KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

Time Series Analysis on Multiple Macro Economic Indicators in Ghana

By

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(BSc. Economics and Statistics)

A Thesis submitted to the Department of Mathematics, Kwame Nkrumah University of Science and Technology in partial fulfillment for the requirements for the degree of

MASTER OF SCIENCE

(INDUSTRIAL MATHEMATICS)

INSTITUTE OF DISTANCE LEARNING

Faculty of Physical Sciences, College of Science

June, 2013

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research *work towards the award of the MSc. degree and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.*

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ACKNOWLEDGMENT

To Almighty God, Father of all mercies, who has brought me this far and also to my supervisor, Mr.*Nana KenaFrempong* , lecturer Department of Mathematics and Statistics for his constructive criticisms and comments that helped me shaped this work.

I would also like to express my gratitude to African Economic and Research Consortium (AERC) and the entire staff of Department of Mathematics and Statistic Kwame Nkrumah University of Science and Technology.

I am also grateful to my wife Mrs Emilia Bonkom, my daughters MypridePomaaAddai LydiaEsi for their encouragement and support. I will like to also acknowledge my father Mr. Martin MensahFiagboh and my Mother MecilinaFiagboh. For their wonderful support that has brought me this far.

Finally, I wish to show my appreciation to my family, and to all individuals who contributed in diverse ways toward the successful completion of this thesis.

DEDICATION

With great joy, this project work is dedicated to my dear and loving wife **EMELIA BONKOM(Mrs.)**, my brother **DAVID FIAGOH(Mr)** my sisters **JOSEPHINA FIAGBOH(Mrs)**, AGENS FIAGBOH **(Miss),** and **ELLEN FIAGBOH(Mrs).**

ABSTRACT

The study sought to test the hypothesis that there is no relationship between real effective exchange rate and other macroeconomic variables.This study was done by developing an empirical model for Real Effective Exchange Rate with special focus on Foreign aid using the cointegration, vector and error correction (VEC) and vector auto regression (VAR) approach.

Annual data covering the period 1980 to 2011 was collected (World Bank Development Indicators). The outcome of the study showed that foreign aid as well as government expenditure, Aid, Money supply, Terms of Trade and Openness of the economy have appreciating effect on Real Effective Exchange Rate. On the other hand Government Expenditure had depreciating pressure on Real Effective Exchange Rate. We also established from the variance decomposition and impulse response function that foreign aid is an important determinant to real effective Exchange Rate.

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CHAPTER ONE

INTRODUCTION

1.0 Background of the study

Exchange rate also known as Foreign exchange rate or Forex rate between two currencies is the price of one currency in terms of another. It is the value of a foreign nation currency in terms of the home nation's currency. Exchange rates are important because they affect the relative price of domestic and foreign goods. The dollar price of Ghana goods to an American is determined by the interaction of two factors, the price of Ghana goods in cedis and the cedi/dollar exchange rate.

Managers of financial institution care a great deal about what foreign exchange rates will be in the future because these rates affect the value of assets on their balance sheet that are denominated in foreign currencies. In addition, financial institutions often engage in trading foreign exchange, both for their own account and for their customers. Forecasts of future foreign exchangerate can thus have a big impact on the profits that financial institutions make on their foreign exchange trading operations.

Managers of financial institutions obtain foreign exchange forecasts either by hiring their own staff economists to generate them or by purchasing forecasts from other financial institutions or economic forecasting firms. Managers of financial institutions, particularly those engaged in international banking rely on foreign exchange forecasts to make decision about which assets denominated in foreign currencies they should hold.

The exchange rate of the Ghana cedi against, for example, the US dollar is quoted as the number of Ghana cedis required to purchase one US dollar (as also for the British pound sterling or the euro the key major currencies in Ghana's international trade with the rest of the world). An unexpected change in the Ghana cedi/US dollar exchange rate could therefore have an impact on profitability of enterprises operating in the tradable sector of the economy exporters and importers. It may call for corrective action such as an intervention by the Bank of Ghana (BOG). In order for the appropriate corrective action to be taken, however, the BOG must determine whether the unexpected change is more the consequence of the policy stance in Ghana or of that of the US Federal Reserve the corresponding central bank of the United States of America. Determining the answer is difficult. One of the widely used approaches is to examine other exchange rates, for example, in respect of the British pound and the euro. Thus if the cedi is depreciating or appreciating that is falling in value or rising in value against all three key major currencies, it is reasonable to conclude that the unexpected or undesirable change in the value of the cedi requires corrective action by the Bank of Ghana This approach has given rise to the concept of the nominal effective exchange rate (NEER) also referred to as the multilateral exchange rate.

The volatile nature of exchange rates has been the focus of many researchers. Although some previous studies suggest that variations in an exchange rate has the potential to affect a country's economic performance .Less Developed Countries (L.C.D) have received less attention compared to industrialized or developed economies (Osei-Assibey, 2010). Richard (2007), in his own Report, said "Volatility plays a very important role in any financial market around the

world, and it has become an indispensable topic in financial markets for risk managers, portfolio managers, investors, academicians and almost all that have something to do with the financial markets. Forecasting accurately future volatility and correlations of financial asset returns is essential to derivatives pricing, optimal asset allocation, portfolio risk management, dynamic hedging and as an input for Value-at-Risk models. Finance has seen intense research interest in the Post- Bretton Woods Era. Surprisingly, the interest in this area of research is still very intense, and experts do not see this interest waning in the foreseeable future. Many researchers attribute exchange rate volatility to the fact that it is empirically difficult to predict future exchange rate values (Killian and Taylor, 2001).In recent years a number of related formal models for time-varying variance have been developed. Recent past behaviour of the Cedi/Dollar is crucial and this has been linked largely to underdevelopment of thefinancial system and the exchange rates market. It is interesting therefore to investigate whether correcting theexchange rate system could solve some of the problems.

The foreign exchange market is small in size with only a few active players. The central bank is the most dominant player in the market and it is responsible for 90 percent of the total amount of transactions in the market. There are currently four identifiable segments of the market. These are:

- The interbank market where banks trade foreign exchange among themselves;
- Foreign exchange bureau which serve individuals, tourists, SMEs, etc.;
- The corporate market through which transactions between banks and their customers are conducted; and

- The unofficial market which comprises of corporations that price their products / services at their own-determined exchange rate.

This means four market rates for each of the major currencies – the US dollar, the British pound, and the euro. The FX market is generally characterized by a structural imbalance in the demand and supply of foreign exchange which exerts depreciating pressure on the cedi and poses a constraint to the development of the foreign exchange market. In CEPA's(Center for Policy Analysis) view, this imbalance stems from a structural savings-investment gap that persists within the economy. In a capital-poor developing country like Ghana, which also has underdeveloped financial markets, the investment/development needs far exceed the levels of domestic savings available to finance them. Under such circumstances, a current account deficit may be natural; and this might exert pressure on the currency to depreciate. The large current account deficits are primarily financed by Official Development Assistance and private capital flows. Thus, in addition to depreciation pressures on the cedi, there is also inherent vulnerability of the exchange rate to changes in market sentiment. The uncertainty and volatility in the flow of foreign capital, therefore, make it prudent for the BOG to aim at high holdings of international reserves. This is to enable it to buffer the potential pressures that may arise from maintaining an open current account. After two years of relative stability, the cedi is facing intensified depreciation pressures and increased volatility. The pressures, which began in June 2011, became chronic in the last quarter of 2011 and further intensified in the first quarter of 2012, especially in January and February. Structural excess demand pressures in the foreign exchange market normally intensify in the last quarter of each year due to seasonal import demand for the holidays. However, the intensification in the first quarter of 2012 was not normal and as a result the depreciation of the cedi in January 2012 was at a much faster rate of 5.9 per cent compared to

only 1.9 per cent in January 2011been much higher than in comparative periods of other years. Similarly, the spread between the rates in the interbank and forex bureau markets has also widened. The unusually strong demand for foreign exchange seen in the first quarter of 2012 can be attributed to the PBC (Political Business Cycle) and some of the consequences that have emanate out of that. In the recent period, the factors that have been at play in the foreign exchange market are the following:

The expansion in the Ghanaian economy. The acceleration in GDP growth from 4.0 percent in 2009 (Bank of Ghana Annual report 2009) has resulted in an increase in economic activity and a higher demand for imports. CEPA estimates show that an increase in GDP by one percent generates a rise in imports by as much as 1.14 percent. Thus, the expansion in the economy has resulted in greater demand for foreign exchange and additional pressure on the cedi to depreciate.

Another factor is the increased in trade with China. The rising volume of trade with China has changed the demand patterns for foreign exchange. This is because imports from China are predominantly paid for in cash rather than with Letters of Credit (LCs) which spread out payments over a period of time. As a result, there has been an increased reliance on cash holdings of foreign exchange which has put stress on the seasonal pressures particularly for the year. Much of the demand for foreign exchange in cash occurs in the forex bureau market. As such, the change in the pattern of trade towards more cash-based transactions, particularly with

China, would have a greater impact on forex bureau rates. This could explain the relatively sharper depreciation seen in the forex bureau market and the resulting wider spreads between the forex bureau and interbank markets.

Excess liquidity in the banking system and the liquidity overhang is a factor. Banks hold excess reserves when their total reserves held at the central bank, and in vault cash exceed the required 9 percent of total deposits. When this is the case, the excess reserves may be loaned out to support private consumption or investments resulting in inflation or they may be used to purchase foreign exchange causing depreciation. The high terms of trade for cocoa and gold that increased foreign exchange inflows and boosted the international reserves of the BOG have also contributed to the excess liquidity in the system. This is because in building its foreign exchange reserves the BOG injects cedis into the system. This is to buy up the foreign currency. The additional cedis in the system, however, need to be mopped up to prevent them from causing inflation and subsequently depreciation of the currency. Because of the high cost of OMO(Open Market Operation), the BOG has been unable to effectively mop-up excess liquidity from the system. This has led to lower yields interest rates on cedi assets and has resulted in the excess being channeled into the foreign exchange market; causing further depreciation in the cedi.

1.1 statement of the problem

The high volatility of foreign exchange rate brings uncertainties about predictions. Form past years, Economist generally believed that allowing exchange rate to be determined in the free

market would not lead to large fluctuations in their values. Recent experience has proved them wrong.

Throughout the economic adjustment agenda, exchange rate and trade reform occupied a core position. The real exchange rate, by virtue of its impact on international competitiveness of an economy, assumed an overriding importance among the cohort of policy variables. The exchange rate is one of the most important economic adjustment instruments and yet it is also one of the most difficult and controversial economic policy tools. As pointed out earlier, changes in the exchange rate basically have an impact on three entities

1. Individual
2. Investors
3. Government

When a country's currency appreciates (rises in value relative to other currencies), the country's goods become more expensive and foreign goods in that country become cheaper (holding domestic price constant in the two countries). Appreciation of a countries currency makes it harder for domestic manufacturers to sell their goods abroad and increase competition at home from foreign goods because they cost less. Again, individuals shift their demand from local manufactured goods to foreign goods whose prices have decreased. The result is that the locally manufactured industries collapse as a result of cheap imports from foreign countries. In addition local investors lose their investment. The repelling effect is that local industries are forced to lay-off workers and this creates serious unemployment problems for the government to solve. A case in point is collapse of the cotton industry in Ghana as a result of cheap import of textile from China. This has force Juapong Textiles to collapse as a result workers are lay-off and the

government have lost a huge investment. From the discussion above a good prediction about the exchange rate of the Ghana cedi to its trading partner's currencies will well inform the Individual, Investors and the Government about the effects of exchange rate on the economy.

1.2 objectives of the study

The o objectives of this study are outlined as follows:

- Examine the long run relationship between Real effective Exchange Rate, Aid, Money Supply, Terms of Trade, Government Expenditure, Openness of the economy, GDP.
- Examine if aid inflows to the country could cause the Dutch disease.
- Study the relationship between real effective exchange rate and other economic variables.
- Study the direction of causality between Real Effective Exchange Rate and its fundamentals.

1.3 hypothesis of the study

- There is no significant relationship between the real effective exchange rate and other currencies.
- Aid inflows in the country cannot cause Dutch disease.
- There is no relationship between real effective exchange rate and other macro economic variables.

1.4 justification of the study

In private sector-led market-oriented economies such as ours, predictability of key market prices such as the exchange rate is of critical importance. In the face of uncertainty, private enterprises are prone to be unwilling or unable to take the long view, preferring to wait and see. This behavior in attitude of the Individual, Managers eventually cost them to loss a huge amount of wealth which could have been easily avoided.

The study among other things will help explain effects of appreciation and depreciation of the cedi on other major currencies. The study will also predict the real effective exchange rate to serve as a guide to Individuals, Investors, and the government as a whole. There exist few studies using multivariate time-series analysis to predict the exchange rate between the cedi and the dollar in the case of Ghana. This study adds to the existing literature. In so doing the study addresses some of the methodological issues inherent in the literature. Finally, the study will equip other researchers who are interested in the field of exchange rate to probe further into some of the economic indicators that affect exchange rate.

1.5 Scope of the study

The real effective exchange rate is not only broad but also complex area as far as the Ghanaian economy is concerned. There are a lot of currencies used in the country, each of which has an impact on the real effective exchange rate determination in the economy. But because of limited time, space and resources, the study will be limited to the currencies used in the determination of

the real effective exchange rate by the Bank of Ghana. Other variables which affect exchange rate namely inflation, imports, exports, net income from abroad, net aid official aid received will be examined. The date will capture from 1980-2011.

1.6 Methods of Study

1.6.1 Data Type and Sources

The study will employ mainly secondary macroeconomic time series data in its analysis. All data to be used in the analysis will be taken from Government Finance Statistics and the World Bank Development Indicators and The State of the Ghanaian Economy (various issues). Other augmenting sources included published articles and journals, working papers, and relevant internet resources.

