$16.3 million.

The major decline of FDI inflows to Ghana was experienced from 1982 to 1988. This was as a result of the 1983 bushfires that destroyed properties and businesses. To resolve this predicament, the government of Ghana in 1983 initiated the Economic Recovery Programme (ERP) and later the Structural Adjustment Programme (SAP) as policies basically to turn around the post-independence economic decline and facilitate the attraction of value-added FDI inflows to Ghana. Although these policies were initiated to revamp the Ghanaian economy and attract more FDI inflows their importance was however not felt up until 1989 and the years that proceeded it. For instance, a sluggish FDI net inflow was experienced in the first period

from 1983 to 1988, averaging US\$ 4.2 million per annum, and the highest and lowest inflow during the period being US\$5.6 million in 1984 and US\$2.0 million in 1985 respectively.

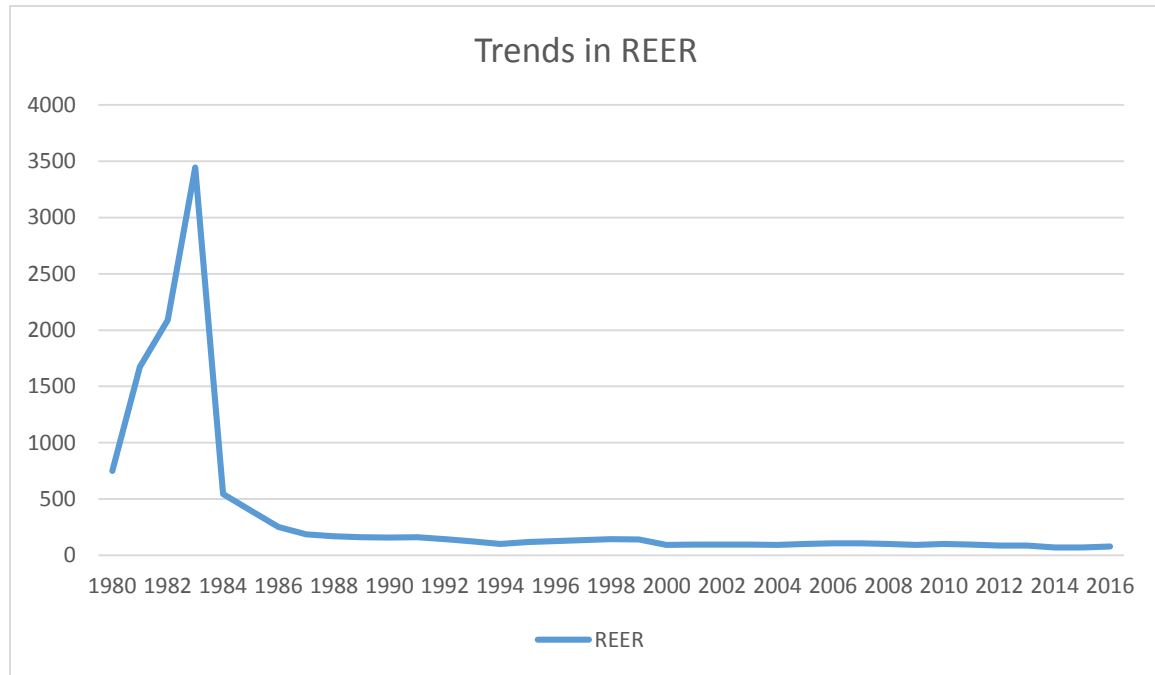
Moreover, moderate inflows were also recorded in the second period beginning from 1989 to 1992. The passing of the GIPC Act, 1994 (Act 478) to encourage and promote investment in the country as well as coordinate investment in the country played a crucial role in attracting more FDI inflows. Statistics from WDI (2018) after the passing of this code saw FDI peaked at US\$233 million in 1994 but declined to US\$106.5 million in 1995 before surging back to US\$120 million in 1996. FDI inflows recorded fluctuating indices from the period of 1997 to 2003 including a decline from US\$81.8 million to US\$56 million from 1997 to 1998 respectively, then a subsequent peak of US\$267 million in 1999 and then a fall to US\$115 million the subsequent year. FDI from 2003 saw an increase and peaked in 2008 with a value of US\$271 million but declined to US\$237 million in 2009 after the 2008 general election. FDI started to increase in 2010 after the general elections and have since maintained a stable growth rate. It was worth mentioning that, FDI prior to general elections records high values however, decline after elections and then starts increasing thereof. In affirming this assertion FDI as at 2016 before the general election stood at US\$348 million, however current statistics reveals a fall in this value from US\$348 million to US\$325 million in 2017.

4.1.2 Trends in Exchange Rate

Ever since Ghana changed its currency from pounds sterling to the Cedi in July 1965, the country's cedi has continually depreciated against major currencies like U.S dollar and the British pounds. Currently ₵1 equals \$5.19 which signals a worrying concern for businesses. Although some studies posit that, the depreciation of the home currency attracts FDI inflows an increase in exchange rate for a country like Ghana that is import based would hamper the

growth of the economy. Fig 4.2 shows the trends in real effective exchange rate from 1980 to 2016.

Figure 4.2: Annual Trend of REER in Ghana from 1980 to 2016



Prior to 1983 exchange rate stood at 1672.19 in 1982, however, there was a sharp rise in the value of real effective exchange rate, which peaked at 3657.31 in 1983. This peak was attributed to the Structural Adjustment Programme that was embarked upon. Ghana started operating the fixed exchange rate regime in 1988 and later the inflation targeting regime in 2007, from the inception of these regimes till date the cedi has been characterized by some instability (appreciation and depreciation). The data represented in Figure 4.2 is an indication of the downward trend of the cedi/dollar exchange rate indicating general depreciation of the cedi from 1980 to 2016.

4.2 Discussion of Time Series Properties

4.2.1 Results of the Unit Root Test

It is an undisputable fact that most economic variables are not stationary at their plane form thus likely to generate coefficients inconsistency and hence produce spurious empirical results. To overcome this hedge, the ADF test and PP test were adopted to investigate the stationarity properties of the variables. Both ADF test and PP test are complementary, however the PP test is less restrictive and its results are accurate even if the absence of autocorrelation and heteroscedasticity of the errors are not met (Pesaran 2001). Hence, this section examines the stationary characteristics of the variables (i.e. dependent and explanatory) specified in equation 3.3 and 3.4 in the Chapter Three of the study.

The decision to accept or reject the null hypothesis of the presence of unit root was done using the probability value (p-value). The stationary findings from the ADF and the PP tests are presented in Table 4.1.

Table 4.1 Unit Root Test

Levels						
Augmented Dickey Fuller				Philip-Perron		
Variable	Constant	Constant trend	with	Constant	Constant trend	with
LnFDI	-0.403346	-2.883538		-0.391696	-2.930405	
LnREER	-2.662515*	-3.063613		-4.128156***	-2.164609	
LnY	0.407913	-1.610137		0.407913	-1.705316	
LnExVoL	-5.549983***	-4.355804***		-11.85197***	-11.24188***	
LnINT	-1.710017	-1.245677		-1.725846	-1.245677	
LnTO	-2.612300	-1.988921		-2.791692*	-1.937817	
LnINF	-3.587073**	-1.778146		-5.125681***	-3.173729	
First Difference						
Augmented Dickey Fuller				Philips-Perron		
Variable	Constant	Constant trend	with	Constant	Constant trend	with
LnFDI	-5.215312***	-5.180907***		-5.174518***	-5.136182***	
LnREER	-6.018665***	-6.522332***		-6.016614***	-6.522332***	
LnY	-4.801317***	-4.853448***		-4.795208***	-4.825673***	
LnExVoL	-4.757300***	-5.134676***		-4.757300***	-5.134676***	
LnINT	-5.653228***	-5.972714***		-5.653258***	-5.972819***	
LnTO	-5.586273***	-4.476907***		-5.644310**	-6.472680***	
LnINF	-5.701905***	-7.094055***		-5.701905***	-10.81760***	

Note: *, **, *** denotes significance at 10%, 5% and 1% respectively

Source: Estimated from Eviews 9.0

From Table 4.1, it is observed that at the log levels, LnExVol was the only stationary variable. Hence, we refuse to accept the null hypothesis of unit root for LnExVol at 1% significance level. Based on this findings we conclude that LnExVol is integrated of order zero $I(0)$.

At first differencing, it can be seen from Table 4.1 that, LnFDI, LnREER, LnY, LnINT, LnTO and LnINF became stationary. Hence, the null hypothesis of “unit root” is rejected at the first difference. This denotes that LnFDI, LnREER, LnY, LnINT, LnTO and and LnINF are integrated of order one $I(1)$.

