

UNIVERSITY OF CAPE COAST

EXCHANGE RATE FLUCTUATIONS AND DOMESTIC INVESTMENT

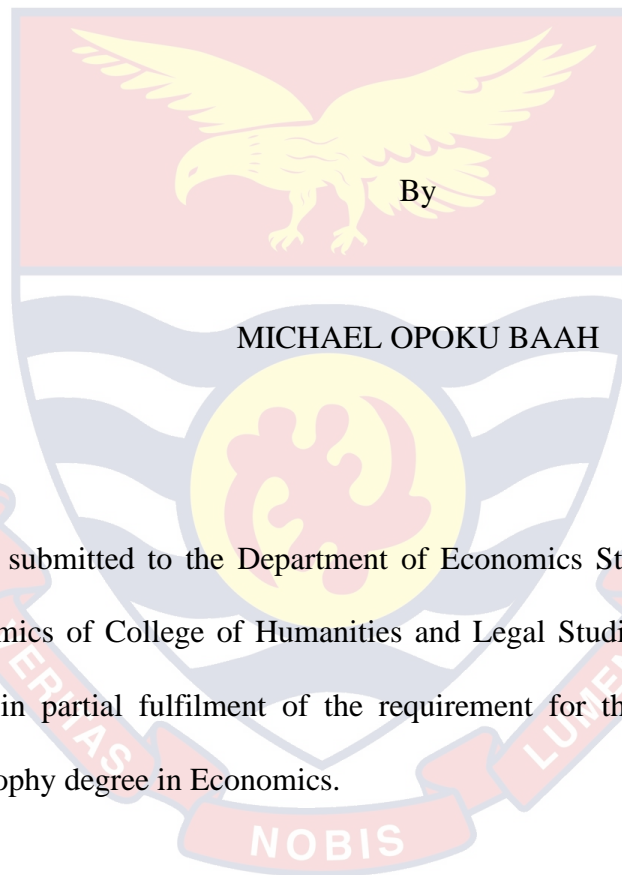


2020



UNIVERSITY OF CAPE COAST

EXCHANGE RATE FLUCTUATIONS AND DOMESTIC INVESTMENT  
IN GHANA



This thesis submitted to the Department of Economics Studies of the School of Economics of College of Humanities and Legal Studies, University of Cape Coast in partial fulfilment of the requirement for the award of Master of Philosophy degree in Economics.

DECEMBER 2020

## DECLARATION

### Candidate's Declaration

I hereby declare that this thesis is the result of my original work and that no part of it has been presented for another degree in this university or elsewhere.

Signature: ..... Date: .....

Name: Michael Opoku Baah

### Supervisors' Declaration

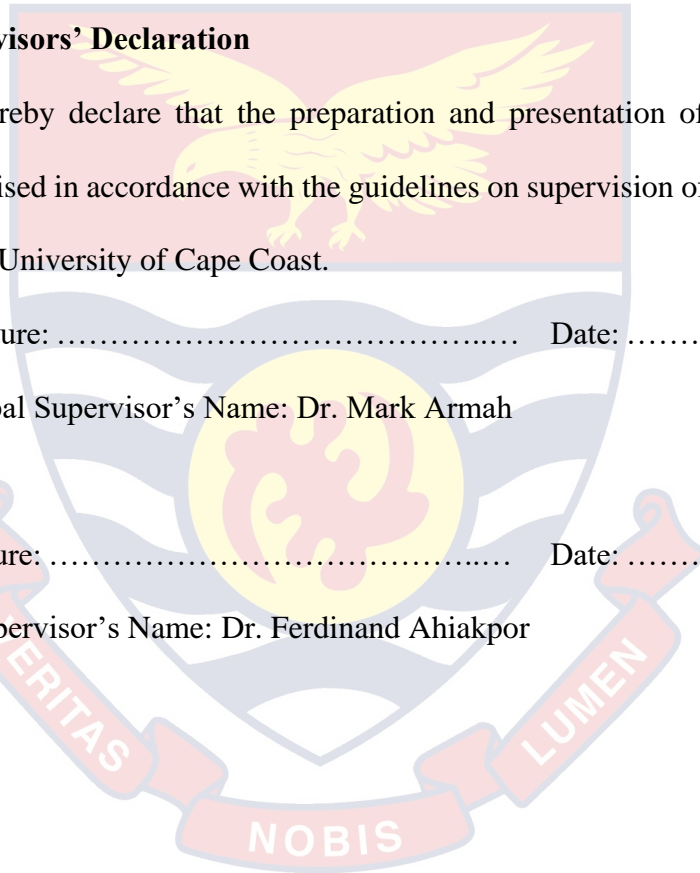
We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

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## ABSTRACT

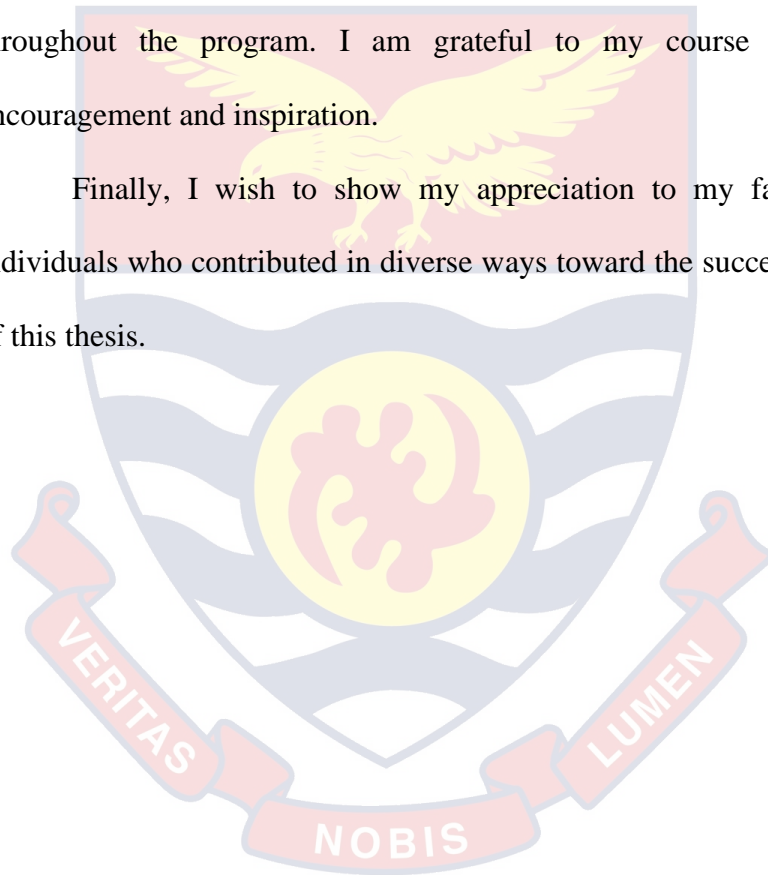
Exchange rate fluctuations is one of the critical determinants of domestic investment. Though exchange rate fluctuations can have an asymmetric effect on domestic investment, other studies assumed a symmetric relationship between these variables. Using an annual data from the period of 1980-2017, the Nonlinear Autoregressive Distributed Lag model (NARDL) was used to investigate the asymmetric effect of exchange rate fluctuation on domestic investment by creating two new variables to substitute exchange rate fluctuation (appreciation and depreciation variables). The Linear Autoregressive Distributed Lag (LARDL) model was use to examine the effect of income on domestic investment. The first objective confirmed the asymmetric effect of exchange rate fluctuations on domestic investment; the second objective also showed that income has a positive effect on domestic investment. The other explanatory variables included in the study were foreign direct investment, interest rate differential and they were found to be detrimental to domestic investment while domestic credit to the private sector had a positive effect on domestic investment. The study recommends that the Bank of Ghana should put in place long-lasting, effective and efficient measures to stabilise the exchange rate.

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## DEDICATION

To my family and friends.



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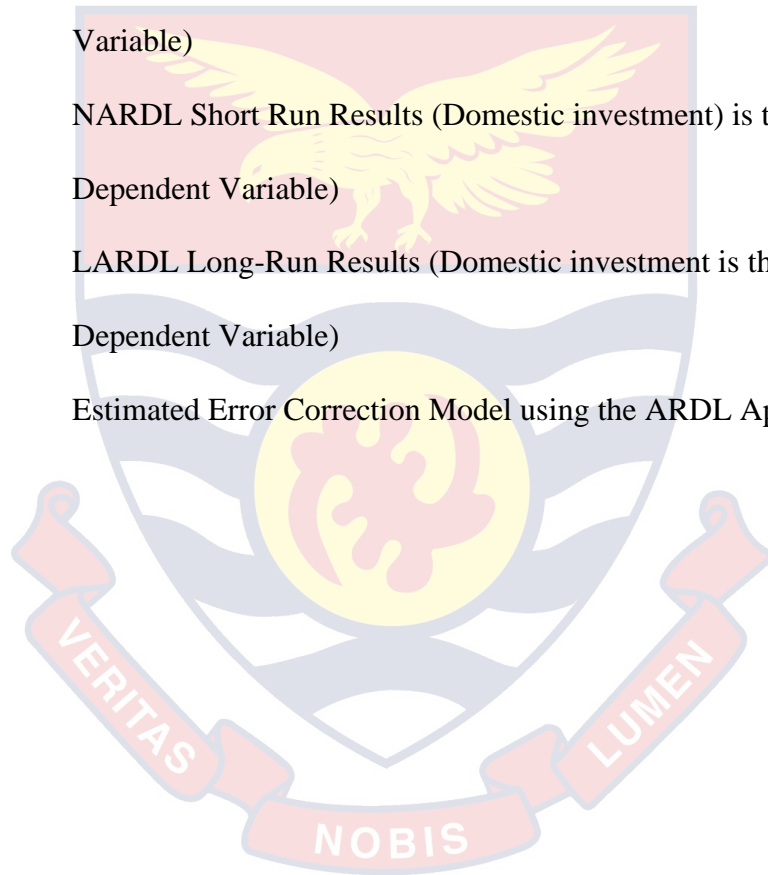
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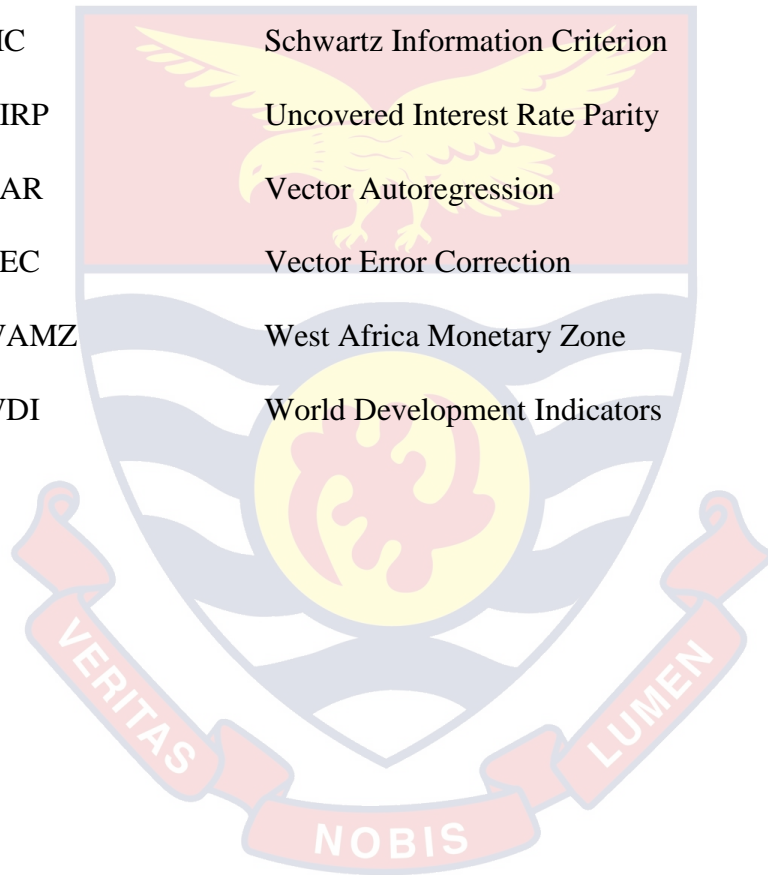
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## LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller
AIC	Akaike Information Criterion
ARCH	Auto-Regressive Conditional Heteroscedasticity
APPP	Absolute Purchasing Power Parity
ARDL	Autoregressive Distributed Lag
BOG	Bank of Ghana
BW	Bandwidth
CUSUM	Cumulative Sum of Recursive Residuals
CUSUMQ	Cumulative Sum of Squares Recursive Residuals
DW	Durbin-Watson
ECM	Error Correction Model
ECT	Error Correction Term
ERP	Error Recovery Programme
EX	Exchange Rate
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
HQ	Hannan-Quinn Information criterion
IMF	International Monetary Fund
LDCPS	Log of domestic credit to the private sector
MEC	Marginal Efficiency of Capital
NARDL	Non-Linear Autoregressive Distributed Lag
REER	Real effective exchange rate
IRD	Interest rate differential
LFDI	Log of foreign direct investment

LARDL	Linear Autoregressive Distributed Lag
LINC	Log of income
OLS	Ordinary Least Squares
PP	Phillips-Perron
PPP	Purchasing Power Parity
SAP	Structural Adjustment Programme
SBC	Schwartz-Bayesian Criterion
SIC	Schwartz Information Criterion
UIRP	Uncovered Interest Rate Parity
VAR	Vector Autoregression
VEC	Vector Error Correction
WAMZ	West Africa Monetary Zone
WDI	World Development Indicators



## CHAPTER ONE

### INTRODUCTION

#### Background to the study

Exchange rate fluctuations have significant ramifications on numerous macroeconomic variables especially domestic investment (Bahmani-Osokooee, & Mohammadin, 2016). According to Iyke & Ho (2018), domestic investment is greatly impacted by exchange rate fluctuations, therefore uncertainty in the exchange rate movement can affect the economic well-being of a country. Caballero & Vittorio (1989) in their work “How does uncertainty about the real exchange rate affect exports” establish the fact that real exchange rate fluctuations can produce undesirable consequence on domestic investment.

A country’s level of economic development is a reflection of the volume of investment they attract locally and internationally. However, the level of investment in Ghana especially domestic investment is woefully inadequate to trigger a noticeable rise in Gross Domestic Product (GDP) (Acquah, 2017). Changes in the exchange rate fluctuations can have two contrasting effects on domestic investment (Nonejad & Mohammadi, 2016). When the rate of exchange falls (domestic currency depreciates), domestic investment is likely to increase because of the rise in revenue generated from the sales of products at the local and international market (Goldberg, 1993).

Nevertheless, this encouraging outcome is neutralized by the opposing effect of increasing cost of variable inputs especially imported raw materials, thereby, decreasing domestic investment (Harchoui, Tarkhani & Yuen 2005). Theoretical models have struggled to clarify as to which of the effect is more dominant. For example, the theory of optimal inertia was used by Dixit &

Pindick (1994) in their work “Investment under uncertainty” to explain how reluctant investors are to embark on an investment venture when the risk is too high.