1.6.2 Data Analysis

The data organized would be analysed both descriptively and quantitatively. Charts such as trend graphs and tables were employed to aid in the descriptive analysis. Additionally, the Vector Autocorrelation Regression Analysis (VAR) would be employed to establish the relationship between inflation, export, import, net official aid received, net income from abroad and exchange rate between the cedi and the dollar. All estimations were carried out using Stata and other relevant econometric softwares.

1.7 Organization of the study

This study is organized into five chapters. Chapter one, which is the introductory chapter, present a background to the study, problem statement, objective of the study, hypotheses, justification of the study, scope of the study as well as the organization of the study. Chapter two present review of relevant literature, both theoretical and empirical that underpins the exchange rate determination and the possible influence it has on the economy of a nation. Chapter three presents the methodological framework and technique employed in conducting the study. Chapter four examines and discusses the results and main findings with reference to the literature. The final chapter presents the summary, conclusion and recommendations of the study.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter is divided into three sections: the conceptual framework, the exchange rate situation in Ghana and the theoretical framework. The conceptual framework discusses the alternative measures of the exchange rate as well as the concept of the equilibrium exchange rate and the importance of the real exchange rate. The second aspect looks at the exchange rate situation in Ghana the major players in the exchange market and how they can influence the market. Finally, the theoretical framework discusses different models of the determination of the exchange rate as well as the various determinants of the exchange rate.

2.1 Conceptual framework

The exchange rate is defined as the price at which one currency is exchanged for another currency and the transactions are carried out either in the spot or forward exchange markets. The spot market for the exchange rate is a current market for the exchange rate, whereas the forward market is quoted and traded in the current period for future delivery. The following sections will discuss the spot rate as well as the various alternatives to the spot rate.

2.1.1 The nominal exchange rate

The spot rate is also referred to as the nominal exchange rate. The nominal exchange rate measures the value of one currency in terms of another and it can be expressed in two ways: the direct and the indirect quotation. The indirect quotation expresses the price of a foreign currency

in terms of the domestic currency. Assuming the naira (N) is the home currency and the United States of America dollar (USD) the foreign currency, an indirect quotation of N125 per USD can be written as follows; USD/N125. The direct quotation on the other hand expresses the price of the local currency in terms of a foreign currency. A direct quotation in this case will be the units of the USD per naira and is written as follows: N/USD0.008. The spot rate is particularly useful because it is directly observable thus making it possible to compare the prices of goods. A problem that arises with the spot rate however is that it fails to indicate a change in the strength of a home currency with respect to the home country's trading partners (other than the United States of America). The spot rate also fails to indicate the effect of acquiring foreign goods and services on the exchange rate itself (Appleyardet al,2006).

2.1.2 The real exchange rate (RER)

The RER is the alternative measure of the spot rate which accounts for price changes in the home country, and in the trading partner country. One of its most important attributes is that it is a good indicator of the overall economic performance of a country. There is no generally agreed measure of the RER; however, there are two common measures of RER which are recurring in literature. An increase in RER is indicative of a real depreciation whereas a decrease in RER is indicative of a real appreciation (Kemme and Roy, 2006). The most common challenge of using this definition of the RER is the problem of finding proxies as well as identifying which price indices to use. In this case, an increase implies real exchange rate appreciation whereas a fall in the RER indicates real exchange rate depreciation. When the price of tradables rises relative to the price of non-tradables, the RER depreciates whereas if the price of non-tradables increases relative to the price of tradables, the RER appreciates. This definition of the RER is derived from

the two-good model. Nominal exchange rates play a major role in the day-to-day operation of the foreign exchange market whereas the real exchange rate is often regarded as more significant in policy decisions and for economic performance. The next section will discuss another alternative to the spot rate.

2.1.3 The multilateral effective exchange rate

The multilateral exchange rate is trade weighted which means that its value indicates its importance relative to the major trading partners of the target country. The following subsections will discuss the nominal effective exchange rate and the real effective exchange rate.

2.1.4 The nominal effective exchange rate (NEER)

The NEER addresses the issue of evaluating the strength of an exchange rate against a number of countries. It is a trade-weighted index of the average value of a country's currency. The use of an example will illustrate how a nominal effective exchange rate is better suited to measure an exchange rate. Suppose the currency in question is the naira and there is a need to calculate its average strength in terms of other countries. Say for example, in the base year the naira is worth 0.50 British pound and 150 Japanese yen. In some later years the exchange rate is for example 0.65 British pound and 100 Japanese yen. In this example, the naira has appreciated in terms of the pound from 0.50 to 0.65 and it has depreciated in terms of the Japanese yen from 150 to 100. The index for the value of the naira used on a later date, in terms of the pound is 1.3 (=0.65/0.5). While on the other hand, the index for the value of the naira used on a later date, in terms of the yen is 0.67 (=100/150). To find the change in the naira value from the base year to a later year, the value of the naira is then weighed by the percentage of each country's trade. In this example,

if 16 percent of Nigeria's trade is with the United Kingdom and 21 percent with Japan, the pound price of the naira would get a weight of 0.16 and the yen price of the naira would get a weight of 0.21. In a country's entire trade, the weights add up to 1. The end result is a trade-weighted index of the average value of a country's currency (Appleyardet al, 2006).

When calculating the percentage change in the real exchange rate using arithmetic average REER the base year used in the index plays a pivotal role. If at any point the base year is changed, the percentage change in the real exchange rate will also change. This is however not the case when calculating the percentage change in the real exchange rate using the geometric average REER. This is because the percentage changes are not affected by the base year used in the index. For this reason, the REER which is derived from the geometric averaging method is said to be consistent.

An additional limitation of the arithmetic method is that it tends to assign greater weights to currencies that have appreciated or depreciated relative to the home currency. The geometric index however treats the weights as symmetrical, whether they are depreciating or appreciating. The geometric averaging technique is therefore preferred over the arithmetic averaging method because of the properties of consistency and symmetry. Essentially a weighted-average exchange rate has an advantage over a bilateral exchange rate because it includes the third-country effects (Hooper and Morton, 1982).

2.1.5 The equilibrium RER

The equilibrium RER is defined in (Edwards, 1989) as the relative price of non-tradables to tradables that results in the simultaneous attainment of equilibrium in the external sector and in the domestic (non-tradables) sector of the economy. The equilibrium exchange rate thus implies the attainment of both external and internal equilibrium. Internal equilibrium means that the non-tradable goods market clears in both the current and future periods. The determinants of the internal RER are productivity differentials and demand-side factors such as consumption. The external equilibrium is concerned with the current account position and its determinants include the terms of trade, monetary and fiscal shocks and stock variables such as a country's net foreign asset position (Candelonet al, 2007).

The equilibrium RER is a long-run equilibrium rate which is determined by the fundamentals in contrast to the short-run equilibrium rate which is determined by the forces of supply and demand of foreign exchange in unregulated markets. Monetary and fiscal policy changes are examples of the short-run shocks which are expected to affect the RER in the short-run. The existing RER in an economy at any given time is determined by both fundamental and short-run shocks.

2.2 The importance of the RER

The RER is a good proxy of the competitiveness of a country's tradable sector. An appreciation of the RER for instance (a rise in RER) indicates an increase in the domestic cost of producing tradable goods. If world relative prices remain constant, a RER appreciation will result in a fall

in a country's international competitiveness. This is because the country is producing tradable goods at a higher price than before, relative to the rest of the world. Real exchange rate depreciation on the other hand indicates in fall in the domestic cost of producing tradable goods. This will increase the country's international competitiveness, if world relative prices are unchanged.

The analysis of the competitiveness of the real exchange rate comes with its challenges, particularly in low income countries which are plagued by weakness in data and the occurrence of structural breaks. Such challenges may result in weak conclusions when assessing the behaviour of the RER. Policy makers in countries such as Ghana and Nigeria are however inclined to use RER in policy making decisions because RER measurements allow these countries to monitor their export sector, on which their economies rely heavily. It is important to note however, that the exchange rate alone does not suffice in explaining the trade competitiveness of a country. An appreciation of the RER may not necessarily lower a country's competitiveness in trade, just as a depreciation of the RER will not always result in a gain in competitiveness. Neglecting other macroeconomic fundamentals (such as changes in the prices of tradables) and using the RER solely as a measure of competitiveness can therefore lead to misleading inferences. Furthermore,(Di Bella *et al*,2007) argue that the use of RER misalignment to assess the competitiveness of a country is insufficient as it is important to supplement it with other variables, namely, relative price measures, external sector outcomes, production costs and measures of institutional quality.

Foreign exchange microstructure research has been motivated by the need to understand exchange rate dynamics at short horizons. The dominant exchange rate models of the recent decades take a macro perspective and come from the macro modelling tradition and have some relative value at long horizons. The search to find a new framework to explain short-run exchange rate dynamics has led to the micro-structural approach to exchange rates, which takes into account the currency trading process. These micro-based models set out to model the structure of the foreign exchange market in a more realistic manner. In this setting, information is dispersed and heterogeneous agents have different information sets. The trading process itself is not transparent and agents may have access to private information about fundamentals or non-fundamental variables that can be exploited in the short-run. Consequently the transactions of better-informed agents may have a larger effect on exchange rates than those of uninformed agents. Thus, the microstructure approach not only recognises private information as being important for exchange rate determination but also takes into account how differences between agents and trading mechanisms affect exchange rates. (Evans and Lyons, 2002). This is in contrast to macro models, which assume that all relevant information is commonly known and all participants are the same.

One of the most important explanatory variables in the microstructure approach to exchange rates is order flow. Order flow, as defined by Evans and Lyons (Evans and Lyons, 2002) refers to "net of buyer-initiated and seller initiated orders; it is a measure of net buying pressure." Order flow consists of signed transaction volumes. When a participant initiates a transaction by selling

the base currency in exchange for foreign currency, the order has a negative sign. On the contrary, if participants buy foreign currency in exchange for base currency, the order has a positive sign.

By observing order flow, a participant might be able to have an idea of the sort of information others may hold. For example, if an initiator's expectation is that the base currency will fall, this may lead to a sale of the base currency in exchange for the foreign currency. This order flow will, thus, provide vital information to other participants and might result in the strengthening of the foreign currency. Order flow is viewed as a transmission mechanism through which information is transmitted to price. The extent to which order flow is informative depends on the factors that cause it. It is most informative when it transmits private information about macroeconomic fundamentals that is scattered among agents. By aggregating information in this way, order flow establishes a connection between macroeconomic fundamentals and exchange rate movements. On the other hand, order flow is less informative when it is as a result of inventory control activities in reaction to liquidity shocks. Nevertheless, the importance of order flow in exchange rate determination does not mean that it is the underlying cause of exchange rate movements. Rather it is a proximate cause with information being the underlying cause. The problem then lies in identifying what information determines order flow.

The relatively impressive explanatory power of order flow has been confirmed by several microstructure studies. For example, Evans and Lyons (Evans and Lyons,2002) propose a transaction frequency model called the 'portfolio shifts model' which focuses on the information

content of order flow. It is a hybrid model which combines both micro and macro variables. A unique feature of the model is that it allows the use of daily frequency data. According to this model daily exchange rate movements depend on signed order flow and changes in the interest rate differential. Under the model's null hypothesis, causality runs strictly from order flow to price. The change in interest differential is preferred to other macro determinants because its data is available at a daily frequency and it is usually the main variable in exchange rate determination models. Using inter-dealer data from Reuters Dealing 2000-1 to analyse the relationship between order flow and exchange rate movements for the DM/USD and JPY/USD over the period between May 1st and August 31st 1996, they find the order flow coefficient to be significant and positively (correctly) signed for both exchange rate equations. This means that net dollar purchases leads to an increase in DM and JPY prices of dollars. The model explains about 64% and 46% of movements in the DM/USD and YEN/USD respectively. More specifically these exchange rate movements are mainly due to order flow, while changes in interest rates account for very little. The paper concludes that a net order flow of $1bn leads the USD to appreciate by 0.5%.

This relationship between order flow and the exchange rate has been confirmed in other studies and for different currency order flow combinations. For example, for the deutschmark (Payne 2003; for the Euro see Breedon and Vitale 2004 and Berger et al. 2006 ,for the Japanese Yen see Evans and Lyons 2002 for the British sterling see Berger et al. 2006 and for several other European currencies see Evans and Lyons 2002 and Rime 2001) Another group of studies examine the information content of disaggregated order flow.6 They find that financial customer order flow is positively correlated with exchange rate movements, whilst non-financial customer

order flow is negatively correlated. They interpret these results that financial customer flows contain price relevant information with non-financial customers following negative feedback trading rules.

Because of the strict causality running from order flow to price, the empirical models do not allow for the case where exchange rate movements could cause order flow (feedback effects). In the presence of feedback effects, the coefficient estimate of order flow is biased and the results from the model could be misleading. The possibility of feedback trading rules was taken into account in (Payne,2003) by applying a simple VAR methodology introduced in (Hasbrouck,1991). This linear VAR model consists of trades and quote revisions. The dataset covers all interdealer trades transacted through the Reuters Dealing 2000-2002 system in the spot USD/DEM market over the week spanning October 6th to October 10th 1997. The results show that order flow is a fundamental determinant of exchange rate movements even if one takes into account feedback trading.

(Danielsson and Love,2004) also examine the issue of feedback trading, but their paper looks at feedback trading and its effect on the informativeness of order flow. Thus, the VAR specification differs from that of Payne 2003 in that order flow is allowed to depend on current exchange rate returns. Using brokered interdealer data for the spot USD/EUR, they find that when feedback trading is allowed, the impact of order flow shock is larger compared to the previous case.