From Table 4.1 we conclude based on the ADF test and PP test that not even one of the variables became stationary at second differencing $I(2)$. Hence it is evident that the variables have clearly shown a case of mixed order integration of $I(0)$ and $I(1)$. On this premises the study applies the bounds testing approach propounded by Pesaran et al., (2001) to identify presence of long-term association of foreign direct investment and its covariates as well as real effective exchange rate and its covariates.

4.2.3 Results of the Bounds Test for Cointegration

The presence of a long run relationship using the ARDL bounds test to cointegration is examined in this section of data presentation, analysis and discussions. The null hypothesis is specified as, the absence of any cointegration among the variables against an alternative hypothesis which says otherwise. To establish the presence of a long run relationship, the computed F-statistic is compared with the upper bound critical value before any inference is made (Pesaran et al., 2001). The decision to accept or reject cointegration between FDI and its covariates as well as real effective exchange rate and its covariates is based on the computed lower critical bound $I(0)$ and the upper critical bound $I(1)$. The $I(0)$ bound is based on the

assumption that the variables under study are integrated at the levels $I(0)$ implying no co-integration exists. The upper bound however is based on the assumption that variables are integrated at first difference $I(1)$ implying that co-integration exists among the variables.

This test is primarily employed to establish the presence of a long run relationships between the variables or otherwise. In testing for the presence of co-integration among the variables and their covariates, the bounds test is estimated. This co-integration test is preferred to others because it best suits variables that are not integrated of the same order and it further estimates the long-run and short-run coefficients simultaneously. Due to the fact that the under studied variables are not integrated of the same order the bounds test becomes the most appropriate co-integration test to use. The outcome of the bounds test is shown in Table 4.2.

Table 4.2 Results of the Co-integration Relationship

LNFDI=f(LNREER, LNY, LNEXVOL, LNINT, LNT0, LNINF)			LNREER=f(LNFDI, LNY, LNEXVOL, LNINT, LNT0, LNINF)		
F-Statistic		K	F-Statistic		K
4.661010 ***		6	24.70467***		6
Critical value bound			Critical value bound		
Significance	I0 bound	I 1 bounds	Significance	I0 bound	I 1 bounds
10%	2.12	3.23	10%	2.12	3.23
5%	2.45	3.61	5%	2.45	3.61
1%	3.15	4.43	1%	3.15	4.43

Note: *** denotes significance at 1%

Source: Estimated from Eviews 9.0

As depicted in Table 4.2, the F- statistic value for lnFDI and its covariates was 4.66 which exceeded the upper bound 1% value of 4.43 implying the null hypothesis of no long run relationship between FDI and its covariates is rejected. Similarly, the F-statistic value for lnREER and its covariates was 24.70 which also exceeded the upper bound 1% value of 4.43 implying the null hypothesis of no long relationship between REER and its covariates is rejected.

After establishing the presence of a long-run relationship among FDI, REER and its covariates using the ARDL approach, the proceeding move is to evaluate the long run and short run relationship between the variables.

The selection of the model was anchored on the Akaike Information Criterion (AIC) and Schwarz Information Criterion (SIC). Therefore ARDL (1, 2, 1, 0, 2, 0, 2) model was selected in this study for lnFDI and its covariates and ARDL(3, 0, 2, 1, 1, 0, 0) for lnREER and its covariates, as presented in Table 4.3.

Table 4.3 Result of the Lag Length Selections

Aike Information Criterion (AIC)/Schwarz Information Criterion(SIC)	
Variables and their lag length	
Dependent variable= Foreign Direct Investment (FDI)	Lag Length
Foreign Direct Investment (FDI)	1
Real Effective Exchange Rate	2
Exchange Rate Volatility	1
Economic Growth	0
Interest Rate	2
Trade Openness	0
Inflation	2
Dependent variable= Real Effective Exchange Rate (REER)	Lag Length
Foreign Direct Investment (FDI)	3
Real Effective Exchange Rate	0
Exchange Rate Volatility	2
Economic Growth	1
Interest Rate	1
Trade Openness	0
Inflation	0

4.2 Long-run Relationship

This section examines the long-run relationships between FDI and the explanatory variables as well as REER and its covariates. In the preceded section the bounds test to cointegration among the variables was established justifying the use of the ARDL estimation technique. Results of this analyses are presented in Table 4.3.

4.2.1 Discussion of Long-run Results (lnFDI as the Dependent Variable)

From Table 4.3, it can be seen that with the exception of real effective exchange rate and economic growth all the other variables had no significant impact on foreign direct investment. The following paragraphs discusses the various impact of real effective exchange rate and economic growth on FDI.

The coefficient of real effective exchange rate was negative and significantly related to FDI at 1% level of significance. The above finding conforms to the a priori expectation of a negative relationship between real effective exchange rate and foreign direct investment. The negative coefficient implies that a 1% increase in real effective exchange rate would result in an 2.76% fall in FDI. This is because an increase in REER implies that the Ghanaian cedis becomes more expensive and the cost of capital would increase. Due to the depreciation of the currency, the zeal with which foreign investors wished to invest in the country would decreases since their capital will be worth less in Ghana as compared to their own country. This finding turns to suggest that, depreciation of the Ghanaian cedi serves as a deterrent to the attraction of foreign direct investment into the country. This result is in consonance with the empirical works of Tsikata et al. (2000), Ullah et al (2012), Husek and Pankova (2008) and Adu et al., (2014) who found that the depreciation of a host country currency increases FDI inflows. Also from Table 4.3 it can be observed that economic growth had a positive and significant effect on foreign

direct investment at 1% level of significance which conforms to the a priori expectation of the study. Hence a 1% increase in gross domestic product would result in 1.79% increase in foreign direct investment. The importance of economic growth in determining the inflows of FDI cannot be overemphasized. This is because, economic growth serves as an indicator of the market size, which provides investors knowledge about business and market opportunities in the host country. Hence, economic growth can be used by the government to lure in FDI from other countries. This can be done by embarking on expansionary monetary policies that are less inflationary to attract more FDI inflows.

4.2.2 Discussion of Long-run Results (lnREER as the Dependent Variable)

This section discusses the relationship between real effective exchange rate and its covariates. Results from the ARDL model as shown in Table revealed a negative and significant effect of FDI on real effective exchange rate. Also results from the long-run revealed a positive and significant relationship between economic growth, interest rate and real effective exchange rate. In addition, a negative and significant relationship was established between inflation and real effective exchange rate. Exchange rate volatility and trade openness had no significant impact on REER. The significant findings are discussed below;

FDI had a negative and significant impact on REER conforming to the a priori expectation of the study. Thus, a 1% increase in FDI would result in a 0.08% decrease in real effective exchange rate. An increase in the inflows of FDI increases investment in the host country. Interest rate in the domestic country reduces as a result of the increase in investment. The reduction in interest rate provides the platform for indigenes to invest in interest bearing asset abroad due to the relatively high returns. This leads to a decline in the real effective exchange

rate because more cedis would be exchanged for the dollar in order to be able to purchase these foreign assets.

Table 4.4: Estimated Long run co-efficient using the ARDL Approach

Dependent Variable: LNFDI				Dependent Variable: LNREER			
Variable	Coefficient	Std. Error	t-Statistic	Variable	Coefficient	Std. Error	t-Statistic
LNREER	-2.766516***	0.878320	-3.149780	LNFDI	-0.088778**	0.042058	-2.110832
LNEXVOL	5.363126	7.451958	0.719694	LNEXVOL	-5.648340	2.931932	-1.926491
LNRY	1.419069**	0.560358	2.532431	LNRY	0.447365***	0.139065	3.216938
LNINT	1.383328	1.435311	0.963783	LNINT	0.770927***	0.268004	2.876547
LNT0	-0.248871	1.197180	-0.207881	LNT0	-0.099009	0.284593	-0.347896
LNINF	-0.184837	0.409455	-0.451423	LNINF	-0.234035**	0.092187	-2.538710
C	-1.331152	17.130193	-0.077708	C	-5.404228	3.854041	-1.402224

Note: **, *** denotes significance at 5% and 1% respectively

Source: Estimated from EViews 9.

The next significant determinant of REER in the short-run was economic growth. The coefficient of economic growth was positive and significantly related to REER at 1% significance level conforming to the a priori expectation of the study. The result implies that, a 1% increase in economic growth would result in a 0.44% in REER. When the economy grows it serves as an incentive for the attraction of FDI into the country which in turn strengthens the domestic currency. Hence, government should embark on policies that will promote economic growth.