According to Wong (2007), using investment timing on real option model demonstrated that exchange rate uncertainty could have a stimulating effect on investment. This shows uncertainty could either promote investment or discourage investment. The Bretton Woods agreement was put in place from the period of 1945 to 1971, in which several countries came into consensus to fix their rate of exchange by pegging it to the American Dollar. Under this arrangement, only the U. S Dollar was convertible to gold at the official market value (Stephey, 2008). In 1971, the Bretton Words agreement collapsed and the countries involved were compelled to trade their currencies amidst themselves at a rate base on the invincible hands of demand and supply (Myrus, 1994). And that was the genesis of exchange rate instability and fluctuations for most countries.

Moreover, the persistent increase in the volume of global trade and capital movement has made the exchange rate one of the fundamental indicators of how profitable business can be (Kim, 2003). Changes in the rate of exchange have a direct influence on how firms become competitive internationally, given their input and output price (Joseph, 2002). Using an annual data for 22 Canadian manufacturing industries, Harchoui et al. (2005) showed that through the channel of the price of imported inputs, exchange rate affects domestic investment when the firm tries to cut down cost by changing its level of output. Covering the period of 1981-1997 in their work, “The Effects of the Exchange Rate on Investment: Evidence from Canadian Manufacturing Industries” further



revealed that industries with low mark-up ratios are more susceptible to the fluctuations in the rate of exchange.

Campa & Goldberg (1999) conducted a study on Canada, Japan, the United States of America and the United Kingdom. A standard adjustment cost model was used, to examine the relationship between exchange rate and investment. Findings from the study were that domestic and export sales are a major factor through which the exchange rate affect domestic investment. Currency depreciation makes domestic goods cheaper on the global market, and the resultant effect is that demand for these domestic goods increases as much export also increases. Thus, a firm reacts to these changes by intensifying and increasing their investment as in the area of labour and capital. Counter-intuitively the cost of total production rises especially when inputs for production are imported and this decreases the marginal profitability of the firm which could decrease investment.

Diallo (2008) analysed the connection between exchange rate volatility and domestic investment. The study was mainly divided into two parts; first, a hypothetical model was used to study the relationship between exchange rate volatility and domestic investment in a small economy. The results revealed that exchange rate volatility has a non-linear effect on domestic investment. The panel cointegration approach was use to empirically analyse the second part of the paper, the results showed that the exchange rate had a negative effect on domestic investment.

Bahmani Osokoe & Hajilee (2013) examined the long run and short run effect of exchange rate uncertainty on domestic investment in 36 countries. Using the ARDL estimation technique, the result showed that the uncertainty in

the rate of exchange had a contrasting impact on domestic investment in the countries under study. Whiles some recorded a positive effect of exchange rate uncertainty on domestic investment others recorded a negative effect. Specifically, 13 countries domestic investment was impacted negatively by exchange rate uncertainty, 14 countries recorded a positive impact. However, only 12 countries had the same effect (negative or positive) in the long run and short run.

Employing the vector error estimation technique, Oluwaseyi, Balogun & Adesoye (2015) investigated the effect of exchange rate volatility on investment and economic growth in Nigeria covering the period from 1986 to 2014. Again, the results showed that exchange rate volatility has a negative effect on investment as well as economic growth. Their empirical results are similar to the findings of Diallo (2008) and Bleaney & Greenaway (2001).

Zooming in on Ghana the most recent study on exchange rate uncertainty and domestic investment was done by Iyke & Ho (2018). Their study was an annual time series study which covered the period from 1980-2015, employing the ARDL estimation technique.

The result showed that the effect of exchange rate uncertainty on domestic investment is not consistent in the two periods (short run and long run period) studied. While exchange rate uncertainty hurts domestic investment in the short run, on the other hand, exchange rate uncertainty has a positive impact on domestic investment in the long run.

The primary and the service sectors have contributed significantly to domestic investment in Canada. However, the study by Harchaoui et al. (2005) considered only the manufacturing sector and not including other sectors of the

economy which are equally important. 22 manufacturing firms were considered for the study out of the 88 registered manufacturing firms in Canada according to which represents 25% of the manufacturing firms (Canadian business report, 2018). Given this, results from this study cannot be generalized at the aggregate level, given that fact that it represents just a quarter of manufacturing firms in Canada.

Industries were categorised into low mark-up industries and high mark-up industries in the work of Campa & Goldberg (1993). However, the study failed to explain the criteria under which these industries were categorised. Given the countries (Japan, Canada, United States, United Kingdom) that were considered for the study, it must be noted that every economy has its individuality and differences. Therefore, the cross-country comparison in the study may not be realistic because high mark-up industries in Canada for example, would not qualify for a high mark-up industry in Japan and vice versa.

Looking at the work of Diallo (2008), it would be difficult to draw inferences from his work given the current situation of the world economy. In his work, Diallo (2008) classified some countries into low-income countries and high-income countries. However, some countries that were considered low-income countries in 2008, may have moved up the income ladder. Also, the paper did not test empirically the non-linearity of exchange rate uncertainty on investment as it did in its theoretical modelling.

Bahamni Osokoe (2013) in his work “exchange rate volatility and its impact on domestic investment” considered 36 countries for his study. The short run and long run effect were analysed for all the 36 countries employing the ARDL estimation technique. The results revealed that out of the 36 countries,

27 countries had short run noticeable effect of exchange rate volatility on domestic investment, interestingly the impact was not consistent in the long run as only 12 countries had a significant long run impact. Since the ARDL estimation technique failed to capture the majority of the impact and interaction, an estimation technique that would have been able to capture all the impact and interaction should have been considered in the study.

Iyke & Ho (2018) worked on exchange rate uncertainty and domestic investment in Ghana, their study covered 35 years period from 1980-2015. The study, however, did not include two key variables which are very important in explaining the domestic investment environment in Ghana. The variables are Foreign direct investment and domestic credit to the private sector. According to the Bank of Ghana report (2019), the economy is plagued with the issue of crowding out of domestic firms, profit repatriation and limited access to credit facilities and all this inhibits domestic investment in the country. For such important variables to have been ignored in their study, may not have given a true reflection of the domestic investment situation in Ghana.

Academicians and economists in their field of study and expertise have raised concerns about the clarity of assuming linear or direct relationship between exchange rate fluctuations and macroeconomic variables (Bahmani-Oskooee, Halicioglu & Hegerty (2016), Bahmani-Oskooee & Mohammadian (2016), Bahmani-Oskooee & Fariditavana (2014, 2015). So far, all the literature reviewed assume a linear relationship between exchange rate movement and domestic investment. The assumption of a linear relationship between exchange rate and macroeconomics variable is flawed because it is possible for exchange rate fluctuations which comprise appreciation and depreciation to have the

differential impact in terms of magnitude and direction on macroeconomic variables of which domestic investment is not an exception.

This study, therefore, explores the asymmetric relationship between exchange rate fluctuations and domestic investment in Ghana. One significant contribution of the study is that by exploring the asymmetric relationship between the two main variables of interest (appreciation and depreciation), helps examined the specific impact of these variables on the Ghanaian on domestic investment. The Non-Linear Distributed Lag (NARDL) estimation technique was be used because it can capture both the short run asymmetric effect and the long run asymmetric effect.

#### **Statement of the Problem**

Exchange rates play an important part in a country's volume of domestic investment, which is a key factor in promoting economic growth. According to Ocampo, Rada & Taylor (2009), a fundamental economic advantage of a stable exchange rate is that it promotes trade and domestic investment, which can be a critical indicator of economic growth and development. A stable exchange rate is essential in reducing uncertainty and fluctuations in the currency as it encourages and gives greater confidence to investors to invest in their local economy. That is why one of the common macroeconomic goal all the economies of the world are to achieve and maintain a stable exchange rate. This is why, exchange rates are extremely monitored, analysed and controlled macroeconomic variable in the world (Darby, Hallett, Ireland & Piscitelli, 1999).

Ever since Ghana shifted to a managed exchange rate regime, currency fluctuations have in general, been aggravating over the past recent years

(Nyarko, 2016). On 1 July 2007 the redenomination of the Ghanaian cedi where an American dollar was worth 93 pesewas (Alagidede & Ibrahim, 2016). After the redenomination of the currency, the Ghanaian Cedi experienced a consistent decline in value (depreciation) over time and by the end of January 2020, an American dollar was worth GH¢5.49 showing the local currency has lost 82.778% of its value against the dollar in space of 13 years (BOG, 2020).

The frequent fluctuation of the rate of exchange (phenomenally, depreciation in the case Ghana) makes it difficult for domestic investment to thrive, because of the high cost of investment and the volatile investment environment which in turn cripple's economic growth development. Even though it is recorded in the investment literature, that investors respond to exchange rate movement differently, this can be attributed to the differences in their investment philosophy and orientation even though fluctuating exchange rate can hurt investment (Iyke & Ho, 2018, Diallo, 2008, Bahmani-Oskooee, & Hajilee, 2013, Campa & Goldberg, 1999, Canbalonglu & Gurgun, 2017). All of authors named presume a linear relation between exchange rate fluctuation and domestic investment neglecting the asymmetric effect. Current study on Ghana was by Iyke & Ho, 2018 who investigated the linear effect of exchange rate volatility on domestic investment ignoring the asymmetric effect.

However, exploring the asymmetric effect informs the directional impact of the exchange rate fluctuation specifically the depreciation and appreciation effect. It is against this foundation that this study sought to investigate the effect of exchange rate fluctuations on domestic investment in Ghana by taking a critical look at the asymmetric effects of exchange rate on domestic investment.



### **Purpose of the study**

The purpose of study is to examine most importantly the effect of exchange rate fluctuations on domestic investment in Ghana, and to look at the effect of income on domestic investment.

### **Objectives of the Study**

1. Estimate the asymmetric of exchange rate fluctuations on domestic investment.
2. Determine the effect of income on domestic investment.

### **Hypotheses**

$H_1$ : Exchange rate fluctuations have an asymmetric effect on domestic investment.

$H_1$ : Income has a significant effect on domestic investment

### **Significance of the Study**

The study will be beneficial to Bank of Ghana and Local investors as it looks at the specific impact of depreciation and appreciation (exchange rate fluctuations) on domestic investment and the way forward in stabilizing the rate of exchange. The results will point the extent to which fluctuations in the rate of exchange affect domestic investment

This will go a long way to inform Bank of Ghana and the Ministry of Finance and Economic Planning on their quest to help the government transform the economy on how to promote and encourage domestic investment. The findings will further the concern on the need for stability in the exchange rate.

## **The Scope of the Study**

Exchange rate fluctuations are not only broad but also quite a debatable area as far the economy is concerned. Generally, this research seeks to estimate the effect of exchange rate fluctuations on domestic investment in Ghana. The study considered a thirty-seven-year period from 1980 to 2017.

Data on several times series variable was chosen for the study which includes: international interest rate differential, foreign direct investment, domestic credit to the private sector, real effective exchange rate, gross fixed capital formation (domestic investment), GDP at per capita (income).

Moreover, the LARDL is used to determine the linear effect of exchange rate fluctuations on domestic Investment while the NARDL is used to determine the asymmetric effect.

## **Limitation of study**

The peculiar setback of this study was the unavailability of data which is common to Sub-Saharan African countries. Large sample size could not be used because of some missing value for some of the variables in the 1970s.

Moreover, the study did not consider how policies such as the Financial Reform Program, HIPC initiative and trade liberalization policies may have affected domestic investment over the period studied.

## **Organisation of the study**

This study is organised into five main parts with every part further partitioned into areas and sub-segments. Chapter One which is a starting part contains the foundation to the investigation, problem statement, objectives of the study, hypotheses, scope of the study, as well as the organization of the study.



Chapter Two presents an overview of the Ghanaian economy with regards to the exchange rate, domestic investment, theoretical literature as well as empirical literature review on domestic investment and exchange rate volatility. Chapter Three discusses the methods employed and estimating techniques employed in conducting the study and the source of the data. Chapter Four discusses analysed the empirical results obtained from the regression. Chapter Five presents the summary of findings, conclusion, policy implication and recommendation of the study.



## CHAPTER TWO

### LITERATURE REVIEW

#### Introduction

The main focus of this chapter is to present the review of relevant literature on the relationship between exchange rate fluctuations and domestic investment. The first sections look at the overview of the exchange rate and domestic investment in Ghana. The second section reviews the literature on the exchange rate and investment. The last section reviews empirical literature with particular emphasis on investment.

#### The overview of the exchange rate in Ghana

Ghana withdrew its membership from the Board of West African Pound, after gaining independence in 1957 from the British; the BOG was instituted to be the sole monetary authority in Ghana (Abdul-Salam, 1970). As a new monetary authority, the Central Bank of Ghana introduced the Ghanaian pound shilling and pence on July 14, 1958, as the new national currency to replace the West African Pound (Obuobi, Nketsiah, Awuah, Oteng, Ofosu, Adu-Gyamfi, Adjei & Amadi, 2020). The Ghanaian pound shilling was fixed to the British pound, as a medium of exchange and transaction between the Ghanaian people and the British from 1958 to 1966. Subsequently, as the world moved towards globalization and international trade, the American dollar became an international unit of exchange.

International trade and transactions were valued in dollars. So, from the period of 1966-1982, the Ghanaian exchange rate was fixed to the dollar, under this arrangement the local currency was fixed to the American dollar at the predetermined rate by the Bank of Ghana. The Central Bank of Ghana used their

administrative tool and power to absorb external shocks and the uncertain market conditions to maintain the rate of exchange (cedi-dollar) at a particular fixed and desirable rate (Antwi-Asare & Addison, 2000).

From 1983-1986 Ghana moved to the multiple exchange rate system. Under this system of the exchange rate, the country engaged in both the fixed and the floating exchange rate at the same time. However, markets and transaction were divided into different categories with their exchange rates. For example, importation of crude oil, essential raw materials, and traditional exports were exposed to a different exchange rate compared to non-traditional export and other imports (Sanusi, 2010). The exchange rate policies in Ghana were affected by several constitutional structures and regimes since colonial independence (Buabin, 2016).

In 1986 Ghana made another transition in their exchange rate system two similar but different exchange rate system. This system came with two exchange rate windows. While one window operated a fixed exchange rate where ₵90:00 was pegged to US\$1.00. The window two operated a floating exchange rate, where the unpredicted market conditions were allowed to operate freely in a weekly auction conducted by the Bank of Ghana. From February 1987, the two windows were eventually merged and the rate was determined at the auction. The first rate determined at the auction in September 1986 was ₵120 to the dollar and by December 1989 the rate had depreciated to ₵300 (Sowa, 1999).

The dual exchange rate system could not stand the test of time, as it increases the activities of those that operated in the black market rather than reducing their activities. So, in a space of 7 months, the dual exchange rate was

abolished (Dordunno, 1994). The Dutch auction system took over in 1988-1989, the banking system was the main channel through which all transactions were conducted and resolved at the additional rate influenced by the weekly auction (Obuobi et al., 2020). Basically, with the Dutch auction system, the auctioneer starts with a higher price and eventually reduces the price to a point where some participant can afford.