2.3 The exchange rate situation in ghana

Ghana's policies on exchange rate is influenced by contrasting political regimes that have been in place since independence in 1957. From the table below we can see that since independence in 1957 to 1992, Ghana adopted a fixed exchange rate regime in the management of its exchange rate. During this period, the Ghanaian Cedi (¢) was pegged to the main convertible currencies, notably the British Pound and the American Dollar. The fixed exchange rate was not maintained by active intervention in the foreign exchange market, as was standard in market economies in those days. Instead, the exchange rate was pegged more or less by decree and a series of administrative control was instituted to deal with any possible excess demand foreign currency. The issuing of import license was one such control

Table 2.0 Exchange rate episode in Ghana 1957-2004

Episode	Period	Policy
1	1957-1966	Fixedto British pound
2	1966-1982	Fixed to American dollar
3	1983-1986	Mutiple exchange rate system
4	1986-1987	Dual exchange rate system -aution
5	1987-1988	Dutch auction system
6	1988-1989	Foreign exchange bureaux
7	1990-1992	Wholesale and inter-bank auction system
8	1992-2004	Inter-bank market. The bank of Ghana(BOG) selling and buying rates are determined by average daily retail rate of commercial banks

Source: Bank of Ghana

With the launching of the Economic Recovery Programme (ERP), the government made a series of devaluation of the Cedi between 1983 and 1986. In particular, the Cedi was devalued in stages from ¢2.75:US$1.00 in 1983 to ¢90.00: US$1.00 by the third quarter of 1986. The new foreign exchange policy was characterized by a scheme of bonuses on exchange receipts an surcharges on exchange payments. A multiple exchange rate of ¢23.38: US$1.00 and ¢30.00: US$1.00 was applied to specified payment and receipts. The two official rates were eventually unified at ¢30.00: US$1.00 in October 1983. A real exchange rate rule cost in the purchasing power parity (ppp), framework was introduced. This required a quarterly adjustment of exchange rates in accordance with the relative inflation rates of its major trading partners for the period 1983-

1984. In December 1984, a policy of more periodic exchange rate devaluations was adopted in place of the quarterly adjustment mechanism because the real exchange rate was thought to be overvalued (Bank of Ghana). In September, 1986, the government adopted an auction market approach in order to accelerate the adjustment of the exchange rate and to achieve the objective of trade liberalization, leaving it partially to market forces (demand and supply) to determine the Cedi-Dollar rates. The new arrangement was made up of a dual exchange rate comprising two windows. Window one was operated as a fixed exchange rate pegged to the Cedi-Dollar exchange rate at ¢ 90.00: US$1.00 and mainly used in relation to earnings from the export of cocoa and residual oil products. Window two, which catered for all other transactions, was determined by demand and supply in a weekly auction conducted by the Bank of Ghana. The two systems were however unified in February 1987.

TheDual-Retail Auction was adopted and was based on marginal price. A second auction; the Dutch auction was introduced and under it, successful bidders were supposed to pay the bid price. The foreign exchange bureaux system was established in an attempt to absorb the parallel market into the legal foreign exchange market. These "forex" bureaux were fully license entities operated by individuals, groups or institutions. Their operation alongside the auction meant that the foreign exchange market was characterized by two spot foreign exchange rates (It must be noted that forex were not allowed to bid for foreign exchange in the weekly-retail auction). In March 1990, the whole sale auction was introduced to replace the weekly-retail auction. Under this system, a composite exchange rate system was operated, namely the inter-bank and a wholesale system. Under the whole sale system, eligible exchange from the Bank of Ghana for

sale to their end-user customers and to meet their own foreign exchange needs. They could now use the foreign exchange obtained to their customers subject to a margin determined by each authorized dealer. The wholesale auction system was abolished in April 1992 and replaced by the inter-bank market. Since then both the Commercial and ForexBureaux have operated in a competitive environment. From the table it is clear that since 1986 the exchange rate policy of the Bank of Ghana has been the managed floating exchange rate. The Bank of Ghana's intervention in the exchange market has been mainly to smooth fluctuations in the foreign exchange market (BoG). Ghana adopted the fixed exchange system in the 1960s, immediately after independence of which the Bretton Woods system supported. In particular the Ghanaian Cedi was pegged at two Cedis to the pound.

The choice of a fixed exchange regime in Ghana was therefore consistent with the thinking of the time. Due to the inheritance of huge foreign exchange reserves from the colonial era, Ghana exercised practically no control over the foreign exchange markets, which were in the hands of a few commercial banks. The Cedi was redenominated on July 3, 2007 with the issuance into circulation of new currency, thus the Ghana Cedis and the Ghana Pesewas. It was designed to address one important lingering legacy of past inflation and macroeconomic instability. The legacy of the past episodes of high inflation had been the rapid increases in the numerical values of prices as well as foreign currency exchange in the local currency terms.

The previous note regime placed significant deadweight burden on the economy. This came in several forms such as high transaction cost at the cashier, general inconvenience and high risk

involved in carrying loads of currency for transaction purposes, increasing difficulties in monitoring bookkeeping and statistical records. By the re-denomination of the then old Ten Thousand Cedis was set to be one Ghana Cedis, which was equivalent to one hundred Ghana Pesewas. Thus ¢10,000 = GH¢ 1.00 =100Gp. The new notes and coins had the same purchasing power or value. (Annual report of BoG, 2010).

The Central Bank of Ghana is the main source of data for the spot foreign exchange market. The data set includes both the daily official and the FX Bureau rate, which is a proxy for the parallel (black market) cedi/dollar rates over the period 3rd January 2000 to 29th December 2007. With the exception of the parallel market, foreign exchange trading takes place during normal banking hours (9am to 4/5pm). FX bureaux data is collected by the central bank daily and is the average of the individual bureaux rates. It should be noted that the FX bureauxs do not observe any customer order flow on the official FX market. The banks' transaction quotes represent the mid-rate between the bid and ask quotes at the close of each day. The transaction rate charged by a particular bank will depend on the availability of FX at that point in time.

For an emerging market like Ghana, it would be unwise to disregard the thriving black market for exchange rates. The Ghanaian Central bank acknowledges this fact and therefore incorporates black market exchange rates (FX Bureaux rates) in its analysis and decision making. The official (transaction rate) is a weighted average of the rates charged of the various bank transaction rates, with the volumes used as weights, and the FX Bureaux rate.

The interest rate differential is the difference between the Ghana daily three-month Treasury bill rate and the US daily three-month Treasury bill rate, expressed on an annual basis. The Ghanaian rates were collected from the Central Bank of Ghana while the US data were obtained from the Federal Reserve website. The data sample is diverse in the sense that it contains a period of relative stability and a period of turbulence. Therefore, the sample period is divided into two sub-periods. The first sub-period represents the crisis period spanning the whole of 200. The crisis period was characterised by spiralling inflation of more than 40% and rapid deprecation of the cedi. During 2000, the cedi depreciated by about 50% against the US dollar. This situation could be attributed to falling prices of Ghana's major exports commodities (main foreign exchange earners), namely cocoa, gold and timber. To further worsen this situation, the price of imported crude oil which previously hovered around $10 per barrel, soared to $34 per barrel by mid 2000. Furthermore, the official donor inflows, which hitherto had been supporting the economy, were withheld in 2000. Against all these challenges, Ghana had to pay about $200 million every month towards foreign debt obligation by drawing on the already depleting foreign exchange reserves. This created an acute shortage of foreign currency as demand for dollars far outstripped supply. In light of the fact that the nation is heavily dependent on imports, the scarcity of FX market fuelled inflationary pressures. Low business confidence and political uncertainty over the outcome of the December 2000 presidential elections led to massive capital outflows around the middle of 2000. At this point, the relative scarcity of FX allowed the black market agents to demand huge premiums. This contributed to the huge spike in the premium during July 2000. The second sub period represents the relatively stable period spanning 2002-2007. By 2002 the prices of Ghana's main exports, cocoa and gold, had recovered slightly and the authorities were

able to stabilise the main macroeconomic indicators. Equally important in 2002 was the resumption of intervention activity on the FX market by the central bank, which stabilised the official exchange rate. By the end of 2001 CPI inflation stood at 21% and the Cedi depreciated by only 3.5%. This was the result of tight monetary and fiscal policies. These developments contributed to the restoration of business confidence in Ghana. At the start of 2004, there is another big hike in the premium due to political uncertainty over the outcome of the December 2004 elections.

2.4 Theoretical framework

The theoretical framework aims to provide a definition for the exchange rate which will be employed in this study. In addition, the various models to determine the exchange rate will be discussed. The Mundell-Fleming one composite good framework can also be referred to as the complete specialisation model. The framework assumes that each country specialises in the production of one good with no perfect substitute. In this model, the real exchange rate is defined as the number of units of the domestically produced good that must be foregone to gain a single unit of a foreign good. Since manufactured goods tend to be imperfect substitutes, whereas raw materials may have close substitutes, this framework is applicable to countries whose trade is centered on manufacturing rather than countries whose trade is focused on raw materials (Montiel, 2003). One of the limitations of the Mundell-Fleming one composite good model is the assumption of complete specialisation in production. This implies that the real exchange rate matches the terms of trade; although they are separate concepts all together. Furthermore, trade policies which may result in large fluctuations of the terms of trade are not taken into account. In

addition, the role played by parallel markets, trade patterns and unrecorded trade which have a significant role in developing countries, may present a problem when applying the Mundell-Fleming one composite good framework. As previously mentioned in the conceptual framework the issues that plague the external RER arise in empirical literature where multiple price and cost indexes exist, because they are not explicitly defined theoretically. Moreover, it is also unclear which basket and weights of the domestic and foreign goods should be used empirically.

The two-good model, otherwise referred to as the two-sector Salter and Swan model, is an open economy version of the aggregate demand and supply model. The model assumes two goods, the tradables and non-tradables, and the real exchange rate is defined as the number of units of the non-traded goods required to purchase one unit of the traded good. The model aggregates exportables and importables together as one tradable good, hence the effect of the terms of trade is negligible. This model is therefore not useful when analysing the effects of fluctuations in the terms of trade on the RER.

Although this model is more applicable to emerging countries, it poses some empirical problems. This is because internal RER should be measured using domestic price indexes for tradable and non-tradable goods and these are not readily available in most developing countries. Most countries however have price data for imports and exports of the domestically produced goods which are used when computing the external RER. For this reason, the external RERs are often used as proxies for internal RERs (Hinkle and Nsengiyumva, 1999).

Other conceptual issues which arise in the two-good model are in the classification of the tradable goods. The definition of traded goods apart from imports and exports can also include those goods that are not necessarily traded but can be traded. For this reason, many goods can be argued to be tradable to various degrees. The three-good model addresses this issue and it will be discussed next.

The three-goods model consists of three goods: an importable good, an exportable good and a non-tradable good. As a result, two definitions of the internal RER arise in this model. The first definition of the internal RER is the relative price of non-tradables to exportables (RERXN) or simply put the ratio of the non-tradable good to the domestic currency price of the exportable good. The second definition of the internal RER is the relative price of non-tradables to importables (RERMN) in other words the ratio of the non-tradable good to the domestic currency price of the importable good. RERXN shows the price competitiveness of exportables in both production and consumption relative to non-tradable goods. Similarly, RERMN shows the internal price competitiveness of importables in both production and consumption relative to non-tradables (Hinkle and Nsengiyumva, 1999). In the three-good model there is a clear distinction between the prices of the importables and the exportables hence this framework is useful when analysing the macroeconomic effects of terms of trade changes, as well as the effect of commercial policy on the RER (Hinkle and Nsengiyumva, 1999).

The three-good model however suffers a drawback in its definition of the non-tradables. As was the case in the two-good model, there is an array of definitions of what constitutes the non-

tradables in empirical literature. These ambiguities are worsened by the various price indexes used to proxy the importable, exportable and non-tradable goods.

Due to the limitations that plague the internal RER, much of the empirical literature opts for the use of a blend of the internal and external RER.

If the foreign price level increases, domestic goods become relatively cheaper at the initial exchange rate. Foreigners demand more of the domestic currency, which will drive the value of the domestic currency up. The appreciation of the exchange rate will continue until the competitiveness of the foreign market is re-established. Thus, an increase in the foreign price level will result in an appreciation of the domestic currency, ceteris paribus. The policy implication of this conclusion is that world inflation does not necessarily impact the domestic economy, and the domestic price level is determined in the domestic market devoid of foreign influences.

An increase in the domestic interest rates relative to those in a foreign country will result in an increase in the supply of foreign currency into the domestic currency, due to an increase in the investors drawn by the high interest rates. This will result in the appreciation of the domestic currency. A lower domestic interest rate relative to foreign interest rates has the opposite effect on the exchange rate.

2.5 The relative purchasing power parity (ppp) approach

The relative PPP theory uses two approaches: the base-year and the trend approach. The base-year approach establishes a base period where the observed RER is assumed to be at its equilibrium level. Misalignment is thus measured as the difference between the observed RER and the base period value, based on the assumption that the long-run RER has remained constant at its base level. The main limitation of this approach is its inability to take note of the permanent changes in the long-run RER which would cause RER to be non-stationary. In the trend approach the long-run RER can be assumed to be a mean value to which the RER reverts back in the long-run. Exchange rate misalignment can thus be measured as the deviation of the RER from its mean value (Ahlers and Hinkle, 1999).

The relative PPP approach described above has its advantages. Apart from having a relatively simple method, it has limited data requirements, which is particularly useful when analysing misalignment in low-income countries. Furthermore, the relative PPP approach is particularly useful in countries which are plagued with inflation where the shocks to the external RER are largely nominal ones. The relative PPP approach is not time consuming, thus it is often used in multi-country cases where the amount of time devoted to the study is limited. Due to its simplicity, the relative PPP approach is also useful as a starting point for analytical purposes, prior to using more sophisticated techniques (Ahlers and Hinkle, 1999).

The model has however been argued to have failed to perform in low-income countries (Edwards 1989, Copeland 1994), and one of the main reasons is because the relative PPP approach fails to take into account that the RER does not necessarily revert back to a mean value. The PPP approach fails to account for a new long-run equilibrium RER caused by the existence of structural breaks in data or permanent changes in its fundamentals. In addition, exchange rates are volatile and reversion to the mean may take a long time. As a result, the use of the relative PPP approach is not useful for policy purposes. It is therefore important to discuss more sophisticated techniques that avoid the limitations of the relative PPP approach. The next section will discuss alternative models of exchange rate determination.