Results from the ARDL model further revealed a positive and significant relationship between interest rate and real effective exchange rate at 1% level of significance. The positive coefficient implies that, a 1% increase in interest rate would result in 0.77% increase in real effective exchange rate. All other factors being equal, higher interest rates in a country increases the value of that country's currency relative to nations offering lower interest rates. Also, this high interest rates serves as incentives for FDI inflows although this may discourage borrowing.

The final significant variable established in the long-run was inflation. Inflation was negative and significantly related to real effective exchange rate at 5% significance level conforming to the a priori expectation of the study. The result suggests that, as inflation increases by 1%, real effective exchange rate decrease by 0.23%. Inflation generally serve as an indicator for price instability in the economy. The rate of inflation is a crucial factor in influencing exchange rate. A high rate of inflation signifies economic instability associated with inappropriate government policies. Hence, it is expedient that low inflation targeting policies be adopted by the government to ensure the reduction in real effective exchange rate.

4.3 Short-run Relationship

This section of the discussion of results examines the short-term dynamic relationship among the variables within the ARDL framework. The Error Correction Model (ECM) for foreign direct investment and real effective exchange rate is estimated and presented in Table 4.4 to depict how the short run reconcile with its long term foreign direct investment and real effective exchange rate model.

4.3.1 Discussion of Short-run Results (lnFDI as the Dependent Variable)

Having discussed the long-run impact of real effective exchange rate on FDI, this section discusses the short-run impact of nexus between the aforementioned variables as well as the other variables employed in the study. The results of the short-run dynamics of Table 4.4 reveal that, real effective exchange rate has a negative but insignificant effect on FDI inflows. Thus, a percentage rise in real effective exchange rate will lead to a 0.62% decrease in FDI inflows. Again, lag 1 of real effective exchange rate has a positive and significant effect on FDI inflows. A percentage rise in real effective exchange rate will lead to a 4.11% increase in FDI inflows. In addition, $D(LNY)$ had a positive impact on FDI in the short-run. The positive coefficient implies that, a 1% increase in $D(LNY)$ would result in a 0.99% increase in FDI. Furthermore, exchange rate volatility unlike the long-run had a negative and significant impact on FDI inflows. Hence, a 1% increase in exchange rate volatility would result in a 27.8% decrease in FDI inflows.

Moreover, as seen in Table 4.4, interest rate and lag 1 of interest rate had a positive effect on FDI. However, the lag 1 of interest rate had no significant impact on FDI inflows. Thus, a 1% increase in interest rate leads to 2.04% increase in FDI inflows. Trade openness was negatively

related to FDI but had no significant impact on it. Hence, a 1% increase in trade openness would result in a 0.17% decrease in FDI. Inflation and lag 1 of inflation had a negative effect on inflows of FDI in the Ghanaian economy. Unlike inflation, the lag 1 of inflation had a significant impact on inflation. Thus, when inflation increases by 1% FDI falls by 6.21%.

Table 4.5 Estimates of the Short-run Error Correction Model

Dependent Variable: LNFDI				Dependent Variable: LNREER			
Variable	Coefficient	Std. Error	t-Statistic	Variable	Coefficient	Std. Error	t-Statistic
D(LNREER)	-0.619771	0.529599	-1.170266	D(LNREER(-1))	0.224399	0.128086	1.751935
D(LNREER(-1))	4.111966***	1.033701	3.977905	D(LNREER(-2))	0.199463	0.115443	1.727810
D(LNEXVOL)	-27.804863***	9.606988	-2.894233	D(LNFDI)	-0.043488	0.022765	-1.910276
D(LNY)	0.998713	0.506306	1.972550	D(LNEXVOL)	-4.346873**	1.610378	-2.699287
D(LNINT)	2.004199**	1.049834	1.909063	D(LNEXVOL(-1))	-1.033514	0.732553	-1.410838
D(LNINT(-1))	3.156317	1.041905	3.029372	D(LNY)	0.535264***	0.126162	4.242664
D(LNTO)	-0.175150	0.837163	-0.209219	D(LNINT)	0.204583	0.127707	1.601964
D(LNINF)	-0.942866	1.500870	-0.628213	D(LNTO)	-0.048500	0.138996	-0.348928
D(LNINF(-1))	-6.219450***	1.582040	-3.931285	D(LNINF)	-0.114642**	0.047836	-2.396544
CointEq(-1)	-0.703781***	0.170201	-4.134989	CointEq(-1)	-0.489851***	0.102454	-4.781165
Cointeq = LNFDI - (-2.7665*LNREER + 5.3631*LNEXVOL + 1.4191*LNGDP_PRO + 1.3833*LNIR -0.2489*LNTO -0.1848*LNCPI - 1.3312)				Cointeq = LNREER - (-0.0888*LNFDI -5.6483*LNEXVOL + 0.4474*LNY + 0.7709*LNINT -0.0990*LNTO -0.2340*LNINF -5.4042)			

Note: **,*** denotes significance at 5% and 1% respectively

Source: Estimated from Eviews 9.

the long run component of the model is given by the lagged error correction, ECM (-1). From the empirical results the coefficient of the ECM (-1), is negative and significant. It means that the real effective exchange rate, exchange rate volatility, inflation, real GDP, interest rate, and trade openness are indeed related to lnFDI. A significant ECM (-1) coefficient means that all things being equal, whenever the actual value of lnFDI falls below the value consistent with its long-term equilibrium relationship, changes in the independent variables help bring it up to the long term equilibrium value. The size of the coefficient shows that the speed of adjustment to equilibrium (whenever there is inequality) is about 70.3%. In other words, 70.3% deviation in the long run equilibrium is corrected in the long run.

4.3.2 Discussion of Short-run Results (lnREER as the Dependent Variable)

This section discusses the short-run impact of the relationship between the aforementioned variables as well as the other variables used in the study. The results of the short-run results as seen in Table 4.4 revealed that, the lag 1 and 2 of real effective exchange rate had a positive but insignificant effect on FDI inflows. Thus, a 1% in the lag 1 and 2 of real effective exchange rate will lead to a 0.22% and 0.19% increase in REER. Again, FDI had a negative and insignificant effect on REER. A percentage rise in FDI would lead to a 0.04% decrease in real effective exchange rate. In addition, D(LNEXVOL) and D(LNEXVOL(-1)) had a negative impact on REER in the short-run. Unlike D(LNEXVOL(-1)), the D(LNEXVOL) had a significant impact on REER. Hence, a 1% increase in D(LNEXVOL) results in a 4.35% decrease in REER.

Furthermore, economic growth in the short-run just like the long-run had a positive and significant impact on REER inflows. Hence, a 1% increase in economic growth would result in a 0.53% increase in REER.

Moreover, as seen in Table 4.4, interest rate had a positive effect on REER. However, interest had no significant impact on REER in the short-run. Thus, a 1% increase in interest rate leads to 0.20% increase in REER. Trade openness and inflation had a negative impact on REER. However, trade openness had no significant impact on REER. Hence, REER is expected to fall by 0.04% should trade openness increase by 1%. Concerning inflation, a 1% increase in this variable would result in a 0.11% decrease in REER.

The error correction term as elaborated above is the measure of the speed of adjustment to equilibrium when there is a shock. The ECM is valid if it is significant and less than zero (0). The results in Table 4.4 show that, the coefficient of the ECM is -0.4898. This implies that about 48.9% deviations from equilibrium can be adjusted in the long run within a year.

4.4 Results of the Granger Causality Test

As reported in the methodology section of the research, a Granger-causality test was performed to determine the causal association between foreign direct investment and real effective exchange rate. Notwithstanding the fact that the estimated results may show the existence of Granger-causality, it is important to note that, this does not literally mean that the occurrence of one variable is as a result of the other. This test further suggests that while the past can predict the future, the future cannot predict the past. The results are presented in Table 4.5.

Table 4.6: Results of the Granger-Causality Test

Null Hypothesis	Obs	F-Statistic	Prob
LNREER does not Granger Cause LNFDI	34	3.81068	0.0339
LNFDI does not Granger Cause LNREER	34	0.83823	0.4427

Source: Authors' Computation

Results from Table 4.5, indicate that the null assumption that real effective exchange rate does not Granger-cause foreign direct investment is rejected at 5% significant level. On the other hand, we fail to reject the null assumption that foreign direct investment does not Granger-cause real effective exchange rate. The implication is that, there is unidirectional causality running from real effective exchange rate to foreign direct investment with no feedback effect. Hence, past and present values of real effective exchange rate provide important information to forecast the future values of FDI inflows to Ghana. The Granger-causality test performed above further conforms to ARDL Cointegration long-run relationship and the error correction short-run relationship established by the study.