On March 1990, as a replacement for the weekly-retail auction, the wholesale auction was launched. Under the wholesale auction, a complex rate of exchange system was operated which comprises of the inter-bank and a wholesale system. Approved banks and qualified bureaux were allowed to purchase foreign exchange from the Bank of Ghana and sell to their customers and sometimes even among themselves (Harrigan & Oduro, 2000). The wholesale auction system was abrogated and supplanted by the inter-bank market in April 1992, where business and forex bureaux worked in a competitive environment (Fiagboh, 2013). This was the final process of exchange rate market reforms in Ghana.

### **Overview of Domestic Investment**

After independence in 1957, Dr Kwame Nkrumah striving towards self-reliant of the domestic economy accelerated infrastructure development and investment both from foreign and domestic sources. Nkrumah focused on huge investments as far as developmental projects were concerned during his time in power, such as Tema motorway, Tema port, Takoradi port, Hospitals, factories and the Akosombo Dam (Osundina, 1973). Several public corporations and state institutions were set up to address the industrial and agricultural need of

the country instead of importing. Domestic investment has quiet been inconsistent in growth

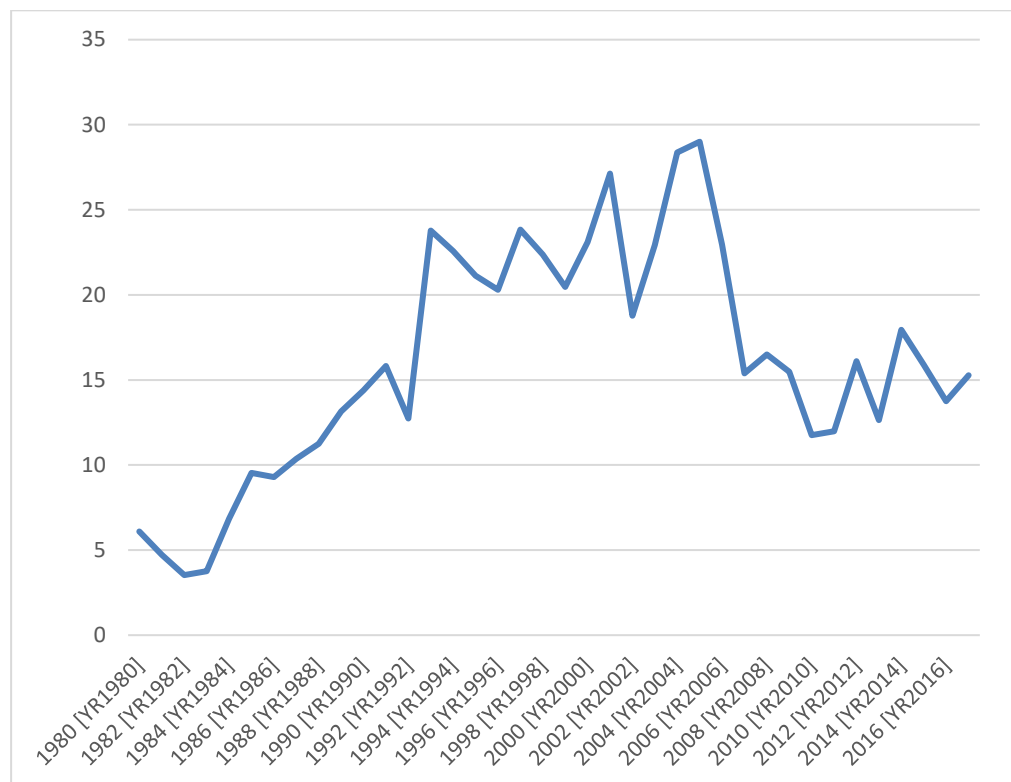


Figure 1: Graph of Domestic Investment

Source: Baah (2020).

The Economic Recovery Program (ERP) launched in 1983 was to reduce Ghana's debt and to improve the position of Ghana's trade in the global economy (Arthur, 2002). From Figure 1:1 the ERP 1983 reforms accelerated the overall domestic investment from 3.7% in 1983 to 9.5% in 1984, thus the implementation of the ERP led to an improvement in domestic investment. Before that domestic investment, but trended downward, reaching its lowest of about 3 per cent by the time of the ERP in 1983. Since 1983, domestic investment steadily increased, reaching its all time highest of 29 per cent of GDP in 2005. While the upward trend seems to have continued it has always been spiky and volatile.

Thus, the evidence supports the view that gross domestic investment has increased substantially since the reforms. Interestingly, private investment also appears to be rising, reaching 14.4 per cent of GDP in 2003 from its very low value of 2.0 per cent in 1986. Indeed, private investment generally mirrored gross investment since the mid-1980s, suggesting that it kept up with rising public investment. The government of Ghana in recent years has paid particular attention to domestic private sector investment through various programs and incentives such as planting for food initiative, made in Ghana initiative, import substitute programs, tax holidays and exemptions because the Government of Ghana believed that the private sector has a key role to play in economic growth and development.

The perception of an unstable exchange rate, political and economic environment had made domestic private investment seem gloomy (Aryeetey, Asante & Kyei, 1992). The private sector investors both local and foreign have been sceptical of investing in the local economy due to the unfriendly business environment that exists in Ghana, but yet, as of late, the promise of investing in a friendly and reliable environment has been championed by the government through various avenues and initiatives. This has caused private investment to gradually pick up in the country despite the difficulties faced by the economy (Ababio, Sarpong-Kumankoma & Osei, 2018).

In conclusion, though various liberal economic policies and investment codes have been introduced to create a friendly investment climate for private investors, the attitude of governments have continued to remain somehow hostile to the private sector because of the recent high, interest rates, inflation and currency depreciation (Frimpong, 2011).



## Theoretical literature review

### The Purchasing Power Parity Approach

The principle of purchasing power parity is critical to the theoretical foundations of the analysis of several trade issues and exchange rate models (Craig, 2005). This theory was the foundation upon which many exchange rate models were built. The theory was credited to Gustav Cassell in 1918 even though its scholarly beginning goes back to the works of David Ricardo an English Economist in the nineteenth century (Pilbeam, 2006). The central ideology of the PPP theory is that when measured in the same unit the monies of different countries should have the same purchasing power and command the same basket of goods (Pilbeam, 2006).

The PPP theory explains that there should be no arbitrage opportunities whereby simultaneously selling the same goods at different markets result in profit due to the difference in price. It is founded on the Law of One Price, which posts that the price of goods should be the same at every location given that there are no transaction cost or trade barriers. The PPP can be categorised into two: the absolute and relation PPP version. The absolute PPP equation can be written as  $E = \frac{P}{P^F}$  where E is the spot exchange rate (domestic currency unit in value of foreign currency), P is the domestic price index,  $P^F$  is the foreign price index (De Jong, Mahieu, & Schotman, 1998).

However, Relative PPP states that the difference in the rate of inflation between the home and foreign country will be equal to the exchange rates of the currency involved (Daniels & VanHoose, 2002). Mathematically, the relative PPP can be written as  $\% \Delta E t = \% \Delta P - \% \Delta P^F$ , where  $\% \Delta E t$  is the change in the percentage of the rate of exchange at time,  $\% \Delta P$  is the home country's

change in inflation rate and  $\% \Delta P^F$  is the foreign country's change in the inflation rate (Ballassa, 1964). The PPP theory has been subject to many criticisms from the onslaught not from the layman perspective but also the academic perspective (Napoles, 2004).

The law of One Price cannot hold at all times and places. Cost of transportation is an inevitable obstacle to the transaction of trade and businesses. Countries who lacked the needed transport infrastructures will experience sharp contrast in prices across different locations this can be attributed to the different cost in transporting the products. Also, the equilibrium exchange rate is not a permanent measure but keeps on changing (Edward, 1989).

### **The Flexible Price Monetary Model**

The flexible price monetary model for determining a floating exchange rate is based on the rationale that prices are adjustable, that local and foreign bonds can be used in place of each other, and that the theory of purchasing power parity only holds in the long term (Södersten & Reed, 1994).

Based the premise that prices are adjustable and flexible, it implies that there will be full employment and therefore can be incorporated into the model, there is stable demand function in each economy and that PPP holds in the long run.

The flexible price monetary model derived from the money supply and money demand conditions of equilibrium

$$Ms = m(D + F) \quad (1.1)$$

$$Md = kPy \quad (1.2)$$

$$\text{Equilibrium condition } Ms = Md \quad (1.3)$$

Where:

$Ms$  = supply of money



$m$  = money multiplier,

$D$  = monetary base (domestic component),

$F$  = monetary base (foreign reserve)

$Md$  = demand of money,

$k$  = the ideal proportion of nominal money balances to nominal national income,

$P$  = price level,

$y$  = real national income

(Salvatore, 2007)

Equation 1.1 and 1.2 represent the several components of a nation's demand for and supply of money. Equation (1.4) and (1.5) represents the equilibrium condition whereby the nation's money demand is equal to nation's money supply.

From the equation established above, we can model for two countries X and Y.

$$Ms_x = k_x P_x Y_x \quad (1.4)$$

$$Ms_y = k_y P_y Y_y \quad (1.5)$$

The APPP condition which  $E = P/P^*$  was replaced into the condition of equilibrium of country X, thus:

$$Ms_x = k_x S P_y Y_x \quad (1.6)$$

$$Ms_y = k_y P_y Y_y$$

By equating equation (1.6) to equation (1.5) for the equilibrium condition, we calculate for exchange rate S:

$$\frac{Ms_x}{Ms_y} = S \times \frac{k_x P_y Y_x}{k_y P_y Y_y} \quad (1.7)$$

$$S = \frac{Ms_x}{Ms_y} \times \frac{k_x P_y Y_x}{k_y P_y Y_y} \quad (1.8)$$

Daniels & VanHoose (2002)

From equation (1.8) when there is a decrease in money supply, as result of reduced and restrained domestic credit, the interest rate will increase, general prices will rise and the domestic currency will appreciate and vice versa (Daniels & Vanhoose, 2002). When the supply of domestic money decreases, this causes a decrease in the amount of local money that individuals and firms can hold and as a result, they spend less. The resultant effect is that aggregate demand will decrease and an increase in demand for the local currency at the expense of foreign currency, and this will cause the local currency to appreciate.

Generally, monetary policies can be used to fight inflationary pressure whether high or low. Countries experiencing higher inflationary pressure will have their exchange rate increasing and local currency depreciating (Salvatore, 2007). Whiles the opposite holds for countries with lower inflationary pressure will have exchange rate decreasing and local currency appreciating. All monetary models of exchange rates determination employ the UIP condition which states that if capital streams are free and trade rates are adaptable, the ostensible loan fee on residential security should rise to the financing cost of comparable foreign security and bonds in addition to the normal change in the rate of exchange all through the bond (Saadon & Sussman, 2018). Thus, domestic and foreign are perfect substitutes and their returns are equalized. An international investor will take into consideration two factors in deciding to invest either in domestic or foreign bonds which are assumed to have similar characteristics.

### **The Dornbusch Sticky Price Monetary Model.**

The Dornbusch sticky-price monetary model assumes that exchange rate is overshooting and that in the short run prices of goods and wages takes time

to adjust, however the rate of exchange in a quiet flexible to market changes (Södersten & Reed, 1994). The flexible monetary model is a long run model and does not explain the behaviour of the exchange rate in the short run. This model was accredited to German economist Rudiger Dornbusch. Dornbusch's model was path-breaking in international economics because he was able to extend the frontiers of knowledge in understanding how the flexible rate of exchange works and how its volatility affects trade (Walsh, 2011).

The model presumes that prices of goods and services are sticky in the long run but PPP only holds in long run but not feasible in the short run because prices of goods and service take time to adjust and are not flexible when compared to asset prices (Dornbusch, 1976). Thus, in this model deviations from the PPP in the short run is allowed, but the exchange rate will return to PPP in the long run (Arnold, 2010). According to Frankel (1979), a rise in the real exchange rate in the short run will increase the competitiveness of the economy which in turn increases net exports. However, because nominal and real inelasticities in the Keynesian theory, the presumption of long run PPP is made due to the fact short run prices are sticky (Romer, 2006).

The Uncovered Interest Rate Parity is another assumption of the Dornbusch sticky-price monetary model which holds at all times. The UIRP states there is perfect capital mobility and that both foreign and domestic assets are perfect substitute so investors are risk-neutral. This means that when the local interest rates become lower than the foreign interest rate, local currency may have to appreciate to maintain foreign investment level else investor will transfer their funds from the domestic market to the foreign market where they can earn greater returns (Pilbeam, 1998)

## The Keynesian Theory of Investment

The Keynes (1936) theory of investment is based on the rationale that decisions of investment are taken by comparing the MEC to the yield of the real interest rate (Tsoulfidis, 2008). As long as the MEC is greater than  $r$ , investment in plants, equipment and machinery will take place. However, the law of diminishing marginal product of capital sets in when more and more of capital is employed in the production process as the MEC begins to fall. The MEC will fall to a point where it is equal to  $r$ , at that point no new investment will be made in any income-earning asset. Thus, a lower real interest rate reduces the borrowing cost hence investors will invest more at such lower rates while higher real interest rate increases the borrowing cost making it difficult and unprofitable to finance investment.

The theory is based on three main assumptions: the cost of borrowing, the returns on investment and the expected return on new capital (MEC). According to Keynes theory, investment is unpredictable and subject to the firm's anticipation of the investment venture profitability, if the anticipated profit on investment surpasses the financing cost, they are bound to invest (Dapaah-Yeboah, 2016). However, he also viewed the firm's investment based on whether investors are optimistic or pessimistic about the prospects of the economy. In times of economic boom, investors anticipate the rapid expansion of the economy and the demand for their products to continue. They invest more in response to this favourable condition by increasing the capacity of their production through high levels of investment in new capital which lead to expansion.

According to Keynes, aggregate demand theory demand is greatly influenced by output so as output increases demand also increases. Eventually, this optimistic expectation does not correspond with the economy's ability to sustain the expansion. As the economy begins to slack back firms are left with excess capacity to produce an unrealistic high volume of output. So they stop investing, output declines so does demand, firms become more pessimistic about the economy keeping investment at the minimum level possible (Parker, 2010).

### **The Rigid Accelerator Theory**

The rigid accelerator model formulated by Clark (1917) was believed to be the simplest theory of investment demand. The theory states that investment is simply proportional to changes in output and that capital is optimally adjusted in each period. That is output only increase when investment increases and vice versa. This theory supposes that there is no surplus and that the firm is always in equilibrium. In this model, investment is motivated by changes in demand, and if firms want to increase their output then their stock of capital must also increase. The model can be represented mathematically as  $K_t^* = \sigma Y_t$  where  $\sigma$  is the constant ideal capital-output proportion,  $K_t^*$  is the ideal capital stock in period  $t$ , and  $Y_t$  is the output level in the period.

### **The McKinnon-Shaw Hypothesis**

McKinnon and Shaw developed a theoretical framework in the 1970s that was used to clarify the development instigating impacts of budgetary advancement as opposed to money related suppression. According to McKinnon and Shaw, the volume of savings can be raised and the quantity and quality of investment improved using the financial sector (Eschenbach, 2004).

Before the 1970s, emerging policies believed low interest rate promotes capital accumulation and investment spending (Serven, 1993).