2.6 Edwards (1989) model

Edwards (1989) model is a benchmark inter-temporal general equilibrium model of a small economy to assess the real exchange rate response to changes in a series of variables. For simplicity, this thesis will summarise the important issues pertaining to this model. The model assumes that all the variables are real; hence, monetary disturbances are not discussed (Edwards, 1989). The model assumes two periods, period 1 representing the present and period 2 representing the future period. The model provides equations to satisfy the internal and external equilibrium and from these equations Edwards (1989) concludes it is possible to arrange the RER implicitly as functions of all the exogenous variables in both the short- and long-run.

(De Broek and Slok2006), apply a cross-sectional analysis as well as a time series analysis to assess the level of misalignment in 26 transition economies covering the period from 1991 to 1998. The cross-sectional analysis sample includes 10 EU accession countries economies.

The time series analysis estimates a BEER model using the productivity variable, the money-to-GDP ratio variable reflecting monetary shocks, the openness variable (measured as a summation of exports and imports as a ratio of GDP), the government consumption variable, the commodity prices variable and the terms of trade variable. The results suggest that an increase in productivity in the EU accession countries will result in the countries exchange rates appreciating. In terms of the money-to-GDP variable the findings suggest that the exchange rate depreciated due to positive monetary shocks in the 16 transition countries, which is also in agreement with theoretical literature. In the EU accession countries increases in the openness variable and the government consumption variables depreciate and appreciate the exchange rate respectively. The term of trade variable is not statistically significant in any of the samples. Increases in commodity prices lead to exchange rate depreciation in the 16 transition countries, and this finding is not in line with the theoretical expectations (De Broek and Slok, 2006).

The results of the cross-sectional analysis show that the exchange rates were generally misaligned at the beginning of the transition period, and as the years passed, the misalignment was corrected. The results from the time series analysis reveal that there were significant RER movements in the EU countries as well as in the transition countries. The paper notes that the sample period used was important because it is the period when the exchange rates became market determined in the transition economies. The paper also emphasises that RER

determination models should be augmented to take into account the key aspects of the transitory reforms in order to capture accurately the movement of the RER (De Broek and Slok, 2006).

(Kemme and Roy, 2006) estimate the long-run equilibrium exchange rate for Poland and Russia using monthly data, covering the period from 1995 to 2001. They use ARIMA and GARCH error correction specification to estimate the short-run movements of the RER. The macroeconomic variables analysed include the openness of the economy variable, the effect of productivity variable, the terms of trade variable, the capital flows variable (net financial assets); and the share of government expenditure in GDP variable. The results show a negative coefficient for the openness variable. In the long-run, the openness variable leads to a currency depreciation which is in support of the theoretical literature, and suggests that the country is a net importer. The effect of the productivity variable exhibits a Balassa-Samuelson effect in both countries which is in support of the (Montiel1999) model. An increase in the terms of trade variable results in exchange rate depreciation which is in line with *a* priori expectations in both countries in the long-run. The capital flows variable performs as expected as an increase results in a currency appreciation in both Poland and Russia. When a larger share of government expenditure is on non-tradables, an increase in government expenditure will result in an appreciation of the currency. While this is the case for Russia, it is not however the case for Poland where the government expenditure variable results in exchange rate depreciation. This depreciation can be attributed to an increase in government spending in the tradable goods sector. In the short-run, all the variables are retained as they were in the long-run, except for the capital flow, openness, government expenditure variables in Poland, and the terms of trade variable which is insignificant in Russia. The results also reveal that overall increase in the

nominal effective exchange rate as well as in domestic credit depreciated and appreciated the currency respectively (Kemme and Roy, 2006).

(Maeso-Fernandez *et al* 2006), analyse the relationship between economic fundamentals and exchange rates of transition country currencies. A BEER approach as well as a two-step approach is used, and the period covered is the transition decade of the 1990s. The determinants used in the model in this paper include the developments in real per capita income, relative government spending and the relative openness. The results reveal that increases in the real per capita income as well as in relative government spending result in an appreciation of the real exchange rate, whereas an increase in the relative openness results in a depreciation of the RER. These findings are all inline with the a prioriassumptions. Croatia is singled out of the sample to analyse the extent of the exchange rate misalignment. The results reveal that there is no evidence of misalignment for the Croatian kuna.

(Cheung *et al,*2007) use a robust relative price and relative output framework and a pooled OLS technique to analyse the exchange rate behaviour of the renminbi, China's currency, from 1975 to 2004. The variables used to model to the renminbi are the real per capita income variable, a proxy for the Balassa-Samuelson effect; the capital account openness variable, government deficit, and the financial deepening variable (M2/GDP). The results reveal that all the variables tend to make the exchange rate appreciate with the exception of the government deficit and financial deepening variable which is statistically insignificant. The paper incorporates a

corruption index to the estimation since China's economy is characterised by extensive corruption and a capital control regime. The results reveal that a reduction in corruption will most likely strengthen the currency in China (Cheung *et al,* 2007).A bivariate analysis shows that the currency was undervalued from the 1980s to 2004. After controlling for serial correlation effects, the paper reports that the evidence for renminbi being undervalued loses significance. Furthermore, when more variables are added to the model, the results indicate an increase in exchange rate misalignment (Cheung *et al,* 2007).

(Yajie*et al,*2007) apply the BEER model using the Johansen technique to estimate the equilibrium exchange rate for China between 1980 and 2004. The variables believed to have an effect on the equilibrium exchange rate are the terms of trade, the technological advances measured as per capita output, foreign exchange reserves and monetary policy. All the variables conform to economic theory, as increases in the terms of trade, technological advances, and foreign exchange reserves lead to an appreciation of the exchange rate whereas monetary policy depreciates the currency. The paper also finds that since 1995 the REER is overvalued as it is above the estimated equilibrium RER. From 1999, however, the RER misalignment was found to be diminishing. There is evidence to suggest that in 2002 the equilibrium RER in China was undervalued.

(Dubas, 2009) assesses the importance of the exchange rate regime to limit misalignment. In the study, a panel cointegration technique and the BEER approach are used to estimate the equilibrium exchange rate of 102 countries covering the period from 1973 to 2002. The

determinants used to model the exchange rate include the terms of trade, productivity, government consumption, capital flows and excess credit. The study reveals that the productivity has the strongest effect on the exchange rate while government consumption and excess credit have the weakest effect. Furthermore, applying an intermediate exchange rate regime reduces the extent of exchange rate misalignment whereas crisis years in a country tend to increase the extent of misalignment. The study also reveals that the degree of misalignment is larger in developing countries overall, and in the case of developed countries the exchange rate regime does not matter in terms of limiting exchange rate misalignment (Dubas, 2009).

(Sackey, 2002) develops a model for the equilibrium exchange rate in Ghana with particular focus on the role of net foreign aid inflows. The model applies the Least squares method and covers the period from 1962 to 1996. The long-run determinants of the equilibrium exchange rate are the terms of trade variable; the net foreign aid inflows variable, measured as net official donor aid to Ghana; the government consumption variable; the commercial policy variable and the technological progress variable1 The short-run determinants of the equilibrium exchange include the above mentioned variables excluding the terms of trade and including the nominal devaluations variable. In the long-run model, increases in the external terms of trade and the net foreign aid inflows result in a depreciation of the exchange rate whereas an increase in government consumption, commercial policy and technological progress appreciate the exchange rate. These results are in line with economic theory with the exception of the aid variable which refutes the notion of the Dutch disease where an increase in net foreign aid inflows is expected to appreciate the exchange rate (Sackey, 2002). In the short-run, the coefficients of the variables are

the same as was the case in the long-run for the aid, government consumption, commercial policy and the technological progress variables. The nominal devaluations variable depreciates the exchange rate in the short-run, which is also as expected in the theoretical literature.

(Masters and Ianchovichina, 1998) investigate exchange rate misalignment in Zimbabwe in the period 1967 to 1987. The paper compares the results of using two different models, the multilateral RER (MRER) model where RER is calculated from aggregate inflation statistics; and the internal RER (IRER) model which is a direct measure of domestic relative prices based on disaggregated national sources. The variables used in the model to estimate the equilibrium exchange rate include the terms of trade variable; the restrictiveness of trade policy variable; the net capital inflow variable; the domestic credit creation in excess of its sustainable level; and a time variable which is the proxy for the Balassa-Samuelson appreciation. In both models, all the variables result in an appreciation of the currency and these results are in line with the economic theory, with the exception of the time variable in the MRER equation which results in exchange rate depreciation (Masters and Ianchovichina, 1998).Their findings reveal that using cross-country differences in overall inflation, as a proxy measure of a country's RER, can result in ambiguous results. In the Zimbabwe situation, it failed to capture the effects of the labour laws and other policy changes, thus failing to capture the changes in real production/consumption incentives. The study suggests the use of indices of domestic relative prices, especially in the case of single country studies when estimating the equilibrium RER, in order to avoid getting biased results (Masters and Ianchovichina, 1998).

(Eita and Sichei, 2006) estimate the equilibrium exchange rate for Namibia covering the period between 1970 and 2004. They do so by applying the Johansen test for cointegration. The variables used to estimate the equilibrium exchange rate include terms of trade, the ratio of investment to GDP and an openness variable. The results reveal that the term of trade variable is not significant in the long-run. An increase in the ratio of investment to GDP and the openness to trade both appreciate the exchange rate. These results for the openness to trade are suggest that Namibia is a net exporter of goods. The results also reveal that there is evidence to suggest that investment is taking place more in the non-tradable goods sector. The results also show that the REER was overvalued throughout the estimation period with the exception of 1998 where it reaches its equilibrium value. Furthermore the extent of overvaluation is seen to be greater between 1975 and 1989 compared to the period between 1990 and 2002 (Eita and Sichei, 2006).

(Loria et al, 2010) apply the SVAR method for cointegration to examine the determinants of the peso-USD nominal exchange rate in Mexico. The study covers the period between 1994 and 2007. The study provides empirical evidence supporting the validity of the short and long-run versions of the monetary approach of exchange rate determination. The variables believed to have an effect on the nominal exchange rate are the money supply, the interest rate differential and domestic real income. The results reveal that in the short-run an increase in the money supply and the interest rate depreciates the currency, whereas an output structural shock will appreciate the currency. Using the Johansen method, the study shows that these results hold in the long-run as well (Loria et al, 2010).

CHAPTER THREE

METHODOLOGY

3.0 Introduction

The purpose of this chapter is to present the methodological framework suitable for conducting the study. It discusses the methods and the tools of analysis employed in this study. Specifically, the chapter presents a detailed description of the theoretical and empirical specification of the model, variables in the model, source and data type, estimation techniques as well as tools for data analysis.

3.1 Theoretical model specification

Edwards (1989) builds a theoretical model, which reproduces the process of output determination in a small open economy with tradables, non-tradables and sector-specific capital. World prices of tradables are assumed to be fixed. Exportable and importable items use domestic labour and capital; non tradables use imported inputs as well. The country has a stock of foreign debt and a wage indexation system that links wages with price index, Edwards uses his ten equation model to derive a testable reduced form, which has since been used unchanged or with minor enhancement by numerous authors in the literature. Thus the model used in this research is a modification of the work done by Edwards (1989), Montiel (1999), Baffes et al (1999) and Issa (2004). The real exchange rate is specified as a single equation, the reduce form solution of small simultaneous equation model:

$$REER = F_T^{\alpha} \quad \text{……} \quad (3.1)$$

Where F is a vector of the permanent component of macro fundamentals, and α is a vector of parameters to be estimated. Thus

$$F = f(Aid, GEXP, RGDP, OPEN, Time, TOT, M2) \quad \text{.....(3.2)}$$

Where

$REER$ is the real effective exchange rate,

$RGDP$ is the real per capita income

Aid is the official development assistant

$OPEN$ is openness of the economy

TOT is the terms of trade

$M2$ is the money supply, which captures expansionary monetary policies.

$Time$ is the time lag

By substituting equations (3.2) into (3.1)

$$REER_t = \eta Aid_t^{\alpha_1} GEXP_t^{\alpha_2} RGDP_t^{\alpha_3} OPEN_t^{\alpha_4} Time_t^{\alpha 5} TOT_t^{\alpha_6} M2_t^{\alpha 7} \quad \text{.....(3.5)}$$

3.2 Empirical Model Specification

Consistent with the objectives of study and in accordance with literature, the study applied natural logarithm to equation (3.5) and estimated a log-linear model of the following form:

$$LnREER_t = \ln\eta + \alpha_1 \ln Aid_t + \alpha_2 \ln GEXP_t$$
$$+\alpha_3 \ln RGDP_t + \alpha_4 \ln OPEN_t + \alpha_5 \ln Time_t + \alpha_6 \ln TOT_t + \alpha_7 \ln M2_t + V_t \quad \text{.....(3.6)}$$

Given that $Ln\eta = \alpha_0$ is the long run model for real exchange rate and its respective error correction terms will be specified as follows:

$$LnREER_t = \alpha_0 + \alpha_1 \ln Aid_t + \alpha_2 \ln GEXP_t +$$
$$+\alpha_3 \ln RGDP_t + \alpha_4 \ln OPEN + \alpha_5 \ln Time_t + \alpha_6 \ln TOT_t + \alpha_7 \ln M2_t + \mu \quad \text{.....(3.7)}$$

Where μ is the error term, t as time subscript and Ln is the logarithm of the respective variables. α_0 to α_7 are the elasticities of the respective variables. We applied natural logarithm in order to effectively linearise exponential trend (if any) in the time series data since the log function is inverse of an exponential function (Asteriou and Price, 2007)

In the short run, the real exchange rate may depend on its lagged values, lagged values of foreign aid, government expenditure, real GDP, trade openness, terms of grade and money supply. The expected relationships among these variables are indicated by the following equations:

$$\Delta \ln REER_t = \alpha_0 + \sum_{i=1}^{j} \gamma \Delta \ln REER_{i-1} + \sum_{i=1}^{k} \alpha_1 \Delta \ln Aid_{i-1} + \sum_{i=1}^{p} \alpha_2 \Delta \ln GEXP_{i-1} + \sum_{i=1}^{q} \alpha_3 \Delta \ln RGDP_{i-1} +$$
$$\sum_{i=1}^{w} \alpha_4 \Delta \ln OPEN_{i-1} \sum_{i=1}^{u} \Delta \ln Time_{i-1} + \sum_{i=1}^{n} \alpha_5 \Delta \ln TOT_{i-1} + \sum_{i=1}^{h} \alpha_6 \Delta \ln M2_{i-1} + \xi \quad \text{.....(3.13)}$$

The expected signs of the parameters are;

$$\alpha_1 < 0, \alpha_2 > / < 0, \alpha_3 < 0, \alpha_4 > / < 0, \alpha_5 > / < 0, \alpha_6 < 0$$

The expected theoretical impacts of the respective variables included in the real exchange rate model are as follows.

Foreign aid tends to cause real appreciation by changing the composition of the demand for traded and non traded goods, according to "Dutch Disease" theory of foreign aid. This hypothesis has been confirmed by many empirical works among them are Van Wijnbergen (1985), Saches and warner (2001) Younger (1992) and Opoku (2004). The expected effect of real GDP on RER is negative. According to the Balassa-Samulson hypothesis Balassa (1973) as development takes place the productivity improvement in the tradable goods sector exceeds that of the non-tradable sector. This implies that the decrease in the price of the former is relatively bigger than that in the later, thus, causes appreciation of the RER.

The effect of government expenditure on real exchange rate depends on the composition of government. Consumption of non-tradable tends to appreciate the RER, while that of tradables leads to real depreciation. Issa and Ouattara (2004) found a positive impact. Openness of the economy would cause real depreciation (appreciation) if it reduces (increases) the demand for non tradables. Takaendesa (2006) observed a depreciation effect of trade openness in South Africa where as Ogun (1998) found an appreciation impact in the case of Nigeria. The effect of the terms of trade on the real exchange rate depends on whether the substitution or the income effect dominates. The income effect of an improvement in terms of trade is that more is spent pm all products, resulting in higher price of non-tradables, causing appreciation in the real exchange rate. The substitution effect leads to a decrease in prices of imported goods and services, falling

demand for non-tradables, hence depreciation of the RER. If the income effect associated with the TOT improvement is stronger than the substitution effect, an appreciation of the RER will occur, otherwise the RER will deprecate. This render the prior expectation of the impact of this fundamental on RER inconclusive. The substitution effect dominated in the works of Elbadawiand Soto (1997), and Mkend (2001) Whiles the income effect dominated in the works of Ogun (1998) and Adenauer and Vagassky (1998)

Changes in the money supply (expansionary monetary policies) would tend to raise the general price level (CPI, Ghana) and thus leading to an appreciation of the RER. Issa and Ouattare (2004) confirmed this theory. Thus increases in the real exchange rate is expected to result in export expansion as stipulated by trade theories. In addition Sackey 2001 and Ogun 1998 observed such relation. Real GDP is a supply side determination of exports. A higher level of production is the main cause of export expansion, because surplus of output can be exhausted in international market. In a close economy surplus of production leads to fall in prices, which in turn creates pessimism among producers. In an open economy such surpluses create foreign reserves by exporting production. So we expect the positive impact of real GDP on exports growth. In empirical literature Majeed and Ahmed (2005) confirmed the positive impact of GDP on export. A good policy environment (proxy by real net ODA to Ghana) tends to elicit positive response from the export sector. Aid inflows, by providing some sort of assistance to the export sector, tend to encourage export competitiveness and output enhancement. Sackey (2001) affirmed this relation.

3.3 Measurement of variables

Real exchange rate

The real exchange rate (RER) corresponds to the multilateral real effective exchange rate or trade weighted real exchange rate. Real effective exchange rate is the nominal effective exchange rate, which is a measure of the value of a currency against the weighted average of several foreign currencies, divided by a price deflator or index of costs. In the case of Ghana it was weighted against the currencies of the major trading partners which are United State, United Kingdom, France, Italy, Japan Netherlands and Germany. A decrease in the index implies an appreciation of the RER. This by interpretation is a loss of competitiveness.

External aid inflows: This variable has been defined in the literature as official development assistance (ODA) from one government or organization to another government or organization in another country through the government of that country. This variable however will be operationally defined as official development assistance and in order to obtain it real values it will be defined by GDP. This follows the literature as it has been used by Sackey (2001), Issa (2004), Nyoni (2004) and many others.

Terms of trade: this meant terms or rate at which the product of one country are exchange for the product of the other. However, operationally the study will measure and compute it by dividing export unit value by import unit.

Open: openness of the economy will be calculated as 100*(imports + exports)/GDP.

Government consumption: This is basically government consumption of goods and services deflated by GDP to obtain real values.

Export: exports of goods and services represent the value of all goods and other services provided to the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude compensation of employees and investment income (formerly called factor services) and transfer payments. This variable was operationally measured by exports of goods and services expressed as a share of GDP.

RGDP: This is operationally defined as GDP deflated by consumer price index to obtain the real values.

M2 Money supply: This will capture expansionary monetary policy in the model.

3.4 Sources of Data

The study will employ secondary data. Time series data will be collected from 1983 to 2010. Quarterly series will be generated from the annual series using Gandolfo (1981) algorithm. The choice of the data coverage was informed by the fact that after economic recovery programme Ghana has had very little exchange rate misalignment if any. The series for the various variables will be drawn from the following sources: World Development indicators (2011), Bank of Ghana's Annual Report and Quarterly Economic Bulletins, OECD's Geographical Distribution

of financial Flows to Developing Countries, Direction of Trade Statistics, and IMF's International Financial Statistics.

3.5 Estimation Procedure

To test the relationship between real exchange rate, foreign aid inflows and exports. The study will apply Granger causality test within the framework of cointegration and error-correction model. The testing procedure involves the following steps. The study first will investigate the time series properties of our data by using the Augmented Dickey-Fuller (ADF) Philip-Perron (PP) tests. The unit root test will be used to check the stationarity position of the data. In the second step, it will test for cointegration using Johansen's multivariate approach. In the third step the study will employ granger-causality to test for causality. The causality test is preceded by cointegration testing since the presence of cointegrated relationships have implications for the way in which causality testing is carried out. Finally, variance decomposition analysis and impulse response function were conducted.

3.6 Unit Root Test

It is crucial to test for the statistical properties of variables when dealing with time series. Time series data are rarely stationary in level forms. Regression involving non-stationary time series often lead to the problem of spurious regression. This occurs when the regression results reveal a high and significant relationship among variables when in fact, no relationship exist. Moreover, Stock and Watson (1988) have also shown that the usual test statistics (t, F, DW, and R^2) will not

posses standard distributions if some of the variables in the model have unit roots. A time series is stationary if its mean, variance and auto-covariance are independent of time

The study employed a variety of unit root tests. This was done to ensure reliable results of the test for stationarity due to the inherent individual weakness of the various techniques. The study used both the PP and the ADF tests. These tests are similar except that they differ with respect to the way they correct for autocorrelation in the residuals. The PP nonparametric test generalizes the ADF procedure, allowing for less restrictive assumptions for the time series in question. The null hypothesis to be tested is that the variable under investigation has a unit root against the stationarity alternative. In each case, the lag-length is chosen using the Akaike Information Criteria (AIC) an Swartz Information Criterion (SIC) for both the ADF and PP test. The sensitivity of ADF test lag selection renders the PP test an important additional tool for making inferences about unit roots. The basic formulation of the ADF is specified as follows

$$\Delta X_t = \alpha + \delta t + \rho X_{t-1} + \sum_{i=1}^{p} \lambda \Delta X_{t-1} + \xi_t \quad \text{.....(3.15)}$$

Where X_t denotes the series at time t, Δ is the first difference operator, α, δ, β, λ are the parameters to be estimated and ξ is the stochastic random disturbance term. Thus, the ADF and the PP test the null hypothesis of non- root (stationary). That is:

$H_0 : \rho = 0$

$H_1 : \rho \neq 0$

If the t values or t-statistic is more negative than the critical values, the null hypothesis is rejected and the conclusion is that the series is stationary. Conversely, if the t-statistics is less negative than the critical values, the null hypothesis is accepted and the conclusion is that the series is non-stationary.

3.7 Granger Causality test

A good feature of VAR models that they allow for testing of the direction of causality. Causality in econometrics refers more to the ability of the variable to predict (and therefore cause) the other (Asteriou and Hall 2007). According to Walsh (2003) ' a variable X is said to Granger cause Y if and only lagged values of X have marginal predictive content in a forecasting equation for Y' The study of causal relationship among economic variables has been one of the main objectives of empirical econometrics. According to Engle and Granger (1987), cointegrated variables must have an error correction representation. One of the implications of Granger representation theorem is that if non-stationary series are cointegrated, then one of the series must granger causes the other (Gujarati, 2001). To examine the direction of causality in the presence of cointegrating vectors, Granger causality is conducted based on the following

$$\Delta Y_t = \mu_0 + \sum_{t=1}^{p} \beta_1 \Delta Y_{t-1} + \sum_{i=0}^{p} \phi_{1i} \Delta X_{t-i} + \xi_{1i} ECT_{t-1} + v_t \quad \text{.....(3.21)}$$

$$\Delta X_t = \mu_0 + \sum_{t=1}^{p} \beta_{2i} \Delta Y_{t-i} + \sum_{i=0}^{p} \phi_{2i} \Delta Y_{t-i} + \xi_{2i} ECT_{t-i} + u_t \quad \text{.....(3.22)}$$

Where ΔY and ΔX are our non-stationary dependent and independent variables, ECT is the error correction terms ξ_{1i} and ξ_{2i} are the speed of adjustments. P is the optimal lag order while the

subscript t and t-i denote the current and lagged values. If the series are not cointegrated, the error correction terms will not appear in equations 11 and 12. To find out whether the independent variable (X) granger-cause the dependent variable (Y) in equation 11, we examine the joint significance of the lagged dynamic terms by testing the null hypothesis:

$H_0 : \phi_{1i} = 0$, implying that the independent variable (X) does not granger-cause the dependent variable (Y), against the alternative hypothesis that $H_1 : \phi_{1i} \neq 0$, implying that the independent variable (X) granger-cause the dependent variable (Y)Similarly, to find out whether the independent variable (Y) granger-cause the dependent variable (X) in equation 12, we examine the significance of the lagged dynamic term by testing the null hypothesis

$H_1 : \phi_{2i} = 0$, implying that the independent variable (Y) does not granger-cause the dependent variable (X), against hypothesis that

$H_1 : \phi_{2i} \neq 0$, implying that the independent variable (Y) granger-cause the dependent variable (X)

Using the standard F-test or wald statistic, four possibilities exist: First, rejection of the null hypothesis in equation 11 but failing to reject the null in equation 12 at the same time implies unidirectional causality running from X to Y. Second, a rejection of the null hypothesis in equation 12, but at the same time failing to reject the null in equation 11 implies unidirectional causality running from X to Y. Third, simultaneous rejection of the two null hypothesis indicates bi-directional causality, Fourth, simultaneous failure to reject the two null hypothesis indicates independence or no causality between the variables of interest

3.8 Cointegration Test

A number of techniques for testing the presence of equilibrium long-run relationship among time series variables have been advocated and used by researchers. Most time series have used either

the Engle-Granger (1987), the Fully Modified Ordinary Least Squares (FMOLS) procedures of Philips and Hensen (1990), the Johansen (1988, 1991) or the Johansen Juselius (1990, 1992) and the Autoregression Distributed Lag (ARDL) approach by Pesaran and Shin (1999) and Pesaran, Shin and Smith (2001) to determine the long-run relationship in bivariate and multivariate frameworks. Johansen (1988) and Johansen and Juselius (1992) particularly developed multivariate method that explicitly used the vector autoregression (VAR) and the vector error correction (VECM) framework for the testing of the presence of cointegration and estimation of long-run and short-run relationships among non-stationary macroeconomic time series. The VAR and VECM provide a useful framework to study the impact of unanticipatedshocks (individual and system) on the endogenous variables (impulse response functions) . Additionally, we can identify the relative importance of each variable in explaining the variations of endogenous variables (variance decomposition analysis). Moreover, both long-run (cointegration) relationships andshort-run dynamics of the variables in the system can be established. The relationship between VAR and VECM is expressed as follows. Assume an unrestricted reduced from VAR (p):

$$X_t = \mu + \theta_t X_{t-1} + ...\theta_k X_{t-k} + V_t \; t = 1, 2, ..., n \quad (3.16)$$

Where X_t is a vector of integrated series (real exchange rate, foreign aid, gross domestic product, openness, terms of trade, exchange rate misalignment, export, money growth and income of trading partners) μ is a vector of intercepts while V_t is a vector of error terms and K represent the lag length of the series. It is important to note that a VAR does not contain explanatory variables. Estimation of equation 4 requires that $V_t \sim ID(0, \Omega)$ where Ω is non-diagonal

covariance matrix that remains constant overtime. Following Johansen (1991) and provided that the variables are integrated of order one and cointegrated, further assuming Δ represent the first differences, equation 4 is transformed into and equilibrium error correction model of the form

$$\Delta X_t = \mu + \Gamma_1 X_{t-1} + ...\Gamma_{p-1}\Delta X_{t-p+1} + \Pi X_{t-1} + \varepsilon_t .....(3.17)$$

Where $\Gamma_t = -(\theta_{t+1} + ... + \theta_k),\ i = 1, ..., k-1,$ and $\Pi_t = -(I - \theta_1 - ..... - \theta_k).$

Γ_i represents a matrix of coefficients of the first difference variables that capture the short-run dynamics. The coefficient of the lagged dependent variable indicates inertia as well as the formation of expectations. The coefficient of the other lagged endogenous variables provides estimates impact assessment. The coefficient matrix Π contains information about the long-run relationships among the variables involved in the model. Given that the rank of Π is $0 < r < n$, then it can be decomposed into

$\Pi = \alpha\beta$ and the error correction representation of equation 5 can be reformulated as

$$\Delta X_t = \mu + \Gamma_1 X_{t-1} + \Gamma_2 X_{t-2} .....\Gamma_{p-1}\Delta X_{t-p+1} + \alpha(\beta' X_{t-p}) + \varepsilon_t .....(3.18)$$

Where the columns of β are interpreted as distinct cointegratrion vector providing the long-run relationship $(\beta' X_t)$ among the variables, and the $\alpha's$ are the adjustment or the correction coefficient (loading matrix) indicating the adjustment of long-run equilibrium. One major problem in estimation of VAR and VEC models is the selection of an appropriate lag length. Most researchers have selected lag length in an arbitrary way. The lag length plays a crucial role in diagnostic test as well as in the estimation of VECM and VAR models (Bhasin, 2004). As a

result, appropriate lag length (p) will be chosen using standard model selection criteria (AIC and SBC) that ensure normally distributed white noise errors with no serial correlation.

Johansen (1988) cointegration technique allow us to test and determine the number of cointegrating relationships between the number of cointegrating relationships between the non-stationary variables in the system using a maximum likelihood procedure. In making inferences about the number of cointegrating relations, Johansen (1988,1991) and Johansen and Jselius (1990) proposed the use of two test statistics: the trace statistic and the maximum Eigen value statistic. The trace statistic is determined using the formula:

$$\lambda_{trace} = -T \sum_{i=r+1}^{n} \log(1-\lambda_i) \quad r = 0,1,2.....n-1 \quad .....(3.19)$$

T =number of observations

λ_i =is the i^{th} Eigen value.

The maximum Eigen value statistic is determined using the following formula:

$$\lambda_{\max} = -T \log(1-\lambda_{r+1}) \quad r = 0,1,2.....,n-2 \quad .....(3.20)$$

The trace and maximum Eigen value statistics are compared with the critical values tabulated in Osterwald-Lenum (1992).

3.9 Variance Decomposition

The forecast error variance decomposition which is obtained from the VAR model is used to identify the most important variable for each of the endogenous variable in this case real

exchange rate and export. The variance decomposition also provides complementary information for a better understanding of the relationships between the variables of a VAR model. It tells us the proportion of the movement in a sequence due to its own shock, and other identified shocks (Enders, 2004). Whiles impulse response function trace the effects of a shock to one endogenous variable on to the other variables in the VAR, variance decomposition separates the variation in an endogenous variable into the component shocks to the VAR. Therefore variance decomposition provides information about the relative importance of each variable in explaining the variation in the endogenous variables in the VAR. TO assign variance shares to the different variables, the residuals in the equation must be orthogonalized. Therefore, the study applied Cholesky decomposition method.

3.10 Impulse Responses

In order to analyze the impact of unanticipated shocks emanating from other variables in the VAR to one endogenous variable, the study will consider the impulse response functions. The impulse response function traces the effect of each shock on each variable in the VAR over a given time horizon. A shock to the i^{th} variable directly affects the i^{th} variable and is also transmitted to the entire endogenous variable through the dynamic structure of the VAR (Ender, 2004). The impulse response function of the VAR model are used to trace the effect of unanticipated foreign aid, real GDP and government expenditure shocks on the real exchange rate and export. The empirical evidence on impulse response function will enable the policy maker to predict the consequences of these unanticipated shocks in advance so that they will be well prepared to react to these changes in future.

Chapter Four

Results and Discussion

4.0 **Introduction**

This chapter seeks to present and analyze the regression results of the models specified in chapter three. As indicated earlier, the purpose of this study is to predict the exchange rate between the cedi and its major trading currencies. The results of the descriptive statistics of the relevant variables, ADF unit root test, Granger-Causality test, Johansen's approach to co-integration, various VAR diagnosticsfor the real effective exchange rate are presented and discussed. These results are discussed in relation to the hypotheses of the study but first we examine whether there is a trend between Exchange rate, money supply and time. A plot of this trend is shown below

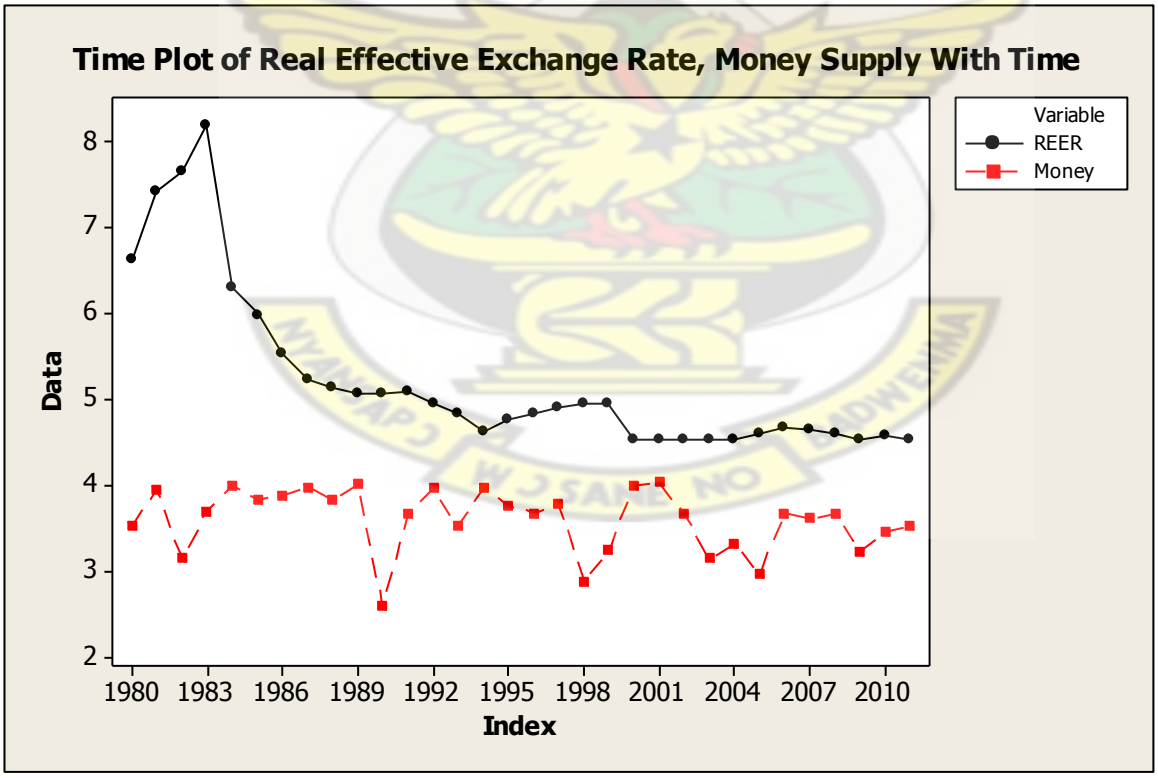

Figure 4.0 Time plot of Real Effective Exchange Rate and Money Supply

4.1 Trends in Real Effective Exchange Rate, and Money Supply

From the figure 4.0, it could be noticed that real effective exchange rate increased sharply with time between 1980 to 1985. There was however, a steady decline from 1985 throughout to 2011.The highest real effective exchange rate was recorded in 1985. This may be attributed to the worsening economic condition during this year which made the country less competitive interm of trade. The steady decline may also be attributed to good economic policy pursued during that time to make the country competitive in the international world. From the graph we can also deduce that money supply have been relatively stable on the average with a shape decline in 1990 and thereafter increasing but maintaining a steady growth with little fluctuation to the end of 2011. This may be so mainly to prevent in the economy and to maintain stable economic growth.

4.2 Descriptive Statistics

The descriptive statistics of the original data are presented in Appendix A. In table: 4.1, the descriptive statistics of the transformed data is presented. The issues looked at include the mean, median, maximum, minimum values, standard deviation, skewness, kurtosis. The Table 4.1 illustrates vividly these statistics. It can be observed from the Table that all the variables have positive average values (mean and median) with the exception of Terms of Trade. Also the minimal deviation of the variables from their means as shown by their standard gives indication of slow growth rate (fluctuation) of these variables over the period of consideration. Again, Money supply, Terms of Trade, Openness of the economy and Aid are negatively skewed whiles GDP, Government Expenditure and Real Effective Exchange rate shows signs of positive

skewness. The variables also have positive standard deviation. With the minimum standard deviation being Money Supply and the maximum Real Effective Exchange Rate.

Table 4.0 Summary Statistics of the Transformed Data

	LnTOT	LnOpen	Lnaid	Lnmoney	LnGDP	LnREER	LNGovex
Mean	-0.5103	2.3588	20.1908	3.5957	22.7808	5.2124	20.5226
Median	-0.3935	2.5296	20.2660	3.6688	22.5620	4.8644	20.523
Maximum	-0.0274	3.2284	21.3821	4.0348	24.3919	8.1828	22.0723
Minimum	-1.8282	-0.7731	18.5049	2.5879	22.1185	4.5161	19.2869
Std.Dev.	0.4108	0.7896	0.7573	0.3693	0.6652	0.9806	0.7499
Skewness	-2.1157	-2.2074	-0.6171	-0.9453	1.2768	1.8110	0.6664
Kurtosis	4.2221	0.0948	-0.3139	0.2214	0.2712	2.2153	-0.3836

Table 4.1 Correlation Matrix of Variables.

	lnreer	lnaid	lnmoney	lngdp	lngovex	lntot	lnopen
lnreeer	1						
lnaid	-0.8894	1					
lnmoney	0.0920	-0.2531	1				
lngdp	-0.5185	0.7874	-0.2505	1			
lngovex	-0.6581	0.8576	-0.2439	0.9657	1		
lntot	-0.8020	0.6237	0.0693	0.2762	0.3821	1	
lnopen	-0.0283	0.1675	-0.2790	0.2102	0.1905	-0.4558	1

4.3 Pairwise Correlation of the Variables

Table 4.2 shows the correlation between the variables under study. From the table it could be noticed that there is high positive correlation between aid and real effective exchange rate, government and aid, gross domestic product and aid, and also between government expenditure

and gross domestic product. On the other hand , there is strong negative correlation between terms of trade and aid, and real effective exchange rate and aid.

4.4 Estimation of Empirical models

Consistent with the objectives of the study, the empirical model stated in chapter three is estimated below

Table 4.2 Estimation of Empirical Model 1

Variable	Coefficient	Std. Error	t-statistic	p-value	
const	10.8269	2.6754	4.0470	0.0005	***
Ln_Aid_	-0.7534	0.2086	-3.6120	0.0014	***
Ln_Money_	-0.1561	0.1452	-1.0760	0.2928	
Ln_GDP_	1.3166	0.3277	4.0170	0.0005	***
Ln_Govex_	-0.9591	0.2357	-4.0680	0.0004	***
Trend	-0.0161	0.0103	-1.5570	0.1325	
Ln_TOT_	-0.9100	0.3059	-2.9750	0.0066	***
Ln_Open_	-0.1485	0.0764	-1.9420	0.0640	*

Akaike information criterion (AIC)=1.4782 Adjusted R-squared= 0.9484
Schwarz Bayesian criterion (BIC)=13.204 SSR=1.1901 df=7

From the table above, it could be seen that all coefficients in the model are significant with the exception of time and money supply which are not significant. Holding all other things constant on the average Real effective exchange rate will appreciate by 10%. It could also be seen that all the variables in the model impact negatively on Real Effective Exchange Rate with the exception of GDP.

Table 4.3 Estimation of Empirical Model 2

Variable	Coefficient	Std. Error	t-statistic	p-value	
const	14.0785	2.0564	6.8460	0.00001	***
Ln_Aid_	-0.8034	0.2300	-3.4940	0.0018	***
Ln_Govex_	-0.9508	0.2478	-3.8380	0.00075	***
Ln_Money	-0.1485	0.1394	-1.0650	0.2970	*
Ln_TOT_	-1.0431	0.3256	-3.2030	0.00369	***
Ln_Open_	-0.2137	0.0891	-2.3990	0.0242	**
Ln_GDP_	1.2016	0.3174	3.7860	0.00086	***

Akaike information criterion (AIC)=1.10789 Adjusted R-squared= 0.9553
Schwarz Bayesian criterion (BIC)=9.90231 SSR=1.25413 df=6
Durbin-Watson statistic = 2.2042

4.5 General Linear Test

$H_O =$ No time effect

$H_A =$ There is time effect

$$F = \left(\frac{SSE_R - SSE_F}{df_{F-}df_R} \right) \div SSE_F \Big/ df_f$$

$$F = \frac{MSE_r}{MSE_f}$$

$$F = \left(\frac{1.25413 - 1.19012}{7 - 6} \right) \div 1.1901 \Big/ 7$$

$$F = \frac{0.06401}{0.170}$$

$$F = 0.377 \qquad F_{tab} = 7.19$$

Conclusion: since $F_{cal} < F_{tab}$ from table we do not reject the null hypothesis, we conlude that there is no time effect. We can estimate the model without time

Table 4.3, shows an empirical model without trend. It could be noted that all the variables are significant. Holding all other things constant, on the average we expect Real Effective Exchange Rate to appreciate by 14.1%. It could also be seen that all the variables have negative effect with Real Effective Exchange Rate with the exception of GDP. Table 4.3 also shows the Durbin-Watson statistic. The formal text indicates that the residuals are normally distributed the non formal test plot is show in the figure below.