4.5 Hypotheses Testing

This section examines the various hypotheses specified by the study. In testing the research hypotheses, the significance of the estimated regressors was used as the benchmark. Hence a hypothesis is supported if its coefficient conforms to the a priori of the study and also significant. The results of the various hypotheses tests are presented in Table 4.6. From Table 4.6, we observe that three (3) hypotheses were tested out of which all were supported. The subsequent paragraphs discuss the various hypotheses specified by the study.

Table 4.7: Summary of Hypotheses

Hypothesis	Empirical conclusions
There exist a relationship between exchange rate volatility and FDI inflows.	Supported
There exist a relationship between FDI inflows and exchange rate volatility.	Supported
Economic growth has a positive impact of FDI inflows to Ghana.	Supported

The first hypothesis of the study was “*there exist a relationship between exchange rate volatility and FDI inflows*”. Findings from the ARDL long-run model revealed a negative and significant relationship between real effective exchange rate and foreign direct investment. Based on the benchmark aforementioned the first hypothesis of the study is supported.

The second hypothesis was stated as “*there exist a relationship between FDI inflows and exchange rate volatility*”. The ARDL long-run model established a negative and significant nexus between foreign direct investment and real effective exchange rate. Since the a priori sign and the significance of the parameter has been satisfied, the second hypothesis specified by the study is supported.

The final hypothesis of the study was “*Economic growth has a positive impact of FDI inflows to Ghana*”. Results from the ARDL long-run model revealed a positive and significant relationship between economic growth and foreign direct investment. Based on the benchmark aforementioned the third hypothesis of the study is supported.

4.6 Model Diagnostics and Goodness of Fit

This section examines the various diagnostics tests conducted and the goodness of fit test. The diagnostic tests carried out included the normality test, serial correlation test, stability test and the heteroscedasticity. The results of these tests are presented in Table 4.7.

Table 4.8: Model Diagnostics Test

Diagnostics	Test Statistic	
	LNFDI=f(LNREER, LNGDP, LNEXVOL, LNINT, LNT0, LNINF)	LNREER=f(LNFDI, LNGDP, LNEXVOL, LNINT, LNT0, LNINF)
F_{Auto}	2.427452[0.1182]	1.696704[0.2129]
F_{RESET}	1.987773[0.1756]	2.197729[0.1555]
χ^2_{Norm}	3.660124[0.1604]	0.173605[0.9168]
F_{HETERO}	2.427452[0.1182]	1.041155[0.4561]

F_{Auto} , F_{Reset} , χ^2_{Norm} and F_{HETERO} are Breusch-Godfrey Lagrange multiplier statistics for test of serial correlation, Ramsey Reset test for functional form misspecification and stability, Jacque- Bera test for non-normal errors and Breusch-Pagan-Godfrey test for heteroskedasticity, respectively. These statistics are distributed as F- statistic values. Values in parentheses [] are probability values.

A parameter estimate is considered as statistically significant if the p-value is less than 0.05 (i.e. 5% significance level). Using the significance level of the computed F-statistics we can infer from Table 4.6 that, the model passed all the diagnostic tests since none of the test were significant at the 5% significance level. Based on the above findings we conclude that the estimated ARDL model is good/appropriate for the analysis carried out and policy implications/recommendations.

CHAPTER FIVE

SUMMARY, RECOMMENDATIONS AND CONCLUSIONS

5.0 Introduction

The relevance of FDI is very critical not only in ensuring economic growth, creation of jobs, industrialization but also fosters bilateral relationship between countries. It is against this backdrop that this study examined the effect of exchange rate movement on FDI inflows into Ghana using time series data from 1980 to 2016. This chapter of the study focuses on presenting a summary of the study and recommendations based on the findings of the study. The chapter ends with a discussion on the study's limitation, implications for future research and conclusion.

5.1 Summary of Findings

The rationale behind this study was to investigate the impact of exchange rate movement on FDI inflows. Specifically, the study investigated the effects exchange rate has on foreign direct investment in Ghana using annual time series data from 1980 to 2016. These periods were chosen due to significance and availability of the data. Secondary data was used in this study to analyse the phenomenon above and it was sourced from the data base directory of WDI (2018) and UNCTAD (2018). The theories as well as empirical works that characterized foreign direct investment as well as exchange rate were reviewed in this study. Based on this review the determinants of foreign direct investment were theoretically modelled. The variables included in the foreign direct investment model which according to the review of pertinent literature have potential effects on it included exchange rate volatility, economic

growth, interest rate, inflation, and trade openness. Analyses involved descriptive measures such as trends in exchange rate and FDI. Also, unit root test was employed to determine the stationarity conditions of the variables. The ARDL bounds test to cointegration was then used to determine the long run relationship among the various variables. The ARDL estimation technique was used to examine the nexus between exchange rate movement and FDI inflows as well as the relationship between real effective exchange rate and its covariates. In addition, the error correction model was used to determine the speed of adjustment to equilibrium in situations where there is disequilibrium in the system in the long run. Furthermore, the various diagnostics tests which included autocorrelation, normality, heteroscedasticity and Ramsey reset were carried out to determine and affirm the validity of the data retrieved for the study. The salient findings of the study based on the various estimation techniques performed is presented in three sections. The first section presents the summary of findings in relation to the trends and movements in exchange rate and FDI. The second section presents the summary of findings concerning the preliminary tests performed prior to estimating the ARDL long and short-run estimates. The final section discusses the summary of results from the ARDL model and the various diagnostic tests carried out.

According to the trend analyses from figures 1 and 2, there exists a time trend between exchange rate and foreign direct investment. FDI inflows was sluggish in the early 1980s due to the various political and economic downturns experienced in the country during that time. However, after series of economic recovery policies FDI started increasing recording an all-time peak in 2004. Exchange rate of the cedi against the major trading currencies on the other hand, revealed a downward trend for almost all the years under study.

The next set of analyses involved performing a stationary test. The ADF and PP tests were employed at this stage to determine the stationary characteristics of the variables. From the analysis, it was evident that all the variables were stationary at $I(0)$ and $I(1)$. Upon this revelation the ARDL bounds test to Cointegration was estimated to determine the long-run relationship among the variables. Finding from this analysis revealed a long run relationship between FDI and its covariates as well as a long –run relationship between REER and its covariates.

Having established a long-run relationship, the ARDL model was estimated. Results from the estimation revealed that, holding all other variables constant, a percentage change in real effective exchange rate brings about 2.76% decrease in the inflows of FDI in the long run. The indication is that, as the cedi depreciates it causes foreign investors to look elsewhere to invest other than Ghana. Also, results from the ARDL long-run results with REER as the dependent variable, a negative relationship was established. The result implies that, holding other variables constant, a percentage increase in the flow of FDI would reduce real effective exchange rate by 0.08%.

Concerning the ARDL short-run results, it was observed that in the short-term the effects that real effective exchange rate had on FDI was negative however, not significant. Nevertheless, the lag 1 of real effective exchange rate was positive and significant in determining the inflows of FDI. Thus the level of exchange rate, whether appreciation or depreciation, significantly influence the behavior of investors, firms, and businesses in their investment decisions in the Ghanaian economy. Also, results from the ARDL short-run results with REER as the dependent variable revealed a negative but insignificant relationship between FDI and REER.

The study also revealed economic growth as a significant determinant of FDI in the long-run. Nonetheless, economic growth, interest rate and inflation were revealed by the long-run results as significant determinants of REER. Also, in the short-run, exchange rate volatility, interest rate and inflation were established by the study as significant determinants of FDI. Similar results were established in the short-run when REER was used as the dependent variable.

Findings from the granger causality tests revealed that real effective exchange rate causes FDI inflows, but FDI does not granger cause real effective exchange rate. This implies that, there is unidirectional causality running from is unidirectional causality running from real effective exchange rate to foreign direct investment with no feedback effect.

Finally, diagnostics test was carried out to affirm the validity of the ARDL models estimated. Findings from these tests revealed no violation of the aforementioned diagnostics test performed.

5.2 Recommendations

It is imperative that the government put in place policies that can lead to FDI attraction. Based on the findings of the study, the following managerial recommendations are made:

The study revealed fluctuations in FDI inflows to Ghana over the study period, based on this finding the study recommends that government should create the necessary environment that would be favourable for foreign investors. On this premises, an improvement in the country's ports and harbours clearing system, transportation system and industry, provision of sustainable water and electricity must be developed since these facilities are important in attracting FDI.