However, McKinnon (1973) and Shaw (1973) were of a different assertion, they believed negative real interest rates were a disincentive to save which could lead withdrawal of funds from the banking sector. Eventually, it depletes the banks' credit reserve, lowering investment and growth but a liberalize financial sector was a better option (Osei-Boateng & Baah-Boateng, 2012). Thus, a liberalize financial sector would lead to a higher or more competitive interest rate because the forces of demand and supply are allowed to work freely which then stimulate saving (Audu & Oluwoyo, 2017).

The important underpinnings of this model are that savings is sensitive to interest rate and increase in saving rate would stimulate investment levels to rise (Gemech & Struthers, 2003). With a repressed financial sector, the financial intermediaries are not allowed to function to their full capacity, making saving and investment unattractive because the return on interest rate is not encouraging when compared to the real interest rate in the competitive market and this hamper economic development (Reinert, 1999).

### **Empirical Literature Review**

Exchange rate volatility over the years has been quite debatable, especially with its impact on various indicators of the economy. This has motivated economist to empirically investigate the relationship between exchange rate fluctuation and volatility and many other variables of the economy. However, studies on exchange rate volatility and domestic investment have arrived at a different conclusion over the past years



Eshun, Adu, & Buabeng (2014) focusing solely on the private sector investigated the financial determinants of private investment in Ghana, using annual data from the period 1970 to 2010. The ARDL estimation technique was used to investigate the long run and short run relationships between the variables. The empirical results revealed that the exchange rate and interest rate were found to be hostile. The study recommended reducing the rate of interest and also removing all impediment to credit accessibility to promote and sustain domestic private investment in Ghana.

Atoyebi (2012) investigated the determinants of domestic private investment in Nigeria from the period of 1970 to 2010. Using time-series data, the Philip Peron unit test was used to check the stationarity properties of the variables and the OLS estimation technique was employed. The empirical results showed, the interest rate harms private domestic investment, however, credit services had a positive effect because it provides the private sector the needed capital embark on investment that involves huge capital. The study recommended that the Central Bank of Nigeria should use their administrative and monetary power to decrease the borrowing and lending rates.

Examining the economic determinants of domestic investment, Al Khatib, Altaleb & Alokor (2012) using a time series data, conducted a study on Jordan from the period 1980 to 2010. The ARDL estimation technique was employed to study the long run and short run relationship among the variables. The empirical results revealed that FDI stimulates domestic investment as well as real GDP growth and export of goods and services. Recommendation from the study was that the government should put in measures to attract FDI and

encourage the export of goods and services since they all have an encouraging effect on domestic investment.

Insah (2013) investigated the sources of exchange rate volatility in the Ghanaian economy. Using annual data from the period of 1980 to 2012, the ARDL was employed in the study. The empirical results revealed that government expenditure was positively related to exchange rate volatility while domestic debts and foreign debts had a negative impact. The study recommended that fiscal and monetary discipline measures should be put in place to check the growth rate of government expenditure to curb the menace of exchange rate volatility.

The work of Oluwaseyi et al. (2015) also investigates the effect of exchange volatility on investment and growth in Nigeria covering the period of 1984 to 2014. The model adopted the VAR in which the vector error correction method, impulse response function and cointegration techniques were employed. The ADF was used to test the stationarity of variables and also to determine the interaction between variables. The Johansen cointegration test revealed the existence of a long run relation between exchange rate, growth interest rate and investment.

The result showed that exchange rate volatility has an opposite relationship with investment, which supports the findings of Diallo (2008) even though both studies employed different methodology they all recorded a negative relationship between investment and exchange rate volatility. On the other hand, volatility in the rate of exchange has an encouraging effect on inflation and interest rate in Nigeria. The policy recommendation from their



studies was that proper exchange rate management structures should be put in place to neutralize volatility of the naira for the better growth of the economy.

Canbaloglu & Gurgun (2017) conducted a panel study for 25 economies on the topic “the impact of exchange rate uncertainty on domestic investment”. The GARCH (1,1), EGARCH (1,1) and GJR-GARCH (1,1) was used to model the exchange rate uncertainty for the countries under study and also the generalized least square estimation technique was used to estimate the impact. The empirical results revealed that the impact exchange rate uncertainty was favourable and statistically significant to domestic investment. This intuition behind these results was that most of the investors were risk lovers or risk indifferent because they are more motivated by the greater profit they may reap rather the losses the uncertainty may bring.

In addition to the above, Bahmani-Oskooee & Hajilee (2013) analysed the impact of exchange rate uncertainty on domestic investment for 36 countries mainly consisting of advanced and emerging across the world from the period of 1975-2008. The study employed a standard investment model that included interest rate, real output, real exchange rate and the measure of the variability of the exchange rate as a domestic investment determinant. They also used the bounding testing approach for cointegration and error-correction modelling, to differentiate the short-run from the long-run effects.

From their findings, real exchange rate volatility had a significant effect on domestic investment in the short run 27 out of the 36 countries that were studied. But exchange rate uncertainty had a positive impact in 14 countries, while in 13 countries it decreases investment. This shows that exchange rate

uncertainty has a differential impact on different countries depending on the environmental settings and how the economy is structured.

In Ghana, Obeng (2018), conducted an annual time series study covering the period 1983 to 2015. He looked at how volatility in exchange affect export diversification and whether the effect was symmetric and asymmetric. The LARDL and NARDL were used to capture long run and short run effects. The study revealed that volatility in exchange volatility is harmful to export diversification in Ghana, and more importantly, the study confirmed that the effect of exchange rate volatility on domestic investment is asymmetric. The study recommended that the BOG should put in measures and structures to strengthen the value of the local currency.

Specifically targeting one European Nucci & Pozzolo (2010) investigated the relationship between exchange rate fluctuations and the investment decisions and data was taken from processing companies in Italy covering the period 1986-1995 using panel data. The q investment business theory was used to explain why there are several avenues of foreign vulnerability which impact the investment decision of firms. A decline in value of the local currency was found to have an encouraging effect on investment through the sales from the foreign and local market, while the negative effect was as a result of the increased cost of imported input. However, the intensity of impact is dependent on the firm monopoly power of the industry.

Using the ARDL approach with a time series data Frimpong & Marbuah (2010) examined the determinants of private sector investment in Ghana covering the period from 1970 to 2002. The accelerator model of investment was used as well as other macroeconomic and political variables were

incorporated in their investment model. The results showed that real interest rate, external debt, inflation and coefficient of real GDP were significant and positively related to private investment statistically. However, credit to the private sector and public investment were insignificant but had a positive effect of the public investment confirming a possible crowding because generally, government investments seek the welfare of the economy in terms of infrastructure development which produce a conducive environment for the private sector to also invest.

Bahmani-Oskooee & Xi (2012) investigated exchange rate volatility and domestic consumption in Japan. The study uses quarterly data covering the period 1970 to 2008. The volatility measure was generated using a GARCH approach and ARDL estimation technique was employed to investigate the long run and short run effect of exchange rate volatility on domestic consumption. The empirical findings revealed that though income had a positive effect on domestic consumption, exchange rate volatility and interest rate had a negative effect. The paper further recommended that the government should take steps to strengthen the exchange rate and reduce the inflation rate because they could hurt domestic investment.

Aghion, Bacchetta, Ranciere, & Rogoff (2006) examined the impact of real exchange rate variability on factor productivity taking into consideration the role of financial development in developed and underdeveloped countries. The empirical analysis was based on an 83-country data set covering the period 1960-2000. The study showed that for countries with underdeveloped financial structures the impact of exchange rate volatility is negative on growth, while financially advanced countries, the impact of exchange rate volatility has no

important or noticeable effect on growth. The findings are backed by theory in the sense that firms of less developed countries face a greater risk when it comes to exchange rate variability because they lack the necessary instrument to manage them.

Bahmani-Oskooee & Mohammadain (2016) used the Nonlinear ARDL model to test whether exchange rate changes have a symmetry or asymmetry effect on domestic production. They argued that depreciation of the currency could either have a promote or hurt on domestic produce, however empirical studies on the subject have all presume that the effect of exchange rate changes is symmetric. The study used quarterly data covering the period of 1973 to 2013. The concept of the partial sum process was used to create exchange rate appreciation and depreciation. The result revealed that the LARDL approach of Shin and Greenwood-Nimo (2014) showed that changes in the real effective exchange rate have an asymmetric effect on the Australian dollar both in the long run and short run. Though the appreciation and depreciation affect Australian domestic production, it is only the appreciation effect that transcends in the long run.

Furthermore, Dixit & Pindyck (1994), use the theory of inertia to demonstrate that most investors are reluctant to invest in unpredictable circumstances. Further elaborating the work of Dixit & Pindyck (1994), Darby et al. (1999) showed that whether a firm will invest or not depends on the opportunity cost of investing in the face of certainty and uncertainty. If the opportunity cost of waiting is disadvantageous than its current value, the firm is likely not to invest but under lower certainty, that particular firm is likely to invest. He argued that hampering exchange rate volatility does not necessarily

lead to an increase in investment because sometimes even when exchange rate volatility suppressed investment will still not respond. His findings revealed that exchange rate volatility has a significant negative effect on investment, however, exchange rate stability would rather increase investment in Europe, especially in countries like France, Italy and Germany.

A study on the exchange rate and export performance in the WAMZ countries conducted by Tarswalie et al, (2013), using the estimation technique of Dynamic OLS (DOLS) presented inconclusive results. Specifically, the results showed that for countries like Nigeria, Liberia and Sierra Leone exchange rate volatility negatively affected export volumes. However, Gambia recorded a positive relationship between exchange rate volatility impact on export volume.

Azeez, Kolopo & Ajayi (2012) investigated the effects of exchange volatility on macroeconomic performance in Nigeria from 1986 to 2010. The estimation technique that was employed in the study was OLS and Johansen cointegration estimation technique which was used to test for the long run and short run effect respectively. The results showed that in the long run real exchange rate volatility has a positive effect on volatility.

Serven (2002) undertook a study on developing countries on the topic of real exchange rate uncertainty and private investment. Modelling volatility using GARCH, exchange rate uncertainty had a negative relationship with private investment however the impact of exchange rate uncertainty was uniform. The threshold effect revealed that when exchange rate uncertainty must pass some certain limit for its impact to be significant.

Yilkal (2014) investigated how currency devaluation affects output in Ethiopia and in developing economies with currency crises respectively. The study used time series data from 1980 to 2010. According to Yilkal (2014), the study revealed that currency devaluation has a contractionary effect on output in the long run but in the short run the effect is neutral. Devaluation is a major part of the gross domestic product because Ethiopian export is dominated by agricultural products and with devaluation makes export cheaper and competitive.

### **Chapter Summary**

This chapter reviewed the theoretical and empirical literature on the relationship between exchange rate fluctuations and domestic investment in Ghana. Some exchange rate models were discussed as well as some investment models. Most of the studies reviewed in the literature have shown inconclusive results of the effect of exchange rate uncertainty on domestic investment. The observed differences in these results have somehow, contributed to the knowledge gap in the literature thus justifying a further examination of the effect of exchange rate fluctuation on domestic investment in Ghana.



## CHAPTER THREE

### RESEARCH METHODS

#### Introduction

The purpose of this chapter is to present the research methods suitable for conducting the study. The chapter discusses the methods and tools of analysis used in this study. Specifically, the chapter presents a thorough description of the theoretical and empirical specification that captures the relationship between exchange rate fluctuations and domestic investment in Ghana, definition, measurement and justification of variables in the model, data source and type, as well as estimation techniques.

#### Research Design

The study seeks to examine the relationship between exchange rate fluctuations and domestic investment in Ghana. The Positivist research philosophy was adapted for the study because this philosophy believes that social world can be understood in an objective way. The researcher according to the positivist philosophy, can observe a natural phenomenon from an objective point of view without interfering with the phenomenon being observe, hence this type of research philosophy is deemed appropriate for a quantitative research.

In line with the objectives of the study, the quantitative research design was used. As compared to qualitative design, quantitative research has the advantages of replicability, objectivity and generalisation of findings. This research design ensures researchers take an objective position towards the study.



### Theoretical model specification

To address the objectives, the study uses a behavioural model of investment called the accelerator theory of investment. The accelerator theory was postulated by Thomas Nixon Carver (1903) and Albert Aftalion (1909), before the time of Keynesian economics (Niehans, 1992). The theory simply states that “investment is directly proportional to the increase in output” (output is proxied by income and consumption) therefore changes in income and consumption will affect investment in the same direction and magnitude,

$$K^* = \alpha Y^* \quad (1)$$

$K^*$  is the stock of capital (investment),  $\alpha$  is a constant capital-output ratio ( $\frac{K}{Y}$ ),  $Y^*$  is the level of output or income. Since output (income) affect capital stock (investment) in the same direction, changes in output will also induce a change in the stock of capital (induced investment).

$$\Delta K^* = \alpha \Delta Y^* \quad (2)$$

Changes (increase or decrease) in output (income) is the difference between the previous output and current output in time (t)

thus  $\Delta Y^* = Y_t - Y_{t-1}$ , capital stock (investment) will also respond to the changes in output (income) in the same manner  $\Delta K^* = K_t - K_{t-1}$

$$K_t - K_{t-1} = \alpha(Y_t - Y_{t-1}) \quad (3)$$

Expanding the bracket in equation (3)

$$K_t - K_{t-1} = \alpha Y_t - \alpha Y_{t-1} \quad (4)$$

Therefore, it is clear in equation (4) that changes in income will affect investment as claimed by the accelerator theory of investment.

### Empirical Model Specification

The study estimated a model in which domestic investment was functionally related to other economic variables. The model specification for this study took into consideration 5 important and influential macroeconomic variables such as Domestic Credit to the Private sector (DCPS), Exchange rate fluctuations (EX), Interest rate Differential (IRD), Foreign Direct Investment (FDI), GDP per capita (a proxy for income)

To determine the effect of exchange rate fluctuation and other control variables on domestic investment, the study expressed domestic investment (Gross Fixed Capital Formation) as a function of these listed macroeconomic variables. Equation 5 is the specification of the functional model below:

$$DI = f(DCPS, REER, IRD, FDI, INC) \quad (5)$$

To clearly distinguish the dependent variable from the independent variables, equation 5 is transformed into a structural model in equation 6

$$DI_t = f(.) = DCPS_t^{\beta_1} REER_t^{\beta_2} IRD_t^{\beta_3} FDI_t^{\beta_4} INC_t^{\beta_5} e^\varepsilon \quad (6)$$

The study applied a logarithmic transformation to some variables in equation (6) to normalise the equation, the empirical specification of the model above was written as seen in equation (7) below:

$$\ln DI_t = \beta_0 + \beta_1 \ln DCPS_t + \beta_2 REER_t + \beta_3 IRD_t + \beta_4 \ln FDI_t + \varepsilon_t \quad (7)$$

Where,  $DI$  indicates domestic investment (a proxy for Gross Fixed Capital Formation as a percentage of GDP),  $DCPS$  measures Domestic Credit to Private Sector,  $REER$  measures Exchange rate fluctuations,  $IRD$  measures Interest Rate Differential,  $FDI$  measures Foreign direct investment,  $\ln$  represents natural

logarithm,  $t$  denotes time and  $\varepsilon_t$  random disturbance term. The slope coefficient  $\beta_1, \beta_2, \beta_3, \beta_4$  and  $\beta_5$  measures the elasticities and  $\beta_0$ , is the intercept parameter.