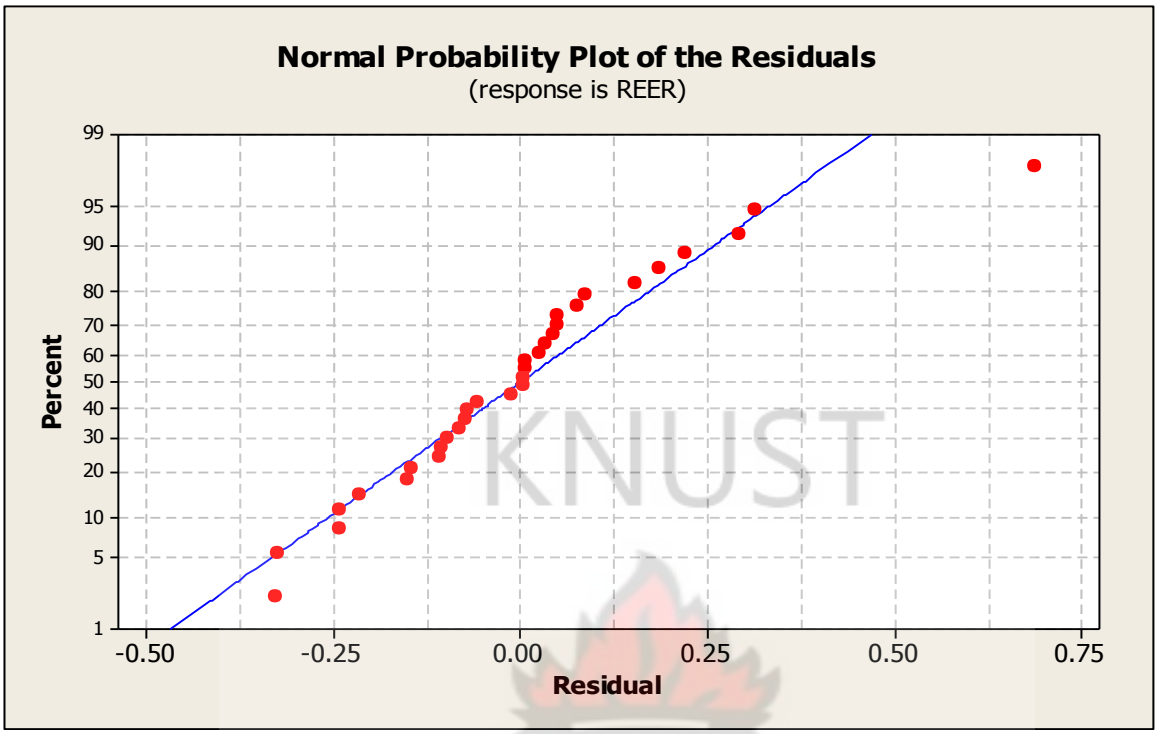

FIGURE 4.1 TESTING FOR THE NORMALITY OF THE RESIDUALS

4.6 NORMALITY OF THE RESIDUALS

From figure 4.1 above, it could be seen that the residuals are very close to the line of best fit. This gives an indication that the residuals are normally distributed and this confirms our earlier formal test.

4.7 Unit Root Test

Unit root test was conducted in order to investigate the stationarity properties of the time series. As a result, all variables are examined by inspecting their trend graphically (Appendix A). From the graph in Appendix A, it can be seen that, all the variables appear to exhibit behavior of non-stationary series. However, the plots of all the variables in their first difference exhibit some

stationary behavior. Additionary, the Augumented Dickey Fuller (ADF)test was applied to all variables in level and in first difference in order to formally establish their order of integration. Akaike Information criterion (AIC) was used to determine the optimal number of lag included in the test. The study presented and used the P-values for making the unit root decision which arrived at similar conclusion with the critical values. The results of both test for unit root for all the variables at their levels with intercept and trend and their differences are presented in Table 4.2 and 4.3.

Table 4.4 Unit Root Test: ADF Test for the order of integration

Levels (Trend &Intercept)			1st Difference (Trend & Intercept)			
Var.	ADF-Statistic	Lag	Var.	ADF-Statistics	Lag	I()
LnAid	-0.2498(0.7452)	1	DLnAid	-1.3236(0.0000) *	1	I(1)
LnMoney	-1.2199(-4.5056)	1	DLnMoney	-1.3886(0.0000)*	1	I(1)
LnGDP	-0.0880(0.9666)	1	DLnGDP	-0.0587(0.0047)*	1	I(1)
LnREER	-0.2422(0.5445)	1	DLnREER	-0.0174(0.0001)*	1	I(1)
LnGovex	-0.2291(0.4509)	1	DLnGovex	-0.0634(0.0415) *	1	I(1)
LnTOT	-2.0440(0.2675)	1	DLnTOT	-0.8711(0.0003) *	1	I(1)
LnOpen	-0.0587(0.0687)	1	DLnOpen	-1.2603(0.0000) *	1	I(1)

Note: IO represent the order of integration and D denotes first difference * represent significance at 5% levels

From the results of the unit root test in Table 4.4 it can be observed that the ADF test for the individual time series shows a non-stationary time. However, at first difference, all the variables are stationary since the unit root hypothesis could be rejected for all the variables. It is therefore clear that all the variables are integrated of order one I(1). Therefore, in order to eliminate the

possibility of spurious regression results, the first difference of the variables should be employed in the estimation process.

4.8 Granger-Causality Test

To find out the direction of causality between real exchange rate and its selected macroeconomic variables, the study conducts a granger causality test and the results are presented in Table 4.5

Table 4.5 Granger causality Results for REER Model

Null Hypothesis	Lags	F-value	P-value
Lnaid does not Granger cause Lnreer	4	8.040	0.006**
Lnreer does not Granger cause Lnaid		0.716	0.7158
Lnmoney does not Granger cause Lnreer	6	0.670	0.6187
Lnreer does not Granger cause Lnmoney		3.54	0.0254**
Lngdp does not Granger cause lnreer	6	25.56	0.0003**
Lnreer does not Granger cause lngdp		2.84	0.1023*
Lngovex does not Granger cause Lnreer	4	48.69	0.000**
Lnreer does not Granger cause lngovex		0.85	0.5125
Lntot does not Granger cause Lnreer	4	4.50	0.532
Lnreer does not Granger cause Lntot		3.10	0.0403**
Lnopen does not Granger cause Lnreer	4	3.26	0.0339**
Lnreer does not Granger cause Lnopen		84.67	0.0000*

Note: *,** denote rejection of null hypothesis at 10%, and 5%

The results of the granger causality test in table 4.5 shows that there is a unidirectional relationship between real exchange rate and foreign aid with the causality running from foreign aid to real exchange rate at 5% significance level. The results rejected the null hypothesis that government expenditure does not Granger cause real exchange rate at 5% level of significance. Further, there is a unidirectional relationship between terms of trade and real exchange rate and between money supply to real exchange rate respectively. However, we observe a bi-directional relationship between real exchange rate and trade openness and between real exchange rate and real gross domestic product. Table 4.5 indicates that real exchanger rate is caused by its fundamentals as specified in the model.

4.9 Cointegration Test

Contributing to the significance and rational for cointegration analysis, Johansen (1991) argued that cointegration can be used to establish whether there exist a linear long-term economic relationship among variables of interest. Pesaran and Shin (1995) added that cointegration enables researchers determine whether there exist disequilibrumin various markets. In this regard, Johansen (1991) asserts that cointegration allows us to specify a process of dynamic adjustment among the cointegrated variables and in disequilibrated markets.

Given that all the variables selected are integrated of order one, I(1), the result of the trace statistics and the unrestricted cointegrating coefficients of the Johansen cointegration test for the real exchange rate model are presented in Table 4.6 below.

Table 4.6: Johansen's Cointegration Test Results for REER

Hypothesized No. Case	Eigen value	Trace Statistic	5% Critical Value	Prob**
None	0.82688	161.9691	136.61	0.0010
At most 1	0.69398	107.6016	104.94	0.0416**
At most 2	0.62342	70.8946	77.740	0.1828
At most 3	0.62342	40.6195	54.64	0.4928
At most 4	0.33575	21.9310	34.55	0.5844

Note: ** indicates rejection of the null hypothesis. The Trace Statistic indicates 1 cointegrating equation at 1% level of significance

Table 4.7 Unrestricted Cointegrating coefficient (normalized by b*)

Lnreer	Lnaid	Lnmoney	Lngdp	Lngovex	Lntot	Lnopen
4.0485	2.1523	1.2466	-2.8320	2.4092	6.6832	1.4388
0.7348	2.3702	0.0145	0.0145	-2.3491	-2.9708	-1.9575
-0.0536	-1.8395	1.5192	1.5192	-0.7586	2.2985	0.0115
-2.8696	-3.3061	7.3988	7.3988	-5.9324	-0.0187	0.2023

From Table 4.6, the result of the trace statistic indicates the presence of cointegration among the variables. Specifically, the null hypothesis of no cointegrating relationship is rejected since the computed value of the trace statistic of 107.6061 is greater than it critical value of 104.94. The P-value of 0.0416 further confirms the rejection of the null hypothesis at 5% significance level. Implying the failure to reject the alternative hypothesis of at two cointegrating relationship. This confirms the existence of a stable long-run relationship among real effective exchange rate (REER) foreign aid (aid), money supply, gross domestic product, government expenditure, term of trade (TOT) and trade openness (OPEN). Also in observing Table 4.7 the first vector and row

appears to be the one on which we can normalize the real exchange rate . The choice of this vector is based on the prior expectations about the long-run relationship as indicated in chapter three.

4.10 Long Run Estimates

Given the results of the cointegration analysis, we can go ahead and estimate the long run relationship among the variables. In order to establish the long-run equation, we normalize the first variable in the VAR which is the real exchange rate and export for the two models respectively. These variables are also of considerable interest to the study. The estimated long-run equilibrium relationship for the real exchange rate and export derived from the normalized vectors and appropriate rows as discussed above are expressed as follows:

The real Exchange Rate Model

$$LREER = 8.10758T - 0.090\ln money - 0.05174\ln GDP$$
$$-0.13523\ln Govex + 0.77382\,\mathrm{n}\,ToT + 0.1018\ln open - 0.431\ln Aid + ECT \quad \text{.....4.1}$$

The error correction term is generated as

$$ECT = -8.10758T + 0.090\ln money$$
$$+0.0517\ln GDP + 0.13523\ln Govex - 0.77382\ln ToT - 0.10181\ln open + 0.431\ln Aid \quad \text{.....4.2}$$

From equation 4.1 holding all other factors constant in the long run, over time, real exchange rate in Ghana grows by (depreciates) by 8 percent each year. Also from the equation it is evident that foreign aid has an appreciating effect on real effective exchange rate in the long run. That is for

every 1% increase in foreign aid on the average real effective exchange rate falls by 0.43%. This is consistent with the Dutch Disease theory which stipulates that an increase in foreign aid to a small economy like Ghana will lead to increase in demand for both tradables and nontradables. Thus the price of nontradables will increase because it's determined domestically thereby causing loss of competitiveness due to exchange rate appreciation. Government expenditure tends to have an appreciating effect on real effective exchange rate. A percentage increase in government expenditure appreciates the real effective exchange rate by 0.14% this implies that consumption by government is nontradeable based. The impact of Gross domestic product is negative implying that higher income level tends to appreciate the exchange rate. This also implies that the rate of technical progress has increased the prices of non-tradable goods over-time, and hence appreciating the real effective exchange rate. In this case a percentage increase in GDP will lead to 0.05% appreciating of the real effective exchange rate. The degree of openness has a depreciating effect on real effective exchange rate as it carries a positive sign. For any percentage increase in the degree of openness will lead to 0.10 depreciation in the real effective exchange rate. This implies that, reduction in trade barriers leads to a fall in price of nontradables and consequently depreciation of the currency. This is true in the sense that open international trade will lead to influx of imported products on the market which is relatively cheaper than the domestic product. Demand for these domestic products will fall and consequently lead to fall in their prices. The positive effect of the terms of trade on the real effective exchange rate indicates that the substitution effect dominates the income effect. The substitution effect may have been on the supply side, in which case an improvement in the terms of trade may relaxed the foreign exchange constraint on intermediate inputs in the production of non-trade goods, and hence lowering the price of non-tradables. It is also possible however, that

the impact or term of trade may be that aid inflows support production rather than consumption in the long run, so that the substitution effect outweigh the income effect causing depreciation in the real effective exchange rate index in the long run. The coefficient of money supply is negative indicating that an increase or expansionary monetary policy will raise the general price level (CPI, Ghana) and hence appreciation of the real effective exchange for exports. This is consistent with theory.

4.11 Impulse Response Function

Extended literature on real effective exchange rate argue that anticipated shocks in the fundamentals such as real GDP, terms of trade , openness, money supply, foreign aid etc can lead to disturbances in the real effective exchange rate market. The effect of these unanticipated shocks on the real exchange rate market (deviation on the short-run equilibrium values from the long-run equilibrium values) can be ascertained from the impulse response function from a VAR model. If the responses is such that the short-run values converge to the long-run values, then it can be deducted that stability can be achieved in the future. The impulse responses of real effective exchange owing to one standard deviation shock in the innovations of government expenditure and openness extracted from the detailed results in appendix are presented in Fig below.