Also, the trends and the long-run results revealed exchange rate as a factor that influences the flow of FDI into Ghana. Hence, the study recommends that the government of Ghana retain tight monetary and fiscal policies in order to stabilize the exchange rate in Ghana. Since exchange rate has a negative influence on FDI, there is therefore the need to put in place stringent policies to minimize strikes in exchange rate. In addition, the central bank should devise policies to manage the persistent hikes in exchange rate in order to attract foreign direct investors.

The study further recommends that, in order to improve the exchange rate stability, the government should implement policies that would reduce importation but rather increase exportation of the country. To achieve this reduction in importation, there is the need to increase production of agriculture commodities that can be supported by national climates so as to reduce the importation of such commodities.

Economic growth plays a crucial role in the attraction of FDI. The study revealed a positive and significant impact of economic growth on FDI attraction. In light of this finding the recommends that, growth policies should be devised by government in other to attract more FDI inflows.

Finally, the inverse relationship of other macroeconomic such inflation and trade openness calls for the need for policy makers and monetary authorities to put measures in place that will bring about a stable macroeconomic environment. This is because any disturbances in the macroeconomic environment may affect the growth performance of the economy as well curtailing investor confidence. Periods of high inflation deters FDI in Ghana. Therefore, both

fiscal and monetary policies geared towards stabilizing prices of goods and services should be implemented.

5.3 Limitations and Implications for further Studies

Despite the enormous findings established by the current study some limitations were encountered in the course of the study. Secondary data was needed up to 2018 but was not available. Although some of the variables had series up to 2017 others did not have hence, reducing the sample size of the study. However, this problem seems not to have significantly affected the findings presented in this study due to the predictive ability of the ARDL model. Hence, future studies can expand the scope of the current study by looking out for data up to 2018 or beyond.

In addition, there are factors (country risk, government debt among others) which might be important in affecting FDI inflows but are not considered in the present study. Thus, future studies can examine the effects of these factors as well as the factors considered in this study.

5.4 Conclusions

Issues created by inconsistency make it difficult for investors to make healthy and sound decisions. Exchange rate over the last two decades has been investigated by researchers to determine its influence in attracting FDI. Most studies have analysed this phenomenon by considering the impact of exchange rate movement on FDI, however the inverse relationship has not been given much research attention. On this premises the study reported herein analysed the impact of exchange rate on foreign direct investment and the impact of foreign direct investment on exchange rate. Other plausible factors that have the tenacity to influence foreign

direct investment was included in the ARDL model after a review of pertinent literature was done. Output from the ARDL estimation model revealed real effective exchange rate as a significant determinant of FDI inflows. Also, FDI was revealed by the study as a significant determinant in reducing the depreciation of the cedi. Hence, the study recommends as seen above that government should design and implement policies that would attract FDI, improve economic growth and finally lead to the appreciation of the cedi.

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APPENDICES

Selected Model: ARDL(1, 2, 1, 0, 2, 0, 2)

Dependent Variable: LNFDI

Method: ARDL

Date: 02/14/19 Time: 14:26

Sample (adjusted): 1983 2016

Included observations: 34 after adjustments

Maximum dependent lags: 1 (Automatic selection)

Model selection method: Akaike info criterion (AIC)

Dynamic regressors (2 lags, automatic): LNREER LNEXVOL LNY LNINT
LNT0 LNINF

Fixed regressors: C

Number of models evaluated: 729

Selected Model: ARDL(1, 2, 1, 0, 2, 0, 2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNFDI(-1)	0.296219	0.170201	1.740406	0.0980
LNREER	-0.619771	0.529599	-1.170266	0.2564
LNREER(-1)	2.784717	1.090127	2.554489	0.0194
LNREER(-2)	-4.111966	1.033701	-3.977905	0.0008
LNEXVOL	-27.80486	9.606988	-2.894233	0.0093
LNEXVOL(-1)	31.57933	7.516352	4.201417	0.0005
LNY	0.998713	0.506306	1.972550	0.0633
LNINT	2.004199	1.049834	1.909063	0.0715
LNINT(-1)	2.125678	1.234756	1.721538	0.1014
LNINT(-2)	-3.156317	1.041905	-3.029372	0.0069
LNT0	-0.175150	0.837163	-0.209219	0.8365
LNINF	-0.942866	1.500870	-0.628213	0.5373
LNINF(-1)	-5.406670	2.615804	-2.066925	0.0526
LNINF(-2)	6.219450	1.582040	3.931285	0.0009
C	-0.936839	12.14297	-0.077151	0.9393
R-squared	0.985043	Mean dependent var		18.77125
Adjusted R-squared	0.974023	S.D. dependent var		2.408708
S.E. of regression	0.388221	Akaike info criterion		1.245949
Sum squared resid	2.863600	Schwarz criterion		1.919343
Log likelihood	-6.181135	Hannan-Quinn criter.		1.475596
F-statistic	89.38215	Durbin-Watson stat		2.384911
Prob(F-statistic)	0.000000			

*Note: p-values and any subsequent tests do not account for model selection

ARDL Bounds Test

Date: 02/14/19 Time: 14:27

Sample: 1983 2016

Included observations: 34

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
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F-statistic	4.661010	6
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Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Test Equation:

Dependent Variable: D(LNFDI)

Method: Least Squares

Date: 02/14/19 Time: 14:27

Sample: 1983 2016

Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNREER)	-0.211213	0.512428	-0.412180	0.6848
D(LNREER(-1))	4.272546	1.113928	3.835567	0.0011
D(LNEXVOL)	-31.56242	10.55516	-2.990236	0.0075
D(LNINT)	1.123716	1.039887	1.080614	0.2934
D(LNINT(-1))	3.312342	1.123981	2.946973	0.0083
D(LNINF)	-0.772754	1.669339	-0.462910	0.6487
D(LNINF(-1))	-5.656259	1.700364	-3.326500	0.0035
C	10.84235	11.60647	0.934164	0.3619
LNREER(-1)	-1.385325	0.733681	-1.888185	0.0744
LNEXVOL(-1)	-0.814853	5.389843	-0.151183	0.8814
LNINT(-1)	0.434427	0.426254	1.019174	0.3209
LNINT(-1)	-0.352249	0.940113	-0.374688	0.7120
LNT0(-1)	-0.068319	0.881888	-0.077469	0.9391
LNINF(-1)	0.060356	0.280510	0.215165	0.8319
LNFDI(-1)	-0.594564	0.187018	-3.179173	0.0049
R-squared	0.773137	Mean dependent var		0.157758
Adjusted R-squared	0.605974	S.D. dependent var		0.670227
S.E. of regression	0.420711	Akaike info criterion		1.406690
Sum squared resid	3.362958	Schwarz criterion		2.080085
Log likelihood	-8.913735	Hannan-Quinn criter.		1.636337
F-statistic	4.625063	Durbin-Watson stat		2.520436
Prob(F-statistic)	0.001227			

ARDL Cointegrating And Long Run Form

Dependent Variable: LNFDI

Selected Model: ARDL(1, 2, 1, 0, 2, 0, 2)

Date: 02/14/19 Time: 14:30

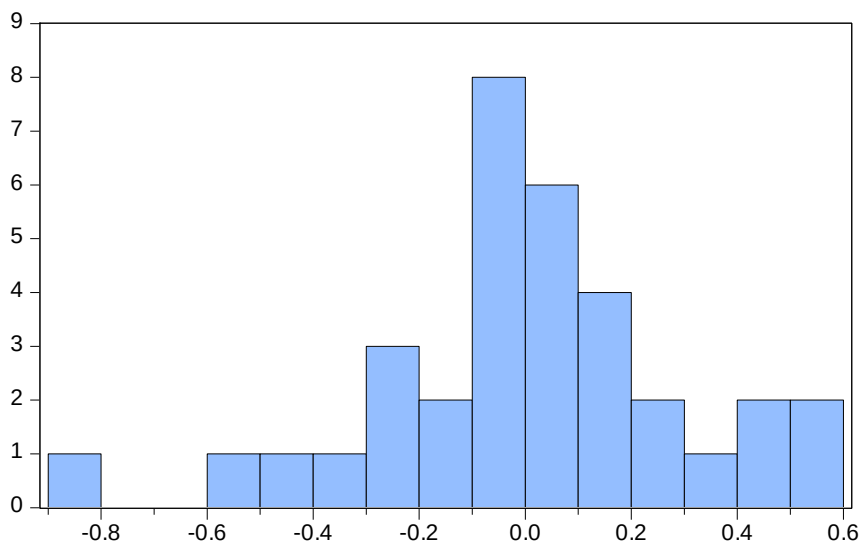
Sample: 1980 2017

Included observations: 34

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNREER)	-0.619771	0.529599	-1.170266	0.2564
D(LNREER(-1))	4.111966	1.033701	3.977905	0.0008
D(LNEXVOL)	-27.804863	9.606988	-2.894233	0.0093
D(LNY)	0.998713	0.506306	1.972550	0.0633
D(LNINT)	2.004199	1.049834	1.909063	0.0715
D(LNINT(-1))	3.156317	1.041905	3.029372	0.0069
D(LNTO)	-0.175150	0.837163	-0.209219	0.8365
D(LNINF)	-0.942866	1.500870	-0.628213	0.5373
D(LNINF(-1))	-6.219450	1.582040	-3.931285	0.0009
CointEq(-1)	-0.703781	0.170201	-4.134989	0.0006