#### **A priori expected signs**

The following are the a priori expected signs :  $\beta_1 > 0, \beta_2 > 0$  or  $< 0, \beta_3 > 0$  or  $< 0, \beta_4 > 0$  or  $< 0, \beta_5 > 0$ .

#### **Measurement and justification of variables.**

##### **Gross Fixed capital formation (DI)**

Gross fixed capital formation is used as a proxy for domestic investment and it includes land improvement (fences, ditches, drains), plants, machinery, equipment purchases, construction of roads, railway, school, offices, hospitals, private residential dwelling, commercial and industrial buildings (Fiagboh, 2014). This is in line Iyke & Ho (2018) who used gross fixed capital formation as a proxy for domestic investment. Gross fixed capital formation as a proxy for capital has also been used in various studies such as Mansouri (2005) and Aryetey & Fosu (2005). The increasing level of investment in a country directly accelerates economic growth and development all other things being equal. Data for Gross Fixed Capital Formation was sourced from World Development Indicators (WDI). Gross fixed capital formation was chosen to represent a domestic investment in this study since it captures all the different aspects of investment in a local economy.

##### **Domestic Credit to Private Sector (DCPS)**

Domestic Credit to Private Sector demonstrates the degree to which the financial sector (banks, credit unions etc.) channels assets to the private sector to encourage investment. Making credit access easier and available to the private sector is a reflection of financial fairness and proficient asset distribution in the economy since the private

sector can use its assets in a progressively effective and profitable way when compared to the public sector (Kargbo & Adamu, 2009). Private firms in developing economies are mostly dependent on bank loans and different types of credit as a wellspring of financing due to the huge capital outlay of their business and investment venture (Emran & Farazi, 2008).

The level of financial development and efficiency of financial intermediaries are shown in amounts of domestic credits given to the private sector as a percentage of GDP. In developing countries, numerous organizations and firms experience limitations in accessing credits because they lack the required collaterals. This variable was chosen for the study because it measures the contribution of the private sector towards development in terms of investment through the aid of credits accessibility. The study expects the coefficient of domestic credit to the private sector to be positive.

#### **Real Interest Rate Differential (IRD)**

Interest rate differential is a difference in the interest rate between two currencies of two distinct economic regions (Ndikumana & Verick, 2008). The real interest rate differential for this study was calculated subtracting the Bank of Ghana real interest rate from the U.S real interest rate. The intuition behind this is to ascertain whether a citizen of Ghana will rather choose to invest in their local economy or invest outside due to the differences in the real interest rate (returns on investment). The data for U.S real interest rate was obtained from International Monetary Fund (IMF) and that of Ghana was obtained from Bank of Ghana the study, therefore, expects the coefficient of this variable to be either positive or negative.

### **Real Effective Exchange rate (*REER*)**

For this study, the real effective exchange rate was used to represent exchange rate fluctuations. Real effective exchange rate takes into consideration the weighted mean of a national currency compared to an index or basket of major currencies in the world. The exchange rate can be used to ascertain the value of a country currency against other major currencies. Fluctuations in the exchange rate is a natural phenomenon of a managed float exchange rate regime of which Ghana is not an exception the real effective exchange rate was chosen for the study because it captures fluctuations (negative and positive changes) in the local currency.

### **Foreign Direct Investment (FDI)**

According to Shim & Siegel (1995), FDI “is the long term participation of source countries’ management, joint venture, transfer of technology and expertise into host countries”. This includes investments of foreign funds into businesses and companies that work abroad instead of the investor’s domestic country. FDI venture might be made either "inorganically" by purchasing an organization in the objective nation or "naturally" by extending the tasks of current business in that nation. In developing economies like Ghana’s, the volume of domestic investment required to achieve a noteworthy increment in Gross Domestic Product (GDP) growth are inadequate. FDI is in this manner seen as a way to overcome the disparities between a nation's domestic income and the ideal level of investment (Acquah, 2017).

As proposed by present-day development hypotheses, FDI significantly improves the monetary possibilities of a nation, with linkage through channels like capital amassing, move of innovation, move of abilities and financing

current record deficiency. The data for FDI was sourced from World Development Indicator (WDI). FDI is measured as the net inflows as a percentage of Gross Domestic Product. FDI is used in the study to observe how domestic investment or local firms survive against competition from foreign firms and products into the local markets. And whether FDI will crowd out or crowd in domestic investment. The study expects the coefficient of FDI to be either positive or negative.

### **GDP Per Capita (Income)**

GDP per capita is an economic measure of income denoting the value of goods and services produced in a given year by the citizens of the country. It is calculated by dividing the country's gross domestic product by its total population. It explains how prosperous a country's citizens are or their standard of living. Fundamentally, an increase in GPC depicts increase income and the ability of the citizenry to spend and afford necessities and hence firms respond by increasing output which leads to an increase in domestic investment (Fry, 1993). The data for the variable was sourced from the 2018 edition of the World Development Indicators (WDI). It is thus expected to impact positively on domestic investment.

### **Data Sources**

The data for this study are secondary data from the World Development Indicators and International Financial Statistics (IFS). Annual Times Series on these selected macroeconomic variables: Gross Fixed Capital Formation (domestic investment), GDP per capita(income), Foreign Direct Investment, Interest Rate Differential, Domestic Credit to the Private Sector are included in the model to examine its effect on Gross Fixed Capital Formation (domestic



investment). 1980 to 2017 was the study period selected for the study; this period was chosen due to availability of data for the variable.

### Estimation Technique

#### Linear Autoregressive Distributed Lag (LARDL) and Non-Linear Autoregressive Distributed lag (NARDL)

The study employed the linear and nonlinear autoregressive distributed lag (LARDL) and (NARDL) estimation techniques developed by Pesaran, Shin & Smith (2001) to empirically establish and analyse the long run and short run relationships among the variables of interest. The reason for choosing the LARDL and NARDL to estimate the model is based on the following advantages:

To begin with, the ARDL and NARDL procedure do not require the pretesting of the variables used in the model for unit roots, however, this is not the same for the Johansen approach. As long as the variables are integrated of order I (1) and I (0) the ARDL is applicable. Secondly, the NARDL was chosen because it was an appropriate methodology to examine the asymmetric effects of exchange rate fluctuations on domestic investment in Ghana. Lastly, once the lag of the model is known the ARDL allows the Ordinary Least Square (OLS) technique cointegration to be estimated. This makes the ARDL procedure very simple.

Following Pesaran et al (2001), the relationship among the variables using the LARDL approach was expressed in equation 8, thus the short and long run result were obtained by estimating LARDL model in equation 8.

$$\begin{aligned} \Delta \ln DI = & \alpha_0 + \alpha_1 \ln DI_{t-1} + \alpha_2 DCPS_{t-1} + \alpha_3 REER_{t-1} + \alpha_4 IRD_{t-1} + \\ & \alpha_5 FDI_{t-1} + INC_{t-1} \sum_{i=1}^{\rho} \beta_1 \Delta DI_{t-1} \sum_{i=1}^{\rho} \beta_2 \Delta DCPS_{t-1} \sum_{i=1}^{\rho} \beta_3 \Delta REER_{t-1} + \\ & \sum_{i=1}^{\rho} \beta_4 \Delta IRD_{t-1} \sum_{i=1}^{\rho} \beta_5 FDI_{t-1} + \sum_{i=1}^{\rho} \beta_7 INC_{t-1} + \varepsilon_t \end{aligned} \quad (8)$$



Where  $\alpha$  and  $\beta$  represent the short long run and short run elasticities respectively.

To investigate the asymmetric effect of real effective exchange rate fluctuations on domestic investment in Ghana, the study followed the methodology used by Bahmani-Oskooee & Fariditavana (2015) and Obeng (2018) in their respective studies. Exchange rate fluctuation was decomposed into positive changes (appreciation) and negative changes (depreciation). Two variables, REERPos and REERNeg, were therefore created using the partial sum process suggested by Shin, Yu & Greenwood-Nimmo (2014) as follows:

$$REER_t = REER_0 + REER + REER_t^- \quad (9)$$

where  $REER_t^+$  and  $REER_t^-$  are the partial sum process of positive changes and negative changes in Exchange rate fluctuations ( $EX_t$ ). ExPos and ExNeg were then obtained in the equation in (10) and (11)

$$REERPos = REER_t^+ = \sum_{t=1}^{\rho} \Delta REERPos_t^+ = \sum_{t=1}^{\rho} \max(\Delta REER_t, 0) \quad (10)$$

$$REERNeg = REER_t^- = \sum_{t=1}^{\rho} \Delta REERNeg_t^- = \sum_{t=1}^{\rho} \max(\Delta REER_t, 0) \quad (11)$$

$REER$  in Equation (9) was replaced with  $REERPos$  and  $Neg$  to obtain the nonlinear ARDL model in equation (12)

$$\begin{aligned} \Delta \ln DI = & \alpha_0 + \alpha_1 \ln DI_{t-1} + \alpha_2 DCPS_{t-1} + \alpha_3 ExPos_{t-1} + \alpha_4 ExNeg_{t-1} + \\ & \alpha_5 IRD_{t-1} + \alpha_6 FDI_{t-1} + \alpha_7 INC_{t-1} + \sum_{i=1}^{\rho} \beta_1 \Delta DI_{t-1} + \sum_{i=1}^{\rho} \beta_2 \Delta DCPS_{t-1} + \\ & \sum_{i=1}^{\rho} \beta_3 \Delta REERPos_{t-1} + \sum_{i=1}^{\rho} \beta_4 \Delta REERNeg_{t-1} + \sum_{i=1}^{\rho} \beta_5 \Delta IRD_{t-1} + \sum_{i=1}^{\rho} \beta_6 FDI_{t-1} + \\ & \sum_{i=1}^{\rho} \beta_7 INC_{t-1} + \varepsilon_t \end{aligned} \quad (12)$$

Equation (12) was estimated following a similar procedure Pesaran et al. (2001) proposed for the estimation of linear ARDL models. The coefficients and signs of  $REERPos$  and  $REERNeg$  give us clues to ascertain whether real effective exchange rate fluctuations,  $EX$  has a symmetric or asymmetric effect

on domestic investment, *DI*. Thus exchange rate fluctuations have an asymmetric effect on domestic investment only when the signs and coefficients of the two newly created variables are different that is negative and positive. On the other hand, exchange rate fluctuation has a symmetric effect on domestic investment when the signs of the newly created variable are the same.

### **Unit root test**

The cointegration technique used in this study does not require the pre-testing of the variables for unit roots. However, the use of the Autoregressive Distributed Lag (ARDL) and Non-Linear Autoregressive Distributed Lag (NARDL) requires that none of the variables used should be integrated of an order higher than one. To make sure that some of the variables are not integrated of higher order than one, there is a need to conduct the unit root tests. The Augmented Dickey-Fuller (ADF) and the Phillips Perron (PP) test were conducted to all variables at levels and in the first difference to investigate the statistical properties of the variables.

The test was conducted with intercept and trend in the model just make sure the order of integration of the variables are not higher than one. The Schwartz-Bayesian Criterion (SBC) and Akaike Information Criterion (AIC) were also used to determine the optimal number of lags in the test. The P-values in parenthesis was used in making the unit root decision, that is whether to reject or accept the null hypothesis that, the series has a unit root. The result of the unit root test both for the ADF and PP with intercept and trend for all variables at their levels and first difference are presented in Table 3 and 4. With the null hypothesis that the series contains a unit root, MacKinnon (1996) posits that

rejection of the null hypothesis should be based on the critical values and the probability values.

### **Cointegration test**

There are several techniques for testing the presence of equilibrium long-run relationship among time-series variables that have been advocated and used by researchers and academicians. Times series econometricians and academics mostly use Engle-Granger (1987), the Fully Modified Ordinary Least Squares (FMOLS), procedures of Philips & Hansen (1990), the Johansen (1988, 1991) and the Autogresssion Distributed Lag (ARDL) approach by Pesaran & Shin (1999) and Pesaran, Shin & Smith (2001) to determine the long-run relationship in bivariate and multivariate frameworks.

For this study, the ARDL Cointegration test, also known the Bound Tests which was developed by Pesaran, Shin & Smith (2001) was employed to test for the cointegration relationships among the variable used in the model. The ARDL bounds test technique is commonly used to test for cointegration among the variables and whether there exists a long run relationship when the variables in the model are mixtures of  $I(0)$  and  $I(1)$  series (Dapaah, 2016). The reparametrized result gives the short-run dynamics and long run relationship of the chosen variables in the model (Nkoro & Uko, 2016). The ARDL Bounds testing procedure is divided into three steps. The initial phase of the ARDL bound testing was to estimate equation (9) using OLS to test for the presence of long run relationship among the variables used in the model. By conducting an F-test for the joint significance of the coefficients of the lagged of the variables the first step was achieved.

The hypothesis would be

$$H_0 = \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = 0$$

$$H_1 = \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq \alpha_5 \neq \alpha_6 \neq 0$$

If the F-statistic is greater than the upper critical value, the null of the hypothesis of the non-existence of long run relationship is rejected irrespective of the integration orders of the time series. On the other hand, when the F-statistic is below the lower critical values, the null hypothesis is accepted, meaning there is no long run relationship among the series. The test becomes inconclusive when the F-statistic falls within the lower critical values and the upper critical values.

After the cointegration has been established, the long run model for  $DI_t$  (domestic investment) was estimated as :

$$\Delta DI_t = \sum_{i=1}^{\rho} \beta_1 \Delta DI_{t-1} + \sum_{i=1}^{\rho} \beta_2 \Delta DCPS_{t-1} + \sum_{i=1}^{\rho} \beta_3 \Delta REER_{t-1} + \sum_{i=1}^{\rho} \beta_4 \Delta IRD_{t-1} + \sum_{i=1}^{\rho} \beta_5 FDI_{t-1} + \sum_{i=1}^{\rho} \beta_6 INC_{t-1} + \varepsilon_t \quad (13)$$

The Akaike Information Criterion (Akaike, 1973) was used to select the lag of the ARDL model. The final step is to estimate the Error Correction Model (ECM) which captures the short run adjustment of the system, due to the shocks and disequilibrium.

#### **Error-Correction Model (ECM)**

The Error Correction Model (ECM) is a time series regression model based on the premise that two or more-time series shows an equilibrium relationship that becomes the bases for estimating both short-run and long-run behaviour (De Boef, 2001). ECM was first promoted in economics by James Davidson, David F. Hendry, Frank Srba, and Stephen Yeo in 1978. In 1987, Robert F. Engle and Clive W. J. Granger exhibited that cointegrated time series are well explained by the error correction model (Lewic-Beck et al 2004).

According to Engle and Granger (1987), an error correction model combines both the long run cointegrating variables at levels and the short run relationship of the variables at the difference. The intuition behind the error correction model is that most of the time there is a long run equilibrium relationship between two economic variables, however in the short run there may be disequilibrium and this disequilibrium is corrected by the error correction model (Kwesi Ofori, Obeng & Armah 2018).

