UNIVERSITY OF CAPE COAST

TESTING THE EFFECTS OF EARNINGS OF COCOA AND NON-TRADITIONAL EXPORTS ON REAL EXCHANGE RATE IN GHANA

BY

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DECLARATION

Candidate's Declaration

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

Candidate's Signature …….. Date ……

Name: Albert Lordson Dei

Supervisors' Declaration

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

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ABSTRACT

Exchange rate basically influences a currency value of an economy. As such it plays a critical role in international trade as well as economic growth and development for every economy. The study sought to investigate the impact of earnings of cocoa and non-traditional exports on real exchange rate in Ghana. Using a disaggregated data for exports, annual time series data were interpolated into quarterly series over the sample period 1990Q1 to 2011Q4. Johansen co-integration test and error correction model were employed for examining both the long run and short run relationships.

The outcome of the study showed that real exchange rate is appreciated for export earnings thus earnings of cocoa and non-traditional export, foreign aid as well as export earnings of mineral while trade openness, government expenditure and money supply depreciate the real exchange rate.

The study recommended that the government should make production of cocoa more attractive by way of providing incentives such as scholarship to the wards of cocoa farmers in addition to subsidies (mass spraying) among others. It is equally expedient to channel a little more resources to the non-traditional export sector especially the production of cashew in order to attract more foreign exchange. Summing up, it is a high time the country diversified and added value to our exports commodities, most especially the cash crops.

KEY WORDS

Exchange rate

Cocoa export

Non-traditional exports

Quarterly time series

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DEDICATION

To my mother, Patience Mensah and all my loved ones.

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LIST OF ACRONYMS

ADF	Augmented Dickey-Fuller
AIC	Akaike Information Criterion
AID	Foreign aid
ARCH	Autoregressive Conditional Heteroschedasticity
BEER	Behavioural Equilibrium Exchange Rate
BOG	Bank of Ghana
COCX	Earnings of Cocoa Exports
CPI	Consumer Price Index
CUSUM	Cumulative Sum of Recursive Residuals
CUSUMSQ	Cumulative Sum of Squares of Recursive Residual
DW	Durbin Watson
ECM	Error Correction Model
ECOWAS	Economic Community of West African State
ECT	Error Correction Term
ERP	Economic Recovery Programme
FEER	Fundamental Equilibrium Exchange Rate
FPE	Final Prediction Error
GDP	Gross Domestic Product
GEXP	Government Expenditure
GM	Geometric Method
GNI	Gross National Income
GOVEXP	Government Expenditure
HIPC	Heavily Indebted Poor Countries
HQ	Hannan-Quinn Information Criterion

IBRD	International Bank for Reconstruction and Development
IMF	International Monetary Fund
IMF	International Monetary Fund
IRF	Impulse Response Function
LDC	Least Developed Country
LIC	Low Income Country
LM	Lagrange Multiplier
LOOP	Law of One Price
LR	Likelihood Ratio
M2	Broad Money Supply
MINX	Earnings of Mineral Exports
MOFA	Ministry of Food and Agriculture
NATREX	Natural Rate of Exchange
NFA	Net Foreign Income
NONTX	Earnings of Non-Traditional Exports
ODA	Official Development Assistance
PEER	Permanent Equilibrium Exchange Rate
PP	Phillip Perron
PPP	Purchasing Power Parity
REER	Rear Effective Exchange Rate
RER	Real Exchange Rate
SAP	Structural Adjustment Programme
SIC	Swartz Information Criterion
TDR	Trade Openness
TOT	Terms of Trade

UK	United Kingdom
US	United State
USD	United State Dollar
VAR	Variance Autoregressive
VECM	Vector Error Correction Model
WDI	World Development Indicators

CHAPTER ONE

INTRODUCTION

Background to the Study

Exchange rates play a huge role in a country's level of trade. It is one of the major determinant of economic growth and development most economy. Ghana had a relatively poor performance on economic growth in the last 20 years and so real per capita income fell by a factor of two during this period. This poor performance of the economy from 1970 to 1990 in real terms was caused by the pattern of trade at the time. However, it started picking up in recent times after the economy was reformed and liberalized. This made the exchange rate regime responsive to the market fundamentals, (Bhattarai & Armah, 2013). However, the imbalances have been widened even further despite these successive reforms and devaluations. The reasons behind the ineffectiveness of these reforms in the exchange rate system leave much to be investigated.

Many developing countries use the exchange rate to regulate flows of trade and capital which tend to have persistent deficits in the balance of payments as a result of a structural gap between the volumes of exports and imports. Consequently, these economies such as Ghana tend to have inelastic demand for both exports and imports. Moreover, the rate of growth of imports is often higher than the rate of growth of exports thereby resulting in balance of payment deficit.

However, there have been several debate in the literature as to whether or not an economy should adopt a fixed or flexible exchange rate in determining

real and nominal exchange rates. Models of real exchange rates reflect the relative prices of one country in terms of reference of households, technology of firms and institutional arrangements as well as taxes and tariffs between two countries. According to Whalley (1985), the real exchange rate is the outcome of general equilibrium in markets for goods and services. Again, financially, nominal exchange rates can be made to change according to the differences in the purchasing power parity and the differences in the interest rates (Dornbusch, 1976; Krugman, 1979; Taylor, 1995). Under a flexible exchange rate system both real and nominal exchange rates are aligned to each other through the market mechanism. However, under the fixed exchange rate system these automatic adjustments are not guaranteed leaving room for appreciation or depreciation of currency, with its consequence for the relative competitive position of the economy.

It is interesting though to investigate whether correcting the exchange rate system could help solve some of the structural rigidities, imbalances in trade, slow growth performance, among others, of the Ghanaian economy.

Ghana experienced economic crises following the breakdown of a stable exchange rate system and imprudent policies adopted by governments in the past, which rendered it less competitive in the world. As a result of the breakdown of the dollar standard in 1973, many advanced economies as well as developing economies in relation to the automatic adjustment in the exchange rate, guaranteed by the price-specie-flow mechanism under the gold standard, or dollar standards, that provided a stable exchange rate system were lost. Gradually, economies started adjusting exchange rates artificially, aiming to correct the balance in international trade. These arrangements have caused a

destabilization in the international payment system and led to exchange rate crises. As a result, these global phenomena are partly responsible for the Ghanaian crises.

Table 1: Exchange Rate Policy Episodes in Ghana 1957-2004

Episode	Period	Policy
1	1957-1966	Fixed to the British Pound.
2	1966-1982	Fixed to the American Dollar.
3	1983-1986	Multiple exchange rate system.
4	1986-1987	Dual exchange rate system-
5	1987-1988	auction determined, dual retail
6	1988-1989	auction rate.
7	1990-1992	Dutch auction system.
8	1992-date	Foreign exchange bureaux.
		Wholesale and inter-bank auction system.
		Inter-bank market. The Bank of Ghana (BoG) selling and buying rates were determined by the average daily retail rates of commercial banks

Source: Bank of Ghana, IMF

Evolution of Exchange Rate System in Ghana

The differences in the political regimes that have been in place since independence in 1957 have characterized the exchange rate regimes in Ghana. Therefore Table 1 summarizes the exchange rate management in Ghana. From Table 1, it can be seen that Ghana adopted a fixed exchange system between 1957 and 1982 within which the Bretton Woods system supported. As a result, the Ghanaian currency was pegged at two Cedi to the pound. Adjustments were made to reflect the fundamental balanced of payments problems. As a matter of

fact, the choice of a fixed exchange rate regime in Ghana was therefore consistent with the thinking at 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 found in the hands of a few commercial banks.

As part of the launch of the Economic Recovery Programme (ERP), the government at the time made a series of devaluation of the Cedi between 1983 and 1986. According to Appiah and Adetunde (2011) 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 characterised by a scheme of bonuses on exchange receipts and surcharges on exchange payments. Consequently, a multiple exchange rate system of two official rates of ¢23.38: US$1.00 and ¢30.00: US$1.00 were applied to specified payments and receipts. The two official rates were eventually unified at ¢30.00: US$1.00 in October 1983. The country also saw the introduction of the real exchange rate rule cost in the purchasing power parity (PPP) framework. After the introduction of the quarterly adjustment of exchange rates which was consistent with the relative inflation rates of its major trading partners for the period 1983-1984, the government adopted an auction market approach in September 1986. The purpose of this was to accelerate the adjustment of the exchange rate and to achieve the objective of trade liberalisation, leaving it partially to market forces (demand and supply) to determine the cedi-dollar rates. This new arrangement consisted of a dual exchange rate categorized two windows. Window one was operated as a fixed exchange rate and pegged the cedi-dollar exchange rates at

¢90.00: US$ 1.00 and mainly used in relation to earnings from the export of cocoa and residual oil products. However, window two covered all other transactions, and 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. Based on the marginal pricing mechanism the Dual-Retail Auction was adopted thereby requiring a successful bidders to pay the marginal price. The Dutch auction being the second auction was introduced which required that successful bidders pay the bid price.

In an attempt to absorb the parallel market into the legal foreign exchange market, the foreign exchange bureaux system was established in 1988. These "forex" bureaux were fully licensed entities operated by individuals, groups or institutions. Their operation alongside the auction meant that the foreign exchange market was characterised by two spot foreign exchange rates. (It must be noted that the forex bureaux were not allowed to bid for foreign exchange in the weekly- retail auction).

Consequently, the wholesale auction was introduced in March 1990 in order to replace the weekly retail auction. Here, a composite exchange rate system was operated, namely the inter-bank and a wholesale system. Under the wholesale system, eligible forex bureaux and authorised dealer banks were allowed to purchase foreign exchange from the Bank of Ghana for sale to their end-user customers and to meet their own foreign exchange needs. They could then sell the foreign exchange obtained to their customers subject to a margin determined by each authorised dealer.

The wholesale auction system was abolished in April 1992 and replaced by the inter-bank market. As expected, both the commercial banks and the Forex

Bureau have operated in a competitive environment since then. It is clear from Table 1 above 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 foreign exchange market has been mainly to smooth fluctuations in the foreign exchange market.

Generally, the exchange rate system has had a huge influence on the flows of exports and imports in Ghana. As such, the pattern of trade has changed significantly since the trade reforms were initiated. In particular, the export to GDP ratio was higher in 1996-2000 (between 32.1% and 49.2%) compared to 1994-1995 where the export to GDP ratio actually fell from 25.3% to 24.5%. In the later period however, the import to GDP ratio also was higher (between 40.09% and 69.59%) than in 1994-1995 (between 32.56% and 32.93%), (Bhattarai & Armah, 2013).

The nominal exchange rate is known not to be the only influencing variable on the real exchange rate, and the effect of the nominal exchange rate on the real exchange rate has not been clear. Moreover, the assertion that the nominal exchange rate contributes more to the movement of the real exchange rate has also not been made clear between the neo-Keynesian and the classical schools of thoughts in economics. The classical school of thoughts argue that the increased variability or otherwise of the real exchange rate is caused by a shift from either the fixed or flexible exchange rate regime that is adopted. However, the computed correlation coefficient between the nominal exchange rate and the real exchange rate in Ghana seems to confirm the view held by the neo-Keynesian economists. This result suggests that the variability of the real

exchange rate is largely accounted for by the changes in the nominal exchange rate (Musila, 2002).

Statement of the Problem

Exchange rate management has been a challenging phenomenon in macroeconomic policy issue. It one of the most important factors for economic growth in the economies of Southeast Asia and so its volatility has been one of the major obstacles to economic growth of many African and Latin American economies.

According to Bhattarai and Armah (2013), exchange rate has been employed as a tool for regulating flows of trade and capital by several developing economies which tend to have persistent deficits in the balance of payments due to the structural gap between the volumes of exports and imports. These economies tend to have inelastic demand for both exports and imports. Moreover, the rate of growth of imports is often higher than the rate of growth of exports resulting in rising imbalances in trade. There have been a lot of discussions in the literature about the determinants of real and nominal exchange rates and how they influence trade and growth in an economy.

Since her independence, Ghana has been confronted with the choice of adopting the appropriate exchange rate policy that will induce economic growth and stability. In order to achieve this objective, the country has carried out several reforms in the exchange rate system, supported by macro-economic policies and liberalization of the exchange rate and trade systems since the implementation of the Economic Recovery Programme (ERP) in 1983. In addition, it has adopted a number of corrective measures on her exchange rates

dominated by devaluing her currency since 1967. The aim is to boast exports and discourage imports for the purpose of improving her current account balance. Nonetheless, there is still debate whether or not the Marshal Lerner Robinson condition applies to developing economies such as Ghana. That is whether devaluation really improves the country's trade balance since the foreign exchange rate adjustments have not proved supportive to the economy's external trade based on the fact that the country's current account is still dominated by deficits.

This concern is genuine in that the exchange rate has been depreciating yet the country has not done much to increase her exports and foreign exchange in order to offset the current account deficit. The fact that Ghana is a net importer as well as an exporter of primary products suggests the country can hardly take advantage of devaluation or exchange rate depreciations currently.

What's the way forward then? What can we therefore do as a country to control, arrest and stabilize the exchange rate? Perhaps, this study is undertaken to provide some solutions to these concerns. Therefore the study seeks to investigate the extent to which earnings of cocoa and non-traditional exports affect the real exchange rate. The purpose of this is to determine the driver of Ghana's foreign exchange in relation to food exports so specific policies can be recommended to specific commodities concerned. This can eventually have some effect on the exchange rate as the country expands productivity of those sectors alongside value addition.

Therefore, one of the important elements of policy that fosters domestic exports is the understanding of patterns exports. And so exchange rate has been empirically studied by a number of researchers. For instance, in his study of real

exchange rate of twelve developing countries, Edwards (1989) found that an increase in capital inflows appreciated the real exchange rate, as expected, (Jongwanich, 2009) conducted a study on Equilibrium Real Exchange Rate, Misalignment and Export Performance in Developing Asia. He found that government expenditure (*GEXP*) and terms of trade (*TOT*) tend to explain movements of real exchange rate with a larger magnitude than other variables, in their study of the determinants of the real exchange rate. For South Africa, (Aron, Elbadawi, & Kahn, 1997) found results consistent with theory such that an increase in reserves appreciated the real exchange rate. As such, an increase in reserves has the effect of appreciating the real exchange rate, while a decrease in reserves depreciates the real exchange rate. Again, Mkenda (2001) analyzed the main determinants of the real exchange rate in Zambia and estimated the degree of misalignment in the real exchange rate. By using Johansen cointegration analysis explored that terms of trade and government consumption were depreciating real exchange rate while investment share, growth of real GDP, central bank reserves was appreciating real exchange rate for export. However, the study could not show specific exports commodities that characterized the reserves of the central bank of Zambia anyway.

Nonetheless, this study will incorporate earnings of export as a source of reserves, which will be disaggregated into the earnings of cocoa and non-traditional exports. This way we can determine their individual contribution in terms of foreign exchange generation aside other policies intended to control the exchange rate.

From the perspective of the Ghanaian situation, figure 1 presents the trend of real effective exchange rate and export of cocoa and non-traditional exports from 1988 to 2012.

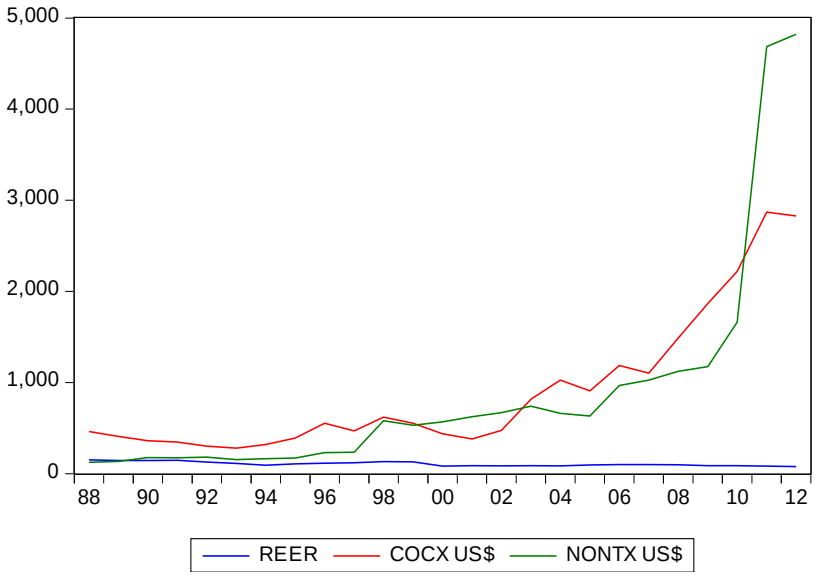

Figure 1: Trend of real effective exchange rate and earnings of cocoa and non-traditional exports from 1988 to 2012.
Source: Generated by the author.