Cointeq = LNFDI - (-2.7665*LNREER + 5.3631*LNEXVOL + 1.4191*LNY + 1.3833*LNINT -0.2489*LNTO -0.1848*LNINF -1.3312)

Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNREER	-2.766516	0.878320	-3.149780	0.0053
LNEXVOL	5.363126	7.451958	0.719694	0.4805
LNY	1.419069	0.560358	2.532431	0.0203
LNINT	1.383328	1.435311	0.963783	0.3473
LNTO	-0.248871	1.197180	-0.207881	0.8375
LNINF	-0.184837	0.409455	-0.451423	0.6568
C	-1.331152	17.130193	-0.077708	0.9389



Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.427452	Prob. F(2,17)	0.1182
Obs*R-squared	7.552845	Prob. Chi-Square(2)	0.0229

Test Equation:

Dependent Variable: RESID

Method: ARDL

Date: 02/14/19 Time: 14:36

Sample: 1983 2016

Included observations: 34

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFDI(-1)	0.177935	0.221927	0.801770	0.4338
LNREER	0.194051	0.502621	0.386078	0.7042
LNREER(-1)	0.793742	1.080257	0.734771	0.4725
LNREER(-2)	-0.092934	0.967590	-0.096047	0.9246
LNEXVOL	-7.661076	9.631035	-0.795457	0.4373
LNEXVOL(-1)	-1.388186	7.108042	-0.195298	0.8475
LNLY	-0.450371	0.587581	-0.766482	0.4539
LNINT	-0.292576	1.146209	-0.255255	0.8016
LNINT(-1)	-0.198185	1.169687	-0.169434	0.8675
LNINT(-2)	0.196925	1.009103	0.195149	0.8476
LNT0	-0.602988	0.827591	-0.728606	0.4762
LNINF	1.543920	1.567320	0.985070	0.3384
LNINF(-1)	-0.818557	2.493787	-0.328238	0.7467
LNINF(-2)	-0.464059	1.519676	-0.305367	0.7638
C	5.336844	12.56905	0.424602	0.6765
RESID(-1)	-0.559439	0.322767	-1.733261	0.1011
RESID(-2)	-0.517234	0.292174	-1.770291	0.0946

R-squared	0.222143	Mean dependent var	5.93E-15
Adjusted R-squared	-0.509959	S.D. dependent var	0.294577
S.E. of regression	0.361978	Akaike info criterion	1.112384
Sum squared resid	2.227473	Schwarz criterion	1.875564
Log likelihood	-1.910532	Hannan-Quinn criter.	1.372651
F-statistic	0.303431	Durbin-Watson stat	2.352435
Prob(F-statistic)	0.989344		

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.829358	Prob. F(14,19)	0.1096
Obs*R-squared	19.51927	Prob. Chi-Square(14)	0.1460
Scaled explained SS	9.686904	Prob. Chi-Square(14)	0.7847

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 02/14/19 Time: 14:37

Sample: 1983 2016

Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.990538	4.100137	1.461058	0.1603
LNFDI(-1)	0.041501	0.057469	0.722133	0.4790
LNREER	-0.152225	0.178822	-0.851265	0.4052
LNREER(-1)	0.355284	0.368087	0.965217	0.3466
LNREER(-2)	-0.696905	0.349035	-1.996664	0.0604
LNEXVOL	-2.856536	3.243850	-0.880601	0.3895
LNEXVOL(-1)	4.612459	2.537936	1.817406	0.0850
LNLY	-0.113956	0.170957	-0.666575	0.5131
LNINT	-0.212150	0.354482	-0.598478	0.5566
LNINT(-1)	0.360228	0.416922	0.864018	0.3984
LNINT(-2)	-0.385697	0.351805	-1.096337	0.2866
LNT0	-0.008365	0.282672	-0.029591	0.9767
LNINF	-0.810446	0.506777	-1.599218	0.1263
LNINF(-1)	-0.439605	0.883240	-0.497718	0.6244
LNINF(-2)	1.082413	0.534184	2.026291	0.0570
R-squared	0.574096	Mean dependent var		0.084224
Adjusted R-squared	0.260272	S.D. dependent var		0.152411
S.E. of regression	0.131085	Akaike info criterion		-0.925511
Sum squared resid	0.326482	Schwarz criterion		-0.252116
Log likelihood	30.73368	Hannan-Quinn criter.		-0.695864
F-statistic	1.829358	Durbin-Watson stat		2.801953
Prob(F-statistic)	0.109579			

Ramsey RESET Test

Equation: UNTITLED

Specification: LNFDI LNFDI(-1) LNREER LNREER(-1) LNREER(-2)
LNEXVOL LNEXVOL(-1) LNLY LNINT LNINT(-1) LNINT(-2) LNT0 LNINF
LNINF(-1) LNINF(-2) C

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.409884	18	0.1756
F-statistic	1.987773	(1, 18)	0.1756

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.284783	1	0.284783
Restricted SSR	2.863600	19	0.150716
Unrestricted SSR	2.578817	18	0.143268

Unrestricted Test Equation:

Dependent Variable: LNFDI

Method: ARDL

Date: 02/14/19 Time: 14:37

Sample: 1983 2016

Included observations: 34

Maximum dependent lags: 1 (Automatic selection)

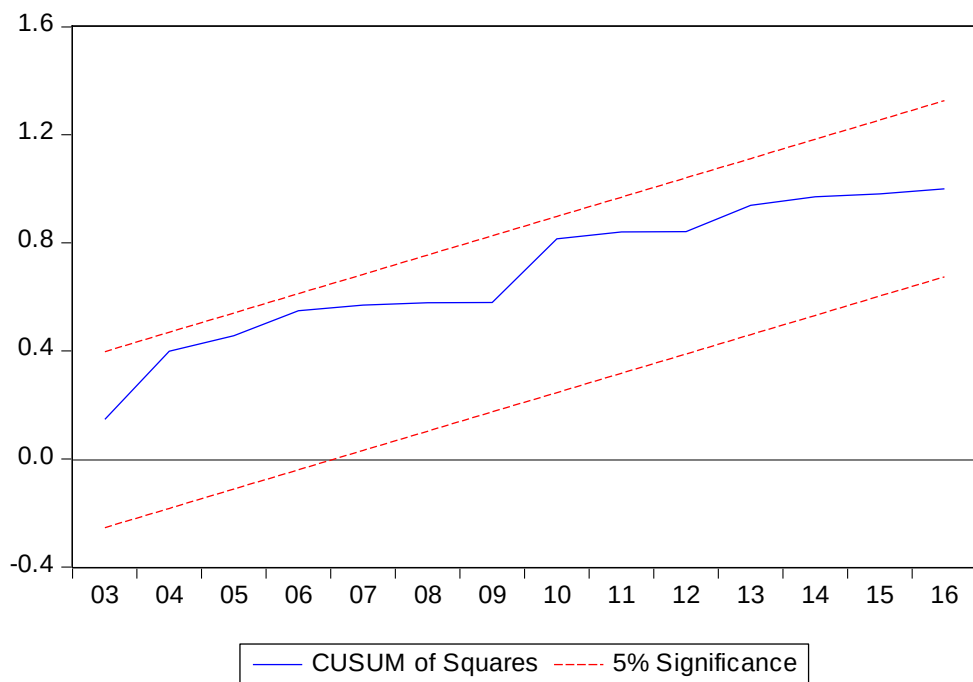
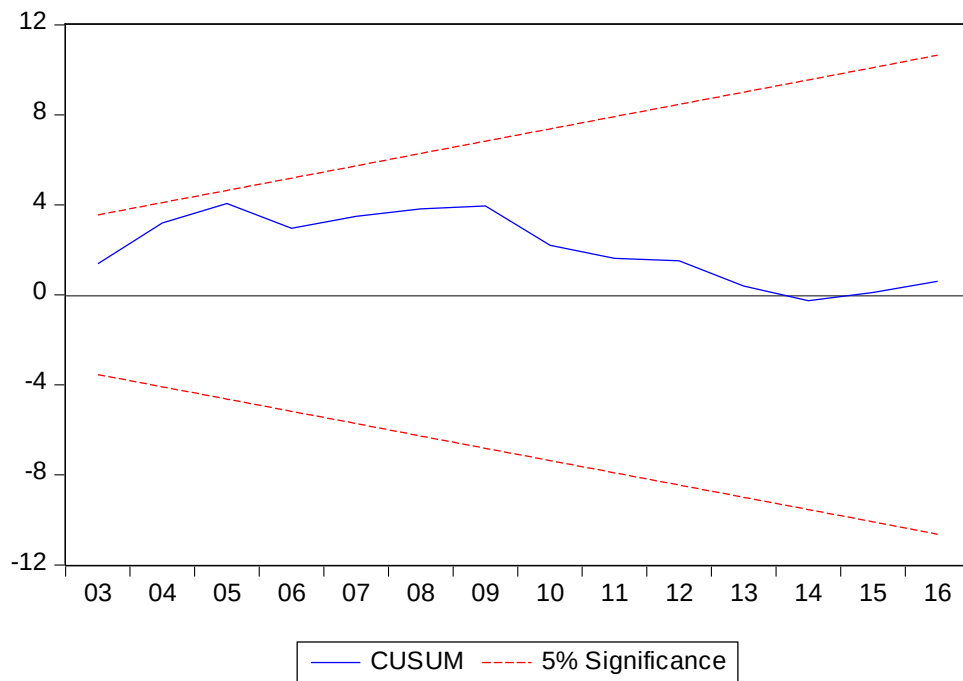
Model selection method: Akaike info criterion (AIC)

Dynamic regressors (2 lags, automatic):

Fixed regressors: C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNFDI(-1)	1.036553	0.550699	1.882249	0.0761
LNREER	-2.520936	1.443934	-1.745881	0.0979
LNREER(-1)	9.380219	4.797266	1.955326	0.0663
LNREER(-2)	-13.70092	6.875502	-1.992715	0.0617
LNEXVOL	-91.10000	45.86057	-1.986456	0.0624
LNEXVOL(-1)	107.6926	54.48063	1.976714	0.0636
LN Y	4.441781	2.491485	1.782785	0.0915
LNINT	7.347081	3.925389	1.871682	0.0776
LNINT(-1)	7.801756	4.202059	1.856651	0.0798
LNINT(-2)	-11.28959	5.857508	-1.927370	0.0699
LNT0	-0.537755	0.855776	-0.628382	0.5376
LNINF	-3.232491	2.186002	-1.478723	0.1565
LNINF(-1)	-19.04774	10.00580	-1.903670	0.0731
LNINF(-2)	21.73542	11.11271	1.955907	0.0662
C	-47.96360	35.39385	-1.355139	0.1921
FITTED^2	-0.071928	0.051017	-1.409884	0.1756
R-squared	0.986531	Mean dependent var	18.77125	
Adjusted R-squared	0.975307	S.D. dependent var	2.408708	
S.E. of regression	0.378507	Akaike info criterion	1.200024	
Sum squared resid	2.578817	Schwarz criterion	1.918311	
Log likelihood	-4.400402	Hannan-Quinn criter.	1.444980	
F-statistic	87.89287	Durbin-Watson stat	2.258102	
Prob(F-statistic)	0.000000			

*Note: p-values and any subsequent tests do not account for model selection.



Dependent Variable: LNREER
Method: ARDL

Date: 02/14/19 Time: 14:45
Sample (adjusted): 1984 2016
Included observations: 33 after adjustments
Maximum dependent lags: 3 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (2 lags, automatic): LNFDI LNEXVOL LNY LNINT
LNT0 LNINF
Fixed regressors: C
Number of models evaluated: 2187
Selected Model: ARDL(3, 0, 2, 1, 1, 0, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNREER(-1)	0.734548	0.153323	4.790842	0.0001
LNREER(-2)	-0.024936	0.198779	-0.125444	0.9015
LNREER(-3)	-0.199463	0.115443	-1.727810	0.1002
LNFDI	-0.043488	0.022765	-1.910276	0.0713
LNEXVOL	-4.346873	1.610378	-2.699287	0.0142
LNEXVOL(-1)	0.546514	1.530911	0.356986	0.7250
LNEXVOL(-2)	1.033514	0.732553	1.410838	0.1745
LNY	0.535264	0.126162	4.242664	0.0004
LN(-1)	-0.316121	0.096203	-3.285988	0.0039
LNINT	0.204583	0.127707	1.601964	0.1257
LNINT(-1)	0.173057	0.135109	1.280870	0.2157
LNT0	-0.048500	0.138996	-0.348928	0.7310
LNINF	-0.114642	0.047836	-2.396544	0.0270
C	-2.647267	1.780023	-1.487210	0.1534
R-squared	0.989511	Mean dependent var	4.832112	
Adjusted R-squared	0.982335	S.D. dependent var	0.453953	
S.E. of regression	0.060336	Akaike info criterion	-2.481372	
Sum squared resid	0.069167	Schwarz criterion	-1.846490	
Log likelihood	54.94264	Hannan-Quinn criter.	-2.267753	
F-statistic	137.8801	Durbin-Watson stat	2.243405	
Prob(F-statistic)	0.000000			

*Note: p-values and any subsequent tests do not account for model selection.

ARDL Bounds Test

Date: 02/14/19 Time: 14:59
Sample: 1984 2016
Included observations: 33
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	24.70467	6

Critical Value Bounds

Significance	I0 Bound	I1 Bound
--------------	----------	----------

10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Test Equation:

Dependent Variable: D(LNREER)

Method: Least Squares

Date: 02/14/19 Time: 14:59

Sample: 1984 2016

Included observations: 33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNREER(-1))	0.220055	0.143827	1.529990	0.1425
D(LNREER(-2))	0.141069	0.116894	1.206820	0.2423
D(LNEXVOL)	-4.947258	1.809399	-2.734200	0.0132
D(LNEXVOL(-1))	-0.659022	0.801282	-0.822459	0.4210
D(LNY)	0.507906	0.099773	5.090597	0.0001
D(LNINT)	0.096047	0.156145	0.615116	0.5458
C	-2.443730	1.939881	-1.259732	0.2230
LNFDI(-1)	-0.011803	0.029477	-0.400414	0.6933
LNEXVOL(-1)	-3.278172	1.111179	-2.950174	0.0082
LNY(-1)	0.170841	0.079276	2.155009	0.0442
LNINT(-1)	0.323109	0.153593	2.103667	0.0490
LNT0(-1)	-0.020042	0.142741	-0.140410	0.8898
LNINF(-1)	-0.118737	0.048974	-2.424474	0.0255
LNREER(-1)	-0.415330	0.116929	-3.552001	0.0021
R-squared	0.979936	Mean dependent var		-0.115397
Adjusted R-squared	0.966208	S.D. dependent var		0.349341
S.E. of regression	0.064218	Akaike info criterion		-2.356643
Sum squared resid	0.078356	Schwarz criterion		-1.721761
Log likelihood	52.88461	Hannan-Quinn criter.		-2.143025
F-statistic	71.38170	Durbin-Watson stat		2.366329
Prob(F-statistic)	0.000000			

ARDL Cointegrating And Long Run Form

Dependent Variable: LNREER

Selected Model: ARDL(3, 0, 2, 1, 1, 0, 0)

Date: 02/14/19 Time: 15:00

Sample: 1980 2017

Included observations: 33

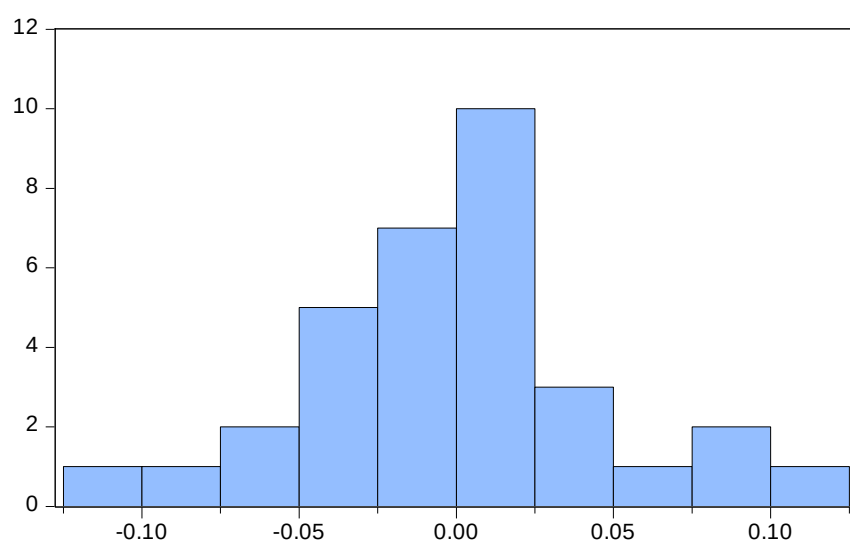
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNREER(-1))	0.224399	0.128086	1.751935	0.0959

D(LNREER(-2))	0.199463	0.115443	1.727810	0.1002
D(LNFDI)	-0.043488	0.022765	-1.910276	0.0713
D(LNEXVOL)	-4.346873	1.610378	-2.699287	0.0142
D(LNEXVOL(-1))	-1.033514	0.732553	-1.410838	0.1745
D(LNY)	0.535264	0.126162	4.242664	0.0004
D(LNINT)	0.204583	0.127707	1.601964	0.1257
D(LNTO)	-0.048500	0.138996	-0.348928	0.7310
D(LNINF)	-0.114642	0.047836	-2.396544	0.0270
CointEq(-1)	-0.489851	0.102454	-4.781165	0.0001

Cointeq = LNREER - (-0.0888*LNFDI -5.6483*LNEXVOL + 0.4474*LNY +
0.7709*LNINT -0.0990*LNTO -0.2340*LNINF -5.4042)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFDI	-0.088778	0.042058	-2.110832	0.0483
LNEXVOL	-5.648340	2.931932	-1.926491	0.0691
LNY	0.447365	0.139065	3.216938	0.0045
LNINT	0.770927	0.268004	2.876547	0.0097
LNTO	-0.099009	0.284593	-0.347896	0.7317
LNINF	-0.234035	0.092187	-2.538710	0.0200
C	-5.404228	3.854041	-1.402224	0.1770



Series: Residuals
Sample 1984 2016
Observations 33

Mean 2.76e-15
Median 0.001133
Maximum 0.100710
Minimum -0.108246
Std. Dev. 0.046492
Skewness 0.100205
Kurtosis 3.293419

Jarque-Bera 0.173605
Probability 0.916858

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.696704	Prob. F(2,17)	0.2129
Obs*R-squared	5.491110	Prob. Chi-Square(2)	0.0642

Test Equation:

Dependent Variable: RESID

Method: ARDL

Date: 02/14/19 Time: 15:01

Sample: 1984 2016

Included observations: 33

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNREER(-1)	0.099280	0.178487	0.556234	0.5853
LNREER(-2)	-0.001561	0.226902	-0.006879	0.9946
LNREER(-3)	0.005472	0.124743	0.043869	0.9655
LNFDI	0.009003	0.023296	0.386473	0.7039
LNEXVOL	-0.586320	1.849601	-0.316998	0.7551
LNEXVOL(-1)	-0.044304	1.706686	-0.025959	0.9796
LNEXVOL(-2)	-0.192160	0.768961	-0.249896	0.8057
LNy	0.013907	0.123284	0.112808	0.9115
LNy(-1)	-0.024917	0.094012	-0.265045	0.7942
LNINT	0.059766	0.128902	0.463653	0.6488
LNINT(-1)	0.001808	0.130671	0.013835	0.9891
LNTO	-0.030620	0.135576	-0.225854	0.8240
LNINF	0.013191	0.046725	0.282301	0.7811
C	-0.524892	1.746086	-0.300610	0.7674
RESID(-1)	-0.492824	0.316152	-1.558821	0.1375
RESID(-2)	-0.445794	0.313326	-1.422782	0.1729
R-squared	0.166397	Mean dependent var	2.76E-15	
Adjusted R-squared	-0.569135	S.D. dependent var	0.046492	
S.E. of regression	0.058238	Akaike info criterion	-2.542158	
Sum squared resid	0.057658	Schwarz criterion	-1.816579	
Log likelihood	57.94561	Hannan-Quinn criter.	-2.298023	
F-statistic	0.226227	Durbin-Watson stat	1.969082	
Prob(F-statistic)	0.997061			

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.041155	Prob. F(13,19)	0.4561
Obs*R-squared	13.72845	Prob. Chi-Square(13)	0.3932
Scaled explained SS	5.218604	Prob. Chi-Square(13)	0.9701

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 02/14/19 Time: 15:01

Sample: 1984 2016

Included observations: 33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.066356	0.094311	0.703585	0.4902
LNREER(-1)	0.014630	0.008124	1.801000	0.0876

LNREER(-2)	-0.012085	0.010532	-1.147444	0.2654
LNREER(-3)	0.003690	0.006117	0.603271	0.5535
LNFDI	0.001062	0.001206	0.880210	0.3897
LNEXVOL	-0.127879	0.085323	-1.498773	0.1504
LNEXVOL(-1)	0.080279	0.081112	0.989726	0.3347
LNEXVOL(-2)	-0.027486	0.038813	-0.708177	0.4874
LNLY	0.000294	0.006684	0.044021	0.9653
LNLY(-1)	-0.004780	0.005097	-0.937781	0.3601
LNINT	-0.004434	0.006766	-0.655364	0.5201
LNINT(-1)	-0.009840	0.007158	-1.374635	0.1852
LNTO	0.008444	0.007364	1.146568	0.2658
LNINF	0.000867	0.002535	0.342205	0.7360
R-squared	0.416014	Mean dependent var	0.002096	
Adjusted R-squared	0.016444	S.D. dependent var	0.003223	
S.E. of regression	0.003197	Akaike info criterion	-8.356940	
Sum squared resid	0.000194	Schwarz criterion	-7.722058	
Log likelihood	151.8895	Hannan-Quinn criter.	-8.143322	
F-statistic	1.041155	Durbin-Watson stat	1.999748	
Prob(F-statistic)	0.456136			

Ramsey RESET Test

Equation: UNTITLED

Specification: LNREER LNREER(-1) LNREER(-2) LNREER(-3) LNFDI
LNEXVOL LNEXVOL(-1) LNEXVOL(-2) LNLY LNLY(-1) LNINT LNINT(-1)
LNTO LNINF C

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.482474	18	0.1555
F-statistic	2.197729	(1, 18)	0.1555

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.007526	1	0.007526
Restricted SSR	0.069167	19	0.003640
Unrestricted SSR	0.061641	18	0.003425

Unrestricted Test Equation:

Dependent Variable: LNREER

Method: ARDL

Date: 02/14/19 Time: 15:01

Sample: 1984 2016

Included observations: 33

Maximum dependent lags: 3 (Automatic selection)

Model selection method: Akaike info criterion (AIC)

Dynamic regressors (2 lags, automatic):

Fixed regressors: C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNREER(-1)	-2.210783	1.992325	-1.109650	0.2818

LNREER(-2)	0.111985	0.213776	0.523841	0.6068
LNREER(-3)	0.576826	0.535482	1.077210	0.2956
LNFDI	0.159928	0.138979	1.150734	0.2649
LNEXVOL	12.55727	11.50913	1.091070	0.2896
LNEXVOL(-1)	-3.116214	2.882534	-1.081068	0.2939
LNEXVOL(-2)	-3.652035	3.239504	-1.127344	0.2744
LNLY	-1.560561	1.419020	-1.099745	0.2859
LNLY(-1)	0.867907	0.804116	1.079330	0.2947
LNINT	-0.559371	0.530000	-1.055416	0.3052
LNINT(-1)	-0.541393	0.499429	-1.084024	0.2927
LNTOL	0.165980	0.197752	0.839337	0.4123
LNINF	0.323025	0.298851	1.080890	0.2940
C	17.48416	13.68892	1.277249	0.2177
FITTED^2	0.422146	0.284758	1.482474	0.1555

R-squared	0.990652	Mean dependent var	4.832112
Adjusted R-squared	0.983382	S.D. dependent var	0.453953
S.E. of regression	0.058519	Akaike info criterion	-2.535964
Sum squared resid	0.061641	Schwarz criterion	-1.855734
Log likelihood	56.84341	Hannan-Quinn criter.	-2.307087
F-statistic	136.2594	Durbin-Watson stat	2.566579
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