It is a fact that a more reliable and consistent way of determining cointegration is through the error correction term (Bahmani-Oskooe, 2001, Kremers et al, 1992). It is still argumentative theoretically that whenever there is a cointegration relationship among variables, there must be an error correction term (Alogoskoufis & Smith, 1991). The error correction term is thus obtained from the negative and significant lagged residual of the cointegration. The error correction term is a means to reconcile short run and long run behaviour. The ECM generally provides ways of reuniting the short run behaviour of an economic variable with its long run behaviour (Immurana et al, 2014).

The ECM was specified as follows:

$$\Delta DI_t = \sum_{i=1}^{\rho} \beta_1 \Delta DI_{t-1} + \sum_{i=1}^{\rho} \beta_2 \Delta DCPS_{t-1} + \sum_{i=1}^{\rho} \beta_3 \Delta REER_{t-1} + \sum_{i=1}^{\rho} \beta_4 \Delta IRD_{t-1} + \sum_{i=1}^{\rho} \beta_5 FDI_{t-1} + \sum_{i=1}^{\rho} \beta_6 INC_{t-1} + \rho ECM_{t-1} + \varepsilon_t \quad (14)$$

From equation (15),  $\rho$  denotes the short run dynamics coefficient of the model's convergence to equilibrium.  $ECM_{t-1}$  is the Error Correction term.  $\rho$  which is the coefficient of the Error Correction term denotes the speed of adjustment to obtain stability in the events of shocks to the system. The absolute size of the error term,  $ECT_{t-1}$  measures the adjustment speed of the model to long run equilibrium when it is shocked.

### **Stability test**

This study used the cumulative sum (CUSUM) and the cumulative sum of squared (CUSUMQ) test developed by Brown, Durbin & Evans (1975) to test for the stability of the parameters of domestic investment. The null hypothesis tested is that there is no structural break against the alternative hypothesis of there is a structural break.

### **Chapter Summary**

This chapter presented the theoretical underpinnings of the relationship between exchange rate fluctuations and domestic investment in Ghana and proceeded to formulate both theoretical and empirical model of the study. The theoretical model in the study is the Accelerator theory of investment. However annual time series data covering the period from 1980 to 2018 on all variables were employed in the study. The Augmented Dickey-Fuller and Philips Perron test was employed to conduct the stationary test. The ARDL, NARDL and Bound testing approach to cointegration were also presented to enable us to examine the long run and short run relationship among the variables.



## CHAPTER FOUR

### RESULTS AND DISCUSSION

#### Introduction

This chapter seeks to present the estimation, interpretation and discussion of the empirical results of the relationship between exchange rate fluctuations and domestic investment and other control variables. Using the Augmented Dickey-Fuller (ADF) and Phillips Peron (PP), the study first test for unit root to determine the stationarity properties of the variables. The study further tested for cointegration, linear effect and asymmetric effect using the Linear Autoregressive Distributed Lagged Model (LARDL), Non-Linear Autoregressive Distributed Lagged Model (NARDL). All the test and estimation were conducted using E-Views (version 10.0) econometric packages.

#### Descriptive statistics

In this section, the study presented the descriptive of the relevant variables involved in Table 2. The issues looked at included the mean, median, maximum and minimum, standard deviation, skewness, Kurtosis, sum, sum squared deviation and the number of observation. Table 2 illustrates clearly these statistics.



**Table 1: Summary Statistics**

	<u>REER</u>	<u>GPC</u>	<u>IRD</u>	<u>GFCF</u>	<u>FDI</u>	<u>DCPS</u>
Mean	341.9188	22.15291	27.48005	16.07676	9.12E+08	9.156950
Median	114.8346	19.95000	18.64108	15.65112	1.31E+08	10.22622
Maximum	3549.286	42.76000	122.8745	29.00214	3.49E+09	15.88200
Minimum	64.66527	9.500000	7.126350	3.531480	2000000.	1.542268
Std. Dev.	684.6902	9.461067	25.28557	6.784972	1.34E+09	5.301333
Skew	3.521101	0.733288	2.648732	-0.010650	1.056741	-0.088509
Kurtosis	15.19704	2.778149	10.06216	2.260643	2.264610	1.338776
Jarque-Bera	314.0706	3.483429	123.4005	0.866245	7.928705	4.419083
Prob	0.000000	0.175220	0.000000	0.648481	0.018980	0.109751
Sum	12992.91	841.8105	1044.242	610.9171	3.47E+10	347.9641
SS. Dev.	17345626	3311.936	23656.32	1703.326	6.64E+19	1039.853
<u>Ob</u>	<u>38</u>	<u>38</u>	<u>38</u>	<u>38</u>	<u>38</u>	<u>38</u>

*Note: Sum Sq. Dev represents Sum of Squared Deviation, Std Dev. represents Standard Deviation, J. Bera represents Jarque Bera, Prob represents Probability, Skew represents Skewness while Obs stands for Observation.*

*Source: Baah (2020).*

It can be observed from Table 1 that all the variables have positive average values and median. This is normal considering the series involved. For instance, the mean of gross fixed capital formation which is the proxy for domestic investment is approximately 16 per cent while the average for inflation is also 27 per cent. The average GDP per capita income of Ghanaians is also GHC 22. Also, the minimal deviation of the variables from their mean as shown by the standard deviation indicates slow growth rate (fluctuation) of these variables over the period considered. Again, most of the variables show signs of positive skewness implying that the majority of the variables mean are greater than their median except for gross fixed capital formation which is 0.010650 negatively skewed.

Moreover, the Jarque-Bera statistic which shows the null hypothesis that all the series are drawn from a normally distributed random process cannot be rejected for the variables. The standard deviation of the variables from their means is quite low except the real exchange rate which is highly deviated.

**Table 2: Results of Unit Root Test with Trend and constant: ADF Test**

<u>Level</u>			<u>First Difference</u>		
Variables	ADF-Statistics	Lag	Variables	ADF-Statistics	Lag
LDCPS	-2.956536[0.1577]	0	ΔLDCPS	-8.123588[0.0000]***	0
LFDI	-2.842795[0.1920]	0	ΔLFDI	-6.113104[0.0001]***	0
LGFCF	-1.551344[0.7928]	1	ΔLGFCF	-6.494254[0.0000]***	1
LGPC	-4.339717[0.0075]**	0	ΔLGPC	-10.44962[0.0000]***	0
LINR	-6.253874[0.0000]***	1	ΔLINR	-7.392264[0.0000]***	1
LREER	-6.545429[0.0000]*	0	ΔLREER	-10.23295[0.0000]***	0

Source: Baah (2020).

**Table 3: Results of Unit Root Test with Trend and constant: PP Test**

Level			First Difference		
Variables	PP-Statistics	BW	Variables	PP-Statistics	BW
LDCPS	-2.939087 [0.1626]	3	$\Delta$ LDCPS	-8.123588[0.0000]***	1
LFDI	-2.778702 [0.2136]	3	$\Delta$ LFDI	-6.171532 [0.0001]***	3
LGFCF	-1.324754 [0.8659]	5	$\Delta$ LGFCF	-8.250757 [0.0000]***	12
LGPC	-4.372349 [0.0069]**	3	$\Delta$ LGPC	-13.23456 [0.0000]***	8
IRD	-6.296919 [0.0000] ***	3	$\Delta$ IRD	-26.27069 [0.0000]***	23
REER	-2.357097[0.3947]	1	$\Delta$ REER	-9.466271[0.0000]***	3

Note: \*\*\*, \*\*, \* indicates the rejection of the null hypothesis of non-stationary at 1%,5%,10% level of significance respectively,  $\Delta$  denotes the first difference, BW is the Band Width. The p-values are in parenthesis while I (0) is the lag order of integration.

Source: Baah (2020).

From the ADF test results in Table 2, it can be observed that at levels the null hypothesis of the presence of unit root for some of the variables specifically log of domestic credit to the private sector (LDCPS), the log of foreign direct investment (LFDI) and the log gross fixed capital formation (LGFCF) cannot be rejected since their P-values of the ADF statistics were not significant statistically at all the three conventional levels. However, the log of the variable of GDP per capita (LGPC), interest rate differential (IRD) and real effective exchange rate (REER) are statistically significant at 5%, 1% and 10% respectively.

At first difference all the variables are stationary and statistically significant at 1% hence we reject the null hypothesis of the presence of a unit.

From Table 3 the PP results at levels for the presence of unit root with trend and intercept, showed all the variables had unit root except for the log of GDP per capita (LGPC) and interest rate differential (IRD) which were statistically significant at 5% and 1% respectively. At the first difference, the null hypothesis is rejected for all the variables since they all become stationary. Thus, the null hypothesis of the presence of a unit is rejected at 1% per cent significant levels for all variables. It was in this manner clear from the unit root results examined, that all the variables were integrated of order zero  $1(0)$ , or order one  $1(1)$ . Since the test outcomes have affirmed the non-appearance of  $1(2)$  variable, the estimation procedure was subsequently suitable for estimation

### Cointegration Analysis

**Table 4: Bounds tests results for cointegration for Linear ARDL model**

Test Statistic	Value	k
F-statistic	6.452505	5
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

**Bounds tests results for cointegration for Non-linear ARDL model**

Test Statistic	Value	k
F-statistic	5.723257	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

Source: Baah (2020).

The purpose of the bound test for cointegration is to test for the existence of long run equilibrium relationship. It was developed by Pesaran et al (2001), this procedure, however, has many advantages over the old and classical cointegration tests. One advantage is that irrespective of the order of integration of the variables either at levels or order one this approach can be used. This study focus on establishing the relationship between exchange rate fluctuation and domestic investment therefore is it crucial to test for the existence of a long run relationship among the variables.

According to Peasaran, Shin & Smith (2001) at most 2 lags can be used in the bound test for cointegration for annual data. The F-statistics is used to test the joint null hypothesis that the coefficients of the lagged levels are zero. Thus  $H_N: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0$  against the alternative hypothesis  $H_A: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq 0$ .

From Table 4, the F-statistics for FGFCF (.) = 6.452505 and 5.723257 for the Linear ARDL model and Nonlinear ARDL Model respectively exceed the lower and upper bound's critical value, at all significance levels, therefore, the null hypothesis of no cointegration between domestic investment and the other variables was rejected at all level of significance.

Therefore, since cointegration has been established among the variables in the domestic investment equation, we proceed to estimate both the long run and short run equations for the Linear ARDL model and Nonlinear ARDL model.

**Non-Linear (NARDL) Long-Run and Short Run Results (Domestic Investment is the Dependent Variable)**

**Table 5: Long-Run Results (Domestic Investment is the Dependent Variable)**

ARDL (1, 0, 1, 0, 1) selected based on SBC Depend variable: LGFCF (log of domestic investment)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REERNEG	0.234593	0.071961	3.260026	0.0028
REERPOS	-0.227250	0.077948	-2.915426	0.0068
IRD	-0.045002	0.051319	-0.876896	0.3877
LDCPS	0.104657	0.106637	0.981437	0.3345
LFDI	-0.072546	0.028408	-2.553764	0.0162
C	3.531563	0.885649	3.987544	0.0004
R-squared	0.875630	Mean dependent var	2.717724	
Adjusted R-squared	0.849898	S.D. dependent var	0.488926	
S.E. of regression	0.189425	Akaike info criterion	-0.316984	
Sum squared resid	1.040570	Schwarz criterion	-0.009078	
Log likelihood	12.70572	Hannan-Quinn criter.	-0.209517	
F-statistic	34.02905	Durbin-Watson stat	1.839026	
Prob(F-statistic)	0.000000			

Source: Baah (2020).

**Table 6. NARDL Short Run Results (Domestic investment) is the Dependent Variable)**

ARDL (1, 0, 1, 0, 1) selected based on SBC Depend variable: LGFCF (log of domestic investment)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
dREERPOS	-0.231238	0.121829	-1.898064	0.0684
dREERNEG	0.248489	0.116623	2.130701	0.0424
dIRD	-0.062874	0.033349	-1.885318	0.0702
dLDCPS	0.293075	0.125471	2.335794	0.0272
dLFDI	-0.141447	0.052563	-2.691020	0.0121
ECM(-1)	-0.945242	0.232927	-4.058099	0.0004
C	0.009389	0.033821	0.277611	0.7834
R-squared	0.690198	Mean dependent var		0.041829
Adjusted R-squared	0.594875	S.D. dependent var		0.232180
S.E. of regression	0.147781	Akaike info criterion		-0.769132
Sum squared resid	0.567822	Schwarz criterion		-0.369186
Log likelihood	22.45982	Hannan-Quinn criter.		-0.631071
F-statistic	7.240577	Durbin-Watson stat		1.691592
Prob(F-statistic)	0.000049			

Source: Baah (2020).

For the first objective, following Bahmani-Oskooee & Fariditavana (2015), Bahmani-Oskooee & Mohammadian (2016), Halicioglu et al (2017) and Obeng (2018), the nonlinear Equation (using the NARDL estimation technique) in equation (13) was estimated, using the same estimation technique used for the linear ARDL, the long run asymmetric effect results is presented in Table 5 and the short run asymmetric results in Table 6 respectively.



From Tables 5 and 6, the main variables of interest, REER(POS) which represents appreciation and REER(NEG) which represent depreciations confirms the asymmetry effect of exchange rate fluctuations on domestic investment in Ghana. This assertion is true because the variables REER(POS) and REER(NEG) have a different coefficient. This result leads us to accept the alternate hypothesis of the study that exchange rate fluctuations have an asymmetric effect on domestic investment. Specifically, REER(POS) has a negative coefficient while REER(NEG) has a positive coefficient in Tables 5 and 6, with the same level of statistical significance. That's is 5 per cent level of significance in Table 5 in the long run and 10 per cent level of significance in Table 6 in the short run.

In table 5, in the long run, five per cent appreciation of the local currency will lead to a 0.68 decrease in domestic investment. Though it is established in this study that exchange rate fluctuations affect domestic investment through the cost of imported inputs and export sales (Goldberg, 1993). However, when the effect of export sales is more pronounced, it can augment the cost of imported inputs. All things being equal, appreciation of the local currency, should have a positive effect on domestic investment, because it reduces the cost of imported inputs (Kandil, 2015), on the contrary appreciation of the currency can also reduce export sales because export becomes more expensive on the international market (Obeng, 2018). With these two contrasting effects, the more dominant of the two effects will prevail and its effect will be felt on domestic investment.

From Table 5 and 6, depreciation has a positive effect on domestic investment both in the short and long run. This is because, counter-intuitively,

depreciation increases the cost of imported inputs but improves exports sale. When the revenue generated from exports sales, far exceed the cost of imported inputs depreciation may promote domestic investment. This result confirms the claim that the relationship between exchange rate movement and some macroeconomic variables can be asymmetric (Bahmani-Oskooee & Fariditavana, 2014, 2015; Bahmani-Oskooee & Mohammadian, 2016; Halicioglu et al., 2017, Obeng, 2018).

All the other drivers (domestic credit to the private, foreign direct investment, interest rate differential) of domestic investment have the same directional impact both in the long run and the short run from the nonlinear ARDL model. All the independent variables in the short run nonlinear ARDL model are statistically significant at 10 per cent. Except for the variable domestic credit to the private sector and interest rate differential, all the independent variables in long run are statistically significant. The Error Correction Model (ECT) for the nonlinear ARDL model is negative as anticipated and it is statistically significant at 1 per cent. The coefficient of the Error Correction Model (-0.945242) implies that approximately 94 per cent of shocks that occur in the short run will be corrected in the long run.