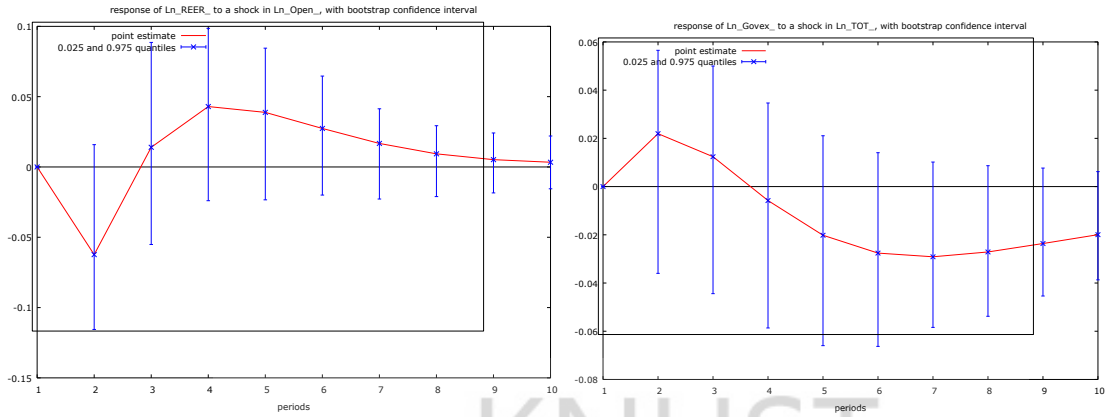

Figure 4.3: Selected impulse response functions from the VAR model of REER

From figure 4.3, any unanticipated one period standard deviation shock to openness of the economy will cause a wide deviation between the short-run equilibrium value of the real exchange rate and its long-run equilibrium value throughout second and fourth year thereafter maintains a minimal deviation to the eighth year thereafter converges to its long-run equilibrium with significant variations. A one period standard deviation shock to government expenditure would result in fluctuations in the real effective exchange rate between positive and negative values from the second year to the six year. However, it converges to its long-run equilibrium thereafter.

4.12 Variance Decomposition Analysis

Following the VAR estimation, the study decomposed the forecast error variance by employing Sim's Recursive Cholesky decomposition method. The forecast error variance decomposition provides complementary information for a better understanding of the relationship between the variables of a VAR model. It tells us the proportion of the movement in a sequence due to its

own shock, and identified shocks (Enders, 2004). Thus, the variance decomposition analysis will enable us identify the most effective instrument for each targeted variable based on the share of the variables to the forecast error variance decomposition of the endogenous variables, at various quarters are shown on Table 4.8

Table 4.8 Results of Variance Decomposition for REER Model

period	std. error	LnMoney	LnGDP	LnREER	LnGovex	Ln TOT	Ln OPEN
1	0.248601	3.3615	8.3033	88.3351	0.0000	0.0000	0.0000
2	0.365095	9.8759	7.5982	54.0803	0.0268	25.5036	2.9153
3	0.438214	9.2316	6.1588	42.0553	2.9297	37.4992	2.1255
4	0.481789	9.0822	5.7997	35.9656	6.4755	40.1232	2.5537
5	0.504058	9.0049	6.1382	33.1110	8.8844	39.9348	2.9266
6	0.515241	8.9406	6.7781	31.7454	10.2184	39.2340	3.0836
7	0.521338	8.8912	7.4663	31.0280	10.8682	38.6314	3.1149
8	0.525103	8.8559	8.0687	30.6024	11.1694	38.2016	3.1020
9	0.527699	8.8328	8.5420	30.3234	11.3164	37.9042	3.0813
10	0.529633	8.8187	8.8932	30.1271	11.4001	37.6980	3.0628

Table 4.8 Shows that the largest source of variations in real exchange rate forecast error is attributed to its own shocks. The innovations of foreign aid openness, terms of trade, government expenditure, money supply and real GDP accordingly are other important source of the forecast error variance of real effective exchange rate. The ratio of TOT and Open to real effective exchange rate contributed least to the forecast error variance during the first year however, in the

subsequent years their contribution were very great. This suggest that all the variables play important part in real exchange rate with the most effective variable being terms of trade.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

The purpose of this final chapter is to present the summary, conclusion and recommendations. Whereas the summary presents a brief overview of the research problem, objective, methodology and findings, the conclusions captures the overall outcomes regarding the findings of the study in light of the hypotheses. Recommendations also present specific remedies to be implemented by specific bodies. The chapter also presents the limitations and direction for future research.

5.1 Summary

This study sought to develop an empirical model of the real exchange rate in Ghana. Specifically it investigated the long-run and causality relationship between real effective exchange rate, foreign aid, Money Supply, GDP, Government Expenditure, Terms of Trade, Openness of the Economy in Ghana using yearly time series data from 1980 to 2011. The study also investigated the dynamic adjustment of the real effective exchange rate to shocks to its determinants. The theories as well as empirical works that characterized foreign aid as well as real effective exchange rate were reviewed in this study as well as documented in the literature for both industrialized and developing economies. Based on an extensive review of the literature on the determinants of real effective exchange rate an empirical model was specified. The variables included in real effective exchange rate model as potential determinant included Terms of Trade, a measure of degree of Openness, Money Supply, Government Expenditure, Real GDP and

Foreign Aid. In order to determine both long-run and short-run determinate of the real effective exchange rate, Johansen cointegration and error correction methodology was preferred to other techniques. In the application of this methodology, we started by analyzing the time series properties of the data employing by plotting a time series graph of Real Effective Exchange Rate and Money Supply. This was followed by a summary statistics of the transformed data. A correlation matrix was also look at to find out how the variable correlate with each other. An empirical model was the fitted based on what was stated in the chapter three and the residuals were examined. The study also employed both formal and informal test of stationarity to ascertain the stationality property of the variables under study. The study went ahead to examine the causal relationship between real effective exchange rate and aid as well as other variables in the mode using pairwise Granger-causality test. It employed Johansen (1988) approach to cointegration and VECM to examine the long-run and short-run dynamics among variables used in estimation. The study went further to estimate the general to specific model which is simplified than the VECM. Finally VAR approach was used to conduct impulse response and variance decomposition analysis in order to identify which variables contributed to the forcast error variance of the targeted variables. All test and estimation were conducted using STATA and Gretl.

The result From the graph form figure 4.1 shows that there exist a time trend between the variables of interest. Also, from the correlation matrix it was observed the variables in the regression equation are correlated with a strong positive correlation between Government expenditure and GDP (0.9657) and a strong negative correlation between Real Effective Exchange Rate and Aid (0.8894). From the estimation of the competing empirical model it could

be seen that empirical model two have the least AIC (1.108) giving an indication that empirical model two better predict Real Effective Exchange Rate. From this model it could be seen that holding all other things constant, a percentage change in Aid brings about a 76.2% decrease in Real Effective exchange Rate. This means that as country receives more aid its Real Effective Exchange Rate falls. Also, From this model it could be seen that holding all other things constant, a percentage change in Government Expenditure brings about a 96.4% decrease in Real Effective exchange Rate. This indicates that as Government Expenditure increases there is depreciation pressure on the Real Effective Exchange Rate. The Granger-causality test for real effective exchange rate model suggested a unidirectional causality between real exchange rate and foreign aid with the causality running from aid to real effective exchange rate. The cointegration analysis for real effective exchange rate model revealed that the variables understudy are cointegrated. We observe form the long-run equation that foreign aid has an appreciating effect on real effective exchange rate as stipulated by the Dutch Disease theory which stipulates that an increase in foreign aid to a small economy like Ghana will lead to increase in demand for both tradables and nontradables. Thus the price of nontradables will increase because it's determined domestically thereby causing loss of competitiveness due to exchange rate appreciation. Government expenditure real GDP and money supply as well have appreciating effect on real effective exchange rate. Nevertheless, terms of trade and degree of openness have depreciating effect on real effective exchange rate.

The evidence from the forecast error variance decomposition suggests that the variables that influenced real exchange rate significantly were terms of trade, money supply and government expenditure with openness of the economy having least influence.

5.2 Conclusion

From the long run estimate we can conclude that, Foreign Aid has appreciating effect on Real Effective Exchange Rate. This is consistent with the Dutch Disease and the result also confirms the finding of Sackey (2001). Also Government Expenditure, GDP and Money supply all have appreciating pressure on the Real effective Exchange Rate. However, Openness of the Economy, Terms of Trade have depreciation pressure on Real Effective Exchange Rate.

From the results of the Granger Causality Results, it was found out that there is a unidirectional causality between Real Effective Exchange Rate Aid, Money Supply, Government Expenditure and Terms of Trade. This gives an indication that Foreign Aid, Money Supply, Government Expenditure and Terms of Trade has the capacity to make both permanent and temporary changes in Real Effective Exchange Rate.

Furthermore, from the empirical data estimation, it could be seen that Goss Domestic Product has an appreciating effect on Real Effective Exchange Rate. However, Money Supply, Government Expenditure, Terms of Trade, Openness of Economy, and Aid have depreciating effect on Real Effective Exchange Rate. This indicates that a percentage increase in each of these variables appreciate the Real effective Exchange Rate. And this depreciates our local currency.Also, from the results of the empirical model specification, the most important variable for real effective exchange rate is foreign aid and government expenditure. This shows how dependent the economy is on aid. Consistent with empirical literature, the study found evidence of unidirectional causality between real effective exchange rate and aid. This gives the indication

that foreign aid has the capacity to make both permanent and temporary changes in real exchange effective exchange rate.

5.3 Recommandations

Taking cognizance of the findings from the study, the following recommendation are proposed.

First, the real effective exchange rate will be shocked by factors that are outside the direct control of policy makers, such as trade openness which explain the greatest component of the variation in the real effective exchange rate in this study. The policy implication is that central bank's ability to influence the movements in the real exchange rate is limited. The central bank may however, reduce the impact of this shock, in the long-run by utilizing policies to promote the diversification of traded goods and acting on other fundamentals.

Second, we observe from the finding that money supply has an appreciating effect on the real effective exchange rate due to inflation. It is therefore recommended that monetary authorities keep money supply as low as possible to avoid situations of international uncompetitiveness.

Third, Government expenditure yielded a negative relationship with real effective exchange rate over the study period. This implies that government spending in non-tradable based and this inhibits the competitiveness of the economy. It is therefore recommended that government should consider spending on primary input for infant industries in order to enhance growth.

Finally, we strongly recommend that, Ghana should wean itself from the overdependence on foreign aid and donor conditionalities for budgetary support. The aid model over the years has not worked in most developing countries. Developing countries can therefore rely on trade,

foreign direct investment and intensify their capital market as the main source of enhancing growth.

5.4 Limitation of the study

One of the reasons of investigating the determinants of the real effective exchange rate is to estimate the equilibrium real effective exchange rate and ultimately measure the degree of misalignment in the actual real effective exchange rate. Having not gone to this extend, the study has obviously left some important gaps, although it has successfully achieved its objectives.

The other issue, which has also confronted previous researchers, concerns the unavailability of data, particularly in developing countries, on the actual variables suggested by theoretical models on the determination of the real effective exchange rate. This means that some of the variables either have to be excluded in the empirical model, albeit with the risk of an omitted variables bias, or proxies have to found for these variables. The risk involved in finding proxies is that they may not correctly represent the impact of the actual variables, resulting in inconsistent results. Stricking this balance poses a serious challenge to empirical studies on the determinants of the real effective exchange rate. However, these problems seems not to have significantly affected the findings presented in this study.

5.5 Areas of Future Research

The areas for further research that emerge from this study include covering the gap that has been left by this study of measuring the degree of misalignment in the exchange rate.

Finally, instead of looking at aid as the only form of foreign income, concentration could be put on other form of income such as remittances and foreign direct investment and evaluate the behavior of these on macroeconomic variables.

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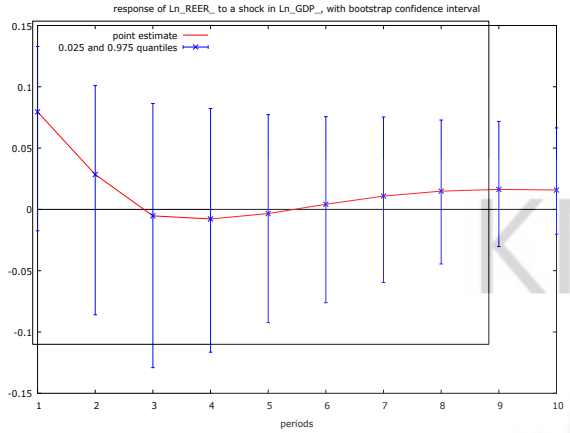
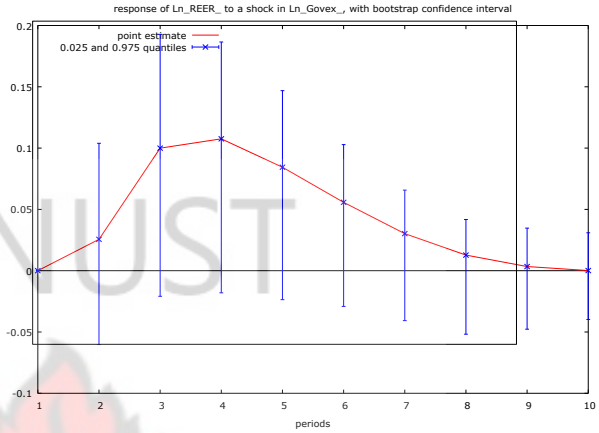
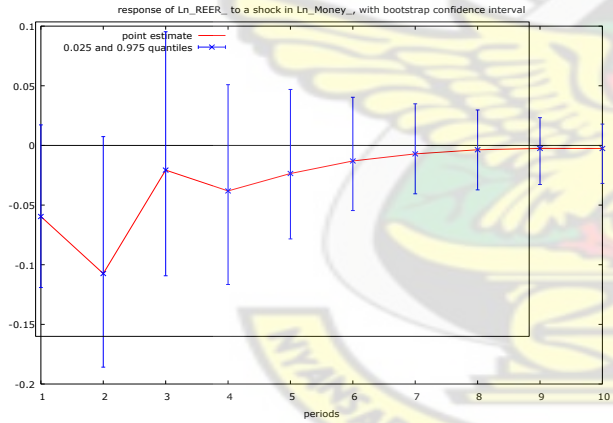
APPENDIX A

Selected Impulse Response Function From of Real Exchange Rate The VAR







APPENDIX B

Time Plot of Variables of Interest