It can be seen from the figure 1 that real effective exchange rate was relatively stable with mild fluctuations from 1988 to 2000. At the same time both earnings of cocoa and non-traditional exports fell from 1988 until 1994 and began to rise but earnings of cocoa export rose faster than that of non-traditional export earnings. However real effective exchange rate fell from 2000 until 2005 with rising portion of both export earnings. The real effective exchange rate then rose slightly from 2005 up to 2009 although both earnings were rising but that of cocoa lied above non-traditional export earnings. The real effective exchange rate fell again thereafter with sharper rise of earnings of non-traditional than that of cocoa exports. To some extent the falling portion of

the real effective exchange rate could partly be explained by the rising portion of both earnings (forex) among other factors. Hence, this gap in the literature informed the bases of the study so we could test the effect of earnings of cocoa and non-traditional exports on real effective exchange rate

To investigate exchange rate and earnings of cocoa and non-traditional exports, this study intends to explore the effect of earnings of cocoa and non-traditional exports on exchange rate by using econometric model. It is necessary to note that the earnings of cocoa and non-traditional exports entered the model as policy variables so we could investigate their effects on the real exchange rate. This therefore forms the basis of the study which examines whether or not those earnings have some influence on real exchange rate in both short run and long run.

Objectives of the Study

The main objective of this study is to investigate the effects of earnings of cocoa and non-traditional exports on exchange rate in order to determine their impact on foreign exchange. Specifically, the study seeks to;

a) Analyze the long-run relationship between earnings of cocoa and non-traditional exports and exchange rate.
b) Examine the short run relationship between earnings of cocoa and non-traditional exports and exchange rate.
c) Explore the response of exchange rate to earnings of cocoa and non-traditional exports by the use of Bayesian VAR.

Research Hypotheses

1. H_0: There is no long run negative relationship between earnings of cocoa and non-traditional exports and exchange rate.

   H_1: There is a long run negative relationship between earnings of cocoa and non-traditional exports and exchange rate.

2. H_0: There is no short run negative relationship between earnings of cocoa and non-traditional exports and exchange rate.

   H_1: There is short run negative relationship between earnings of cocoa and non-traditional exports and exchange rate.

3. H_0: Exchange rate will not respond to shocks in earnings of cocoa and non-traditional exports.

   H_1: Exchange rate will respond to shocks in earnings of cocoa and non-traditional exports.

Justification of the Study

The exchange rate and external trade are areas in modern economies which are of great concern to institutions like International Monetary Fund (IMF), World Bank, the Bank of Ghana and Ministry of Finance and so on. This research is intended to assess the effects of Ghana's exports on exchange rate. Although Ghana is an import dependent economy or net importer, her exports does not yield adequate foreign exchange simply because it does not add value to her traditional exports. According to theory exchange rate depreciation should make imports expensive whiles making exports relatively cheaper to boosting foreign exchange generation. Unfortunately, past trends of exchange rate depreciations do not necessarily reflect an upward adjustment of Ghana's

exports and so, this study focuses on what the country can do in terms of the export sector of the economy to curbing the free but rapid rise of exchange rate so that a little more attention could be given to the production of her major export commodities since the economy can hardly take advantage in the presence of exchange rate depreciations.

Again, the country will have to be more innovative in terms of adding value to our exports. In order words, this study will ascertain the sectorial contribution of these export commodities to the foreign exchange generation among other policies. This therefore leaves the dilemma to be investigated as to which export commodities can have much or less impact on exchange rate so that policies can be directed to specific commodities. Therefore, it is justifiable to investigate the effects of earnings of cocoa and non-traditional exports on exchange rate regime. Therefore, the responsiveness of exchange rate changes to exports is important to policy makers in formulating trade policies for Ghana. The research will reveal the malaise in the external trade and eventually presents a study capable of making contribution to international trade

Scope of the Study

Foreign exchange rate and export are not only broad but also complex area as far as the Ghanaian economy is concerned. In order to do justice to this enquiry, the study aims to investigate the relationship among the real exchange rate and macroeconomic variables under the multivariate framework. The study focused on the period between 1990Q1 and 2011Q4 using quarterly but disaggregated data for exports and other covariates in the study. The rationale behind the choice of the sample period is due to unavailability of data. The study

uses the Johansen approach to cointegration and VEC to examine the relationship between the variables under consideration.

Organization of the Study

The study is organized into six chapters. Chapter one looks at the general introduction comprising the statement of the problem, objectives of the study, hypotheses, justification of the study as well as the scope of the study. Chapter two concentrates on overview of the Ghanaian economy, whiles chapter three deals