### **Linear ARDL Long-Run Results (Domestic Investment is the Dependent Variable)**

Table 7 is the long run estimate based on the Schwartz Bayesian criteria (SBC). The selected ARDL (1, 0, 1, 0, 1 0) passes the post-diagnostic test (functional form, normality, heteroscedasticity and serial correlation) in Appendix C. The coefficients represent the long run elasticities.

**Table 7: LARDL Long-Run Results (Domestic investment is the Dependent Variable)**

ARDL (1,0,0,0,1) selected based on SBC Depend variable: LGFCF (log of domestic investment)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REER	-0.248016	0.063108	-3.929994	0.0005
IRD	-0.093362	0.047981	-1.945841	0.0611
LDCPS	0.097347	0.097123	1.002310	0.3242
LGDP	0.142034	0.047473	2.991915	0.0055
LFDI	-0.060313	0.025909	-2.327876	0.0269
C	3.449771	0.742686	4.644994	0.0001

Source: Baah (2020).

The results of the first objective of the study have been discussed so far, where the results for the asymmetric effects of exchange rate fluctuations on domestic investment was presented using the Non -Linear ARDL approach in Table 5 and Table 6, on the premise that the main variable of interest, appreciation and depreciation have a differential impact on domestic investment

Moving on to the second objective, where the effect of income on domestic investment is determined. Expectedly, the coefficient of GDP (INGPC) per capita (a proxy for income) carried a positive sign and is statistically significant at 5 per cent significance level which also consistent with the findings of Alshamsi, Hussin & Azam (2017), Hakizimana, J. (2015) and Guechheang & Moolio (2013). With a coefficient of 0.14, it implies that a one per cent increase in GDP per capita (a proxy for income) will cause domestic investment to increase by approximately 0.14 per cent, *ceteris paribus*. The finding supports the accelerator theory of investment, which states that

investment expenditure increases when there is salary (income) increment. This is because when there increase in demand which is strongly influenced by income, local firms, businesses and investors increase their investment to meet the new level of demand.

The long run results show that exchange rate fluctuations (REER) are detrimental to domestic investment in Ghana. The coefficient of exchange rate fluctuations is negative and statistically significant at 1 per cent level of significance. This means that, with the coefficient of -0.2480, a 1 per cent increase in exchange rate fluctuations will lead 0.25 percentage decrease in domestic investment. In this study specifically, exchange rate fluctuations affect domestic investment through the imports of raw materials and inputs, therefore, fluctuations in the exchange rate affect the cost of imported raw materials and inputs, which will, in turn, discourage domestic investment. The results have theoretical backing in the sense that when real exchange rate fluctuates, investment becomes riskier and uncertain for a developing economy like Ghana, its repercussions is felt on domestic investment.

The results concur with the findings of Diallo (2008), Oluwaseyi et al., (2015) and Oniore, Gyang & Nnadi (2016) in their study where they found exchange rate volatility and fluctuation to hurt domestic investment. The results point out that exchange rate fluctuations are a significant factor in explaining domestic investment and subsequently cannot be ignored. However, these results do not coincide with the findings of Iyke & Ho (2018) who asserts that exchange rate volatility and fluctuation have a positive impact on domestic investment in the long run.

From the results in Table 7, the coefficient of interest rate differential (IRD) of -0.093362 depicts that a 1 per cent increase or change in interest rate differential will result in a 0.1 approximate decrease in domestic investment, in the long run, all other things being equal. The result is statically significant at the 10 per cent level of significance. For clarity interest rate differential in the context of this study is the interest on investment. The interest rate differential variable was created to measure the difference in the interest rate in Ghana and outside Ghana and since the rate of interest is an important incentive for investment. It is the key factor in determining why an investor will invest in the local economy or may decide to invest outside Ghana. The negative impact of interest rate differential on domestic investment explains that the reality that investment conditions outside Ghana are more favourable and therefore nationals prefer to invest abroad rather than in Ghana.

Moreover, foreign direct investment (INFDI) has a significant negative effect on domestic investment in this study. The long-run result shows that an increase in foreign direct investment will reduce domestic investment by 0.06 per cent and it is significant at 10 per cent. Though competition has been heightened by developing countries of which Ghana is no exception to attract FDI, the question whether FDI crowds out or crowds in domestic investment in the host country remains an empirically and a debatable question (Boateng and Glaister 2000). In this study, FDI was found out to crowd out domestic investment in Ghana.

This result is line with the findings of Adams (2009), Agosin & Machado (2005), Yahia, Haiyun, Khan, Shah & Islam (2018). For example, Yahia et al (2018) pointed out that though FDI inflows are intended to accelerate

economic growth in the host country, when it is not well regulated by the government it turns out to stunt the growth of domestic investment, local business and firms. Most of the FDI the Ghanaian economy attract are domestic market seeking, thus to take over the local market. Due to the superior technology of these foreign firms as compared to a local firm and business, they are able to out-compete our local firms and this gives them a competitive advantage. They eventually end up crumpling local firms and business because products from these foreign companies are more price competitive and a step up ahead in quality when compared to our local products.

**LARDL Short Run Results (Domestic investment is the Dependent Variable)**

The presence of a long run relationship among domestic investment and its independent variables allows for the estimation of short run estimates.

**Table 8: Estimated Error Correction Model using the ARDL Approach.**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
dREER	-0.235786	0.068441	-3.445120	0.0018
dIRD	-0.083020	0.030547	-2.717792	0.0111
dLDCPS	0.251160	0.114743	2.188893	0.0371
dLGDP	0.091295	0.033640	2.713873	0.0113
dLFDI	-0.109755	0.045320	-2.421778	0.0222
ECM(-1)	-0.837713	0.224667	-3.728688	0.0009
C	0.013459	0.028014	0.480441	0.6346
R-squared	0.667173	Mean dependent var		0.032592
Adjusted R-squared	0.583967	S.D. dependent var		0.235454
S.E. of regression	0.151869	Akaike info criterion		-0.738461
Sum squared resid	0.645801	Schwarz criterion		-0.386568
Log-likelihood	21.29230	Hannan-Quinn criter.		-0.615641
F-statistic	8.018271	Durbin-Watson stat		1.857997

Source: Baah (2020).



From table 8, the Adjusted  $R^2$  is approximately 0.58. It implies that approximately 58 per cent of the variations in domestic investment is explained by the independent variables. The DW-statistics of approximately 1.9 shows non-existent of autocorrelation in the residuals. The negative coefficient of the Error Correction Term (ECT) is an indication that any shocks and disequilibrium that occurs in the short run will be rectified in the long run. The rule of thumb says that the rate at which the variables equilibrate in the long run when shocked is largely dependent on the coefficient of the error correction (in absolute terms) so a larger coefficient will cause the variables to equilibrate faster and vice versa (Acheampong, 2007).

The result shows that the coefficient of the lagged error correction term ECM (-1) is -0.8377 and it is statistically significant at 1 per cent. This implies that approximately 84 per cent of the disequilibrium caused in the previous year's shocks converges back to the long run equilibrium in the current year. The short run results still shows that income has a positive effect on domestic investment, that is a 1 percent increase in income will increase domestic investment by 0.09 percent. All the independent variables in the short run are statistically significant including the variable "domestic credit to the private sector" which was not statistically significant in the long run. The coefficient of domestic credit to the private sector (INDCPS) in the short run is 0.251160 and it is statistically significant at 10 per cent.

This implies that a 1 per cent increase in domestic credit to the private sector will cause domestic investment to increase by approximately 0.25 per cent. The private sector contributes immensely to economic growth, but for them to continually invest in the local economy they must have access to credit



facilities, therefore making credit access and services available to the private sector encourages and promote domestic investment. The Banking industry is one of the major avenues in accessing credits and their ability to offer these services is directly critical to domestic investment in a country (Mallinguh & Zoltan, 2018).

The short run dynamics reveals that exchange rate fluctuation (REER) is still hostile to domestic investment in Ghana. The coefficient of exchange rate fluctuation is negative and statistically significant at 5 per cent level of significance. The coefficient of  $-0.235786$  implies that an increase in fluctuations of the real effective exchange rate of Ghana by 1 per cent leads to approximately 0.23 per cent decrease in domestic investment.

Failure to manage and stabilize the rate of exchange of country can cause some economic distortions in domestic investment, consumptions and production patterns. The long term and short term exchange rate fluctuations showed a negative effect on domestic investment. This result reveals that exchange rate fluctuation is a key factor in explaining domestic investment and cannot be overlooked.

#### **Post Estimation (Model Diagnostic) Test**

The following diagnostic tests were conducted for the Linear model and Nonlinear mode in Appendix C. The test presented in Appendix C shows that the estimated linear ARDL model and Nonlinear ARDL model passes all the diagnostic test which includes normality test, heteroscedasticity test, functional form test (Ramsey RESET) and the Breusch-Godfrey serial correlation test.

Specifically, Appendix C shows the Breusch-Godfrey Serial Correlation LM test for the existence of autocorrelation. The results of the test show the p-value of 0.6034 and 0.2818 for the Linear ARDL model and Nonlinear ARDL model respectively, which are greater than the critical value of 0.05. This affirms the non-existence of autocorrelation in the Linear ARDL model and Nonlinear ARDL model. The heteroscedasticity test shows the p-value of 0.641164 and 0.8632 for the Linear ARDL model and Nonlinear ARDL model respectively, which exceeds the critical value of 0.05, therefore, we conclude that the Linear ARDL model and the Nonlinear ARDL model are homoscedastic. The Ramsey RESET test shows that p-value of 0.3812 and 0.1387 for the Linear ARDL model and Nonlinear ARDL model and are greater than the critical value of 0.05. This shows that there is no apparent non-linearity in the regression equations and therefore the models are linearly appropriate.

### **Stability Tests**

The cumulative sum of recursive residuals (CUSUM) and cumulative sum of the square of recursive residual (CUSUMSQ) are used to test for stability and consistency of the model (Peasaran, Smith & Yeo 1985). This is done to check the stability of the parameters in the model. The test finds the parameters of the model unstable when the cumulative and cumulative sum of squares lies outside the critical bound of the 5 per cent significance level, when this happens the null hypothesis that all coefficients are stable has to be rejected.

Figure 1 and 2 shows the plot of CUMSUM and CUSUMQ for the estimated Linear ARDL model and Nonlinear ARDL model. The plot affirms the non-existence of structural breaks in the model because the plot of all the coefficient lies within the critical bounds at 5 per cent significance interval. This

means the estimated models are stable and the coefficients are not changing systematically throughout the study.

### Chapter Summary

This chapter presented the descriptive statistics of the study. It also examined the time-series properties of the data used for the estimation and also presented and discussed the results. The unit root tests were conducted using both the ADF and PP techniques, however, some of the series had to be differenced once to achieve stationarity. The series were integrated of order  $I(0)$  and  $I(1)$ . The presence of non-stationarity variables implies the possibility of the presence of a long-run relationship, which the study verified using the bounds testing approach to cointegration.

The results showed the presence of cointegration relationship between exchange rate fluctuations, income, foreign direct investment, interest rate differential, domestic credit to the private sector and domestic investment. Whereas income, domestic credit to the private sector exerted a positive and statistically significant impact on domestic investment, exchange rate fluctuations, foreign direct investment and interest rate differential exerted a negative impact on domestic investment. Exchange rate fluctuation was confirmed to also have an asymmetric effect on domestic investment. The results of the ECM showed that error correction term for domestic investment did carry the expected negative sign.

## CHAPTER FIVE

### SUMMARY, CONCLUSIONS AND RECOMMENDATION

#### Introduction

The purpose of this final chapter is to present the summary, conclusions and recommendations. The aim is to show the major findings of the study and also suggest policy recommendation as a remedy to ensure an improved and sustainable domestic investment. The chapter also presents the limitation and direction for future research.

#### Summary

This study aimed to investigate the relationship between exchange rate fluctuation and domestic investment in Ghana by particularly focusing on the asymmetric effect and the effect of income both in the long run and short run. In all the study examined the effect of exchange fluctuations together with some control variables on domestic investment using the Linear ARDL model and Nonlinear ARDL model developed by Pesaran et al. (2001). The study used an annual time series data from the period of 1980 to 2017.

The first objective results revealed that in the long run the exchange rate fluctuation has an asymmetric effect on domestic investment. Specifically, because, the two variable of interest had different signs in their coefficient, appreciation had a negative coefficient while depreciation had a positive coefficient and they were all statistically significant. The long run results showed that depreciation, and domestic credit to the private sector had a positive impact on domestic investment however of all the three variable the impact of domestic credit to the private sector was positive it was not statistically

significant. While appreciation, foreign direct investment and interest rate differential was detrimental to domestic investment.

The short-run asymmetric results confirmed what was found in the long run revealed that depreciation, and domestic credit to the private sector have a positive and significant influence on domestic investment. However, the short run dynamics also revealed that appreciation and foreign direct investment was negative and inversely related to domestic investment. The Error Correction Term showed that any disequilibrium caused by previous year's shocks converges back to equilibrium in the long run in the current year at a rate of 88 per cent.

The second objective results showed that, in the long run income and domestic credit to the private sector had a positive impact on domestic investment, of all these variables the impact of domestic credit to the private sector was not statistically significant. However, exchange rate fluctuations, interest rate differential and foreign direct investment has a statistically significant but negative impact on domestic investment. According to the findings exchange rate fluctuation, interest rate differential and foreign direct investment are deleterious to domestic investment in Ghana. However,

The short-run results were in similitude with the long run result. Income and domestic credit to the private sector had statistically significant and an appreciating effect on domestic investment, however, it must be noted that domestic credit to the private sector which was not statistically significant in the long run was significant in the short run. The short run dynamics revealed that exchange rate fluctuation, foreign direct investment and interest rate differential still have a deleterious effect on domestic investment. The Error Correction term

obtained from the short run estimation did carry the expected sign and was significant indicating that disequilibrium in the short run is corrected in the long run.

### **Conclusions**

The empirical evidence revealed the following findings: First, exchange rate fluctuations have an asymmetric effect on domestic investment in the long and short run. In other words, decomposition of exchange rate fluctuation into two new variables appreciation and depreciation have a differential impact on domestic investment which affirms the fact that the impact of exchange rate movement on macroeconomic variables is not in the same magnitude (Obeng, 2018, Bahmani-Oskooee et al., 2015). The Nonlinear ARDL model was to estimate the asymmetric effect.

Secondly, the income exerts positive effects on domestic investment both in the long run and short run. This confirms the accelerator theory of investment that as income increase investment will also increase in the same proportion.

### **Recommendations**

Based on the findings of this study, the following recommendations are proposed.

Uncertainty and fluctuations in the exchange rate make domestic investors apprehensive about investing in the local economy. The Bank of Ghana should strengthen up their effort to stabilise the exchange rate by providing long-lasting and effective measures and not just provide knee-jerk solutions. For example, the Bank of Ghana can sensitize and encourage domestic investors especially in the areas of import and export to take advantage



of hedging and forwards contracts. This will help reduce the risk faced by domestic investors.

With foreign direct investment crowding out local business and investment, the study recommends that Ghana Investment Promotion Centre should focus on promotional resources to attract some types of FDI's that encourage domestic investment. Specifically policies should be targeted on attracting FDI's that enhance domestic investment through a bundle of beneficiary effects, such as more advanced production technology, improved organizational and managerial skills, marketing know-how and market access. The consequent improvement in c, technology, institutions, and in the speed of development in general, are expected to further encourage domestic investment and entrepreneurship.

Coming from the background of the contribution of domestic credit to the private sector, the study recommends that Bank of Ghana should implement an incentive mechanism that will encourage banks and other financial institutions to give more loans and credits to local investors as this will further improve domestic investment.

#### **Future Direction of Research**

Based on the challenges faced by the study, the following suggestion for future research was put forth:

Future research on this work can expand the sample size to and also add other macroeconomic variables that are not considered in this model. This can help improve our understanding and identify some variables that are important to domestic investment in Ghana.



Lastly, future studies can also consider how policy switches over the cause of time affects domestic investment in Ghana.



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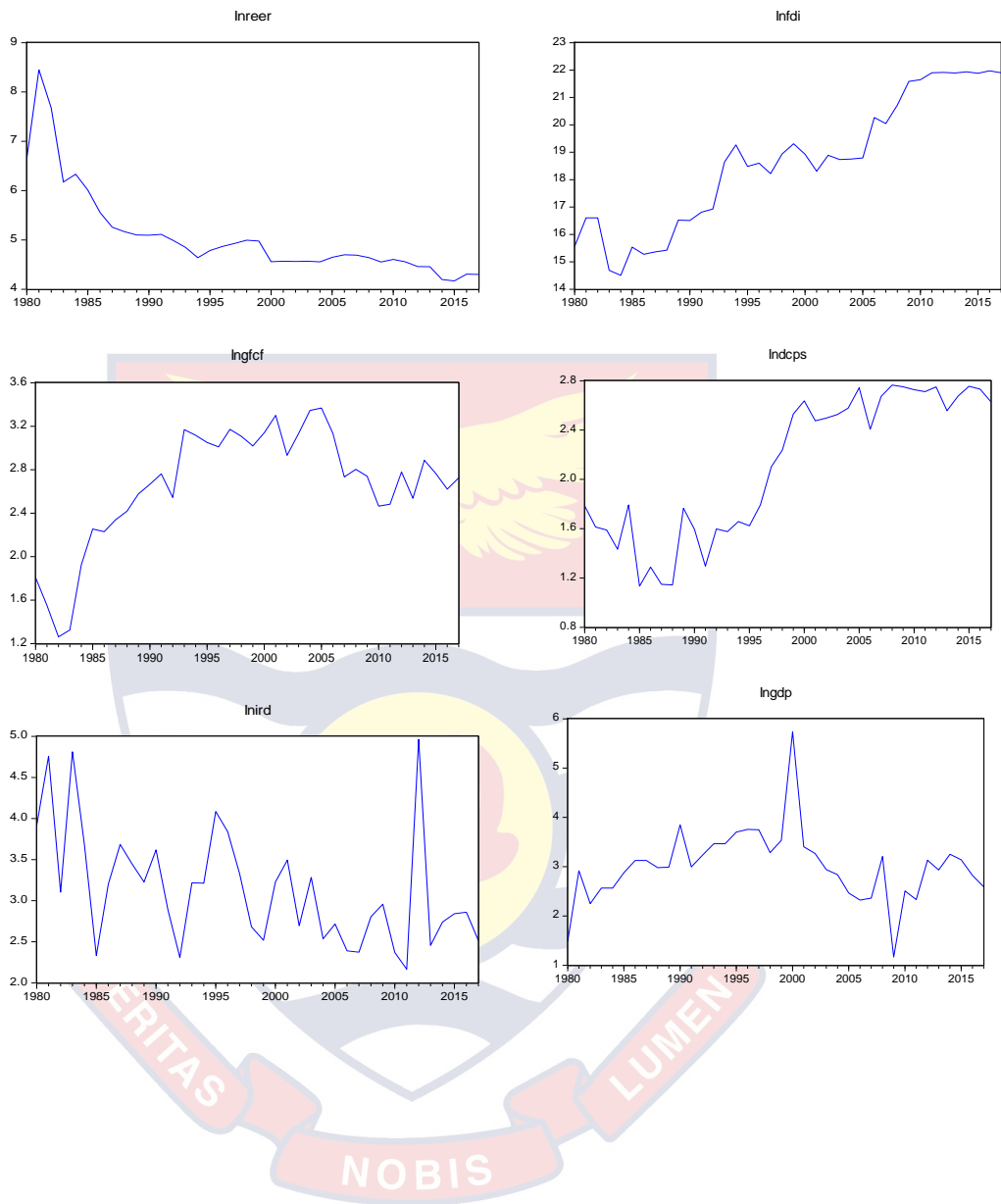
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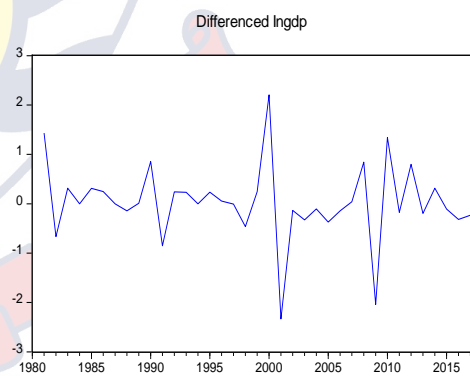
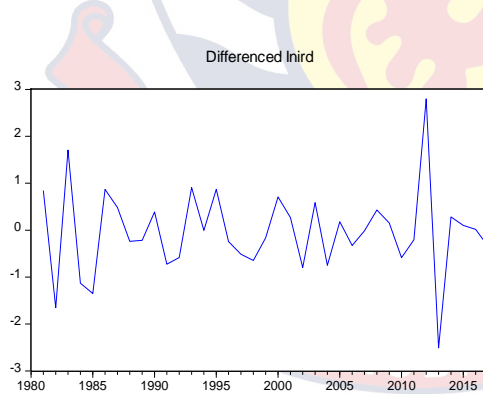
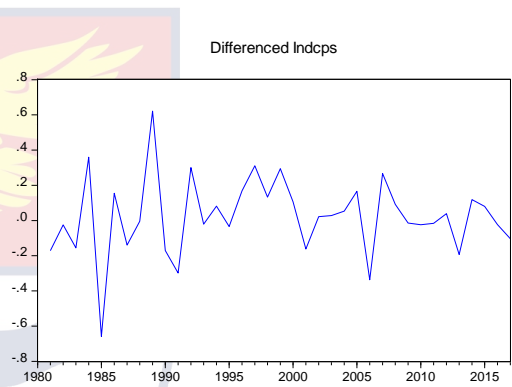
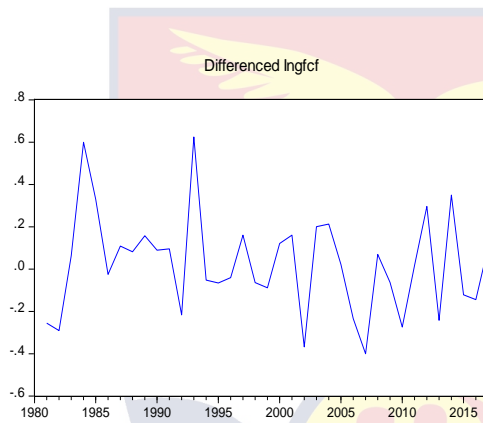
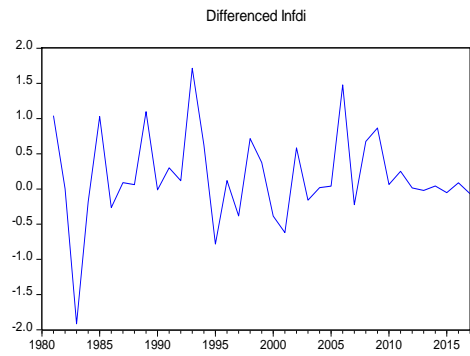
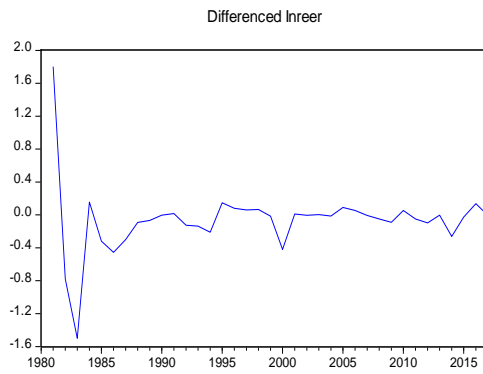


## APPENDIX

### A: Plot of Variables (Series) at Level

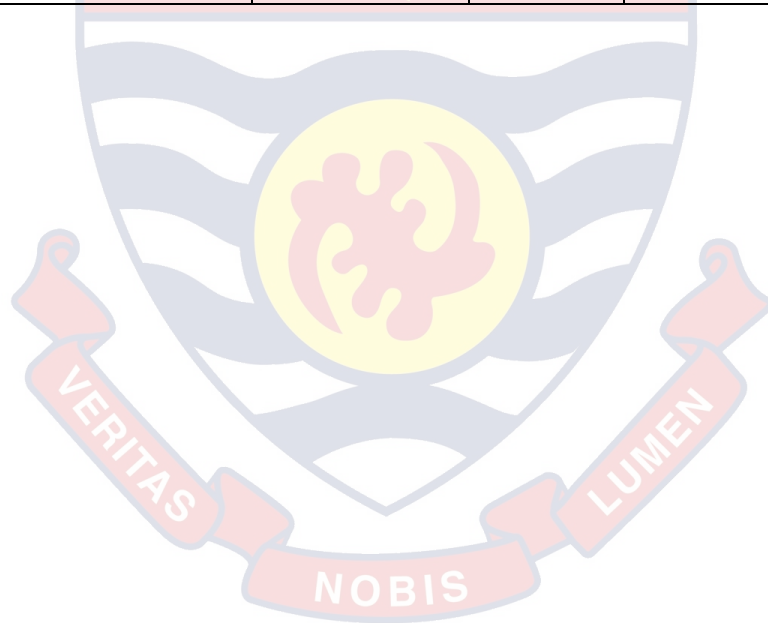


### B: Plot of Variables (Series) at first difference

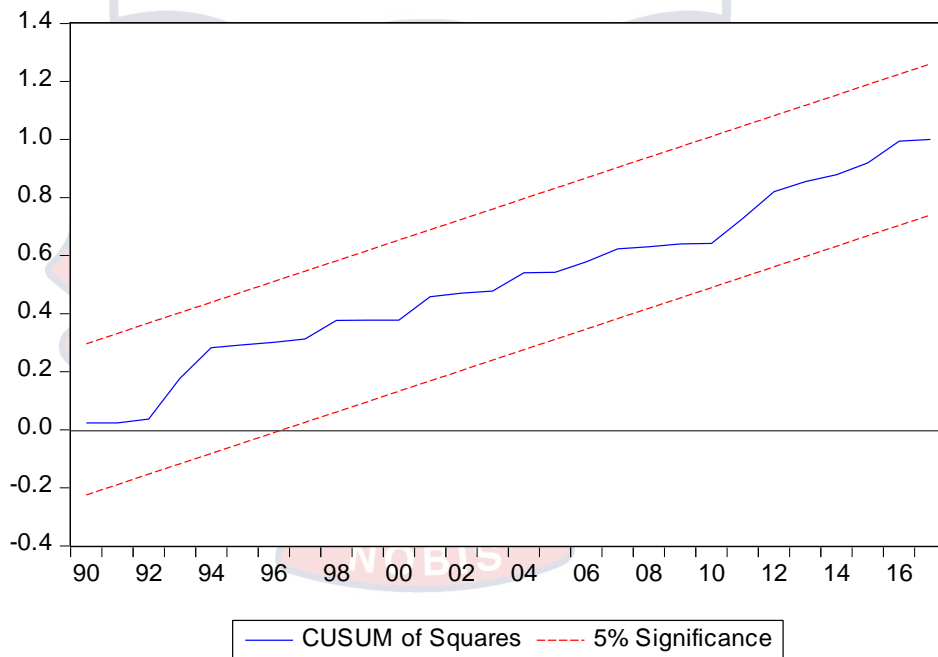
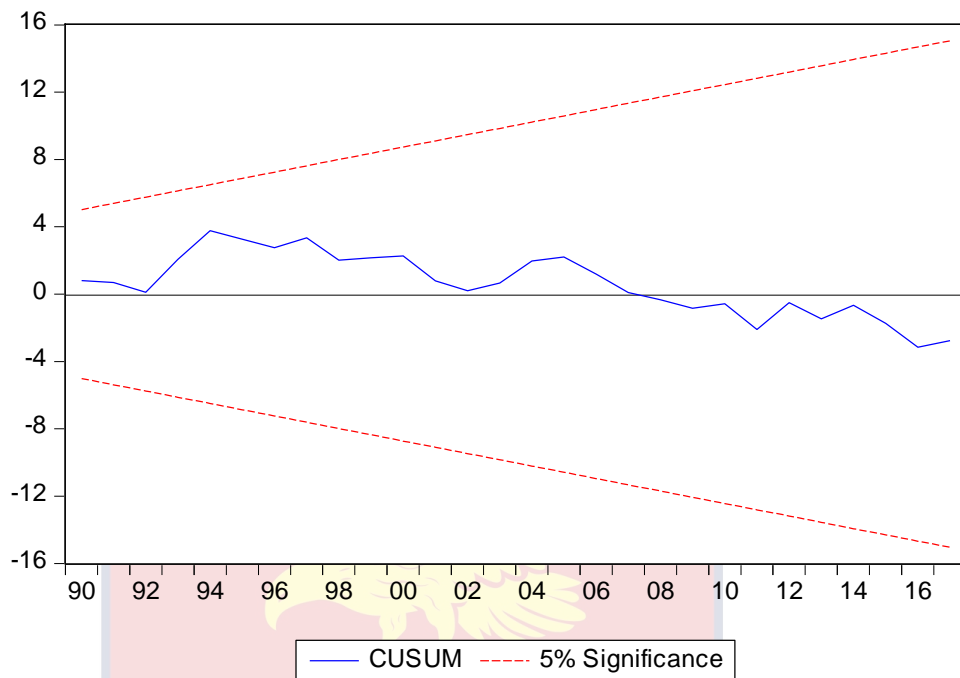


**C: Diagnostic Tests**

Test	Linear ARDL model		Non-Linear ARDL model	
	F-statistic	p-value	F-statistic	p-value
Serial Correlation	0.276339	0.6034	1.209869	0.2818
Functional Form	0.792439	0.3812	2.338901	0.1387
Normality	1.500919	0.472149	2.204050	0.332198
Heteroscedasticity	0.641164	0.7182	0.474028	0.8632
CUSUM	-	stable	-	stable
CUMSUMSQ	-	stable	-	stable



### CUSUM and CUMSUMQ for the Linear ARDL model.





### CUSUM and CUMSUMQ for the Nonlinear ARDL model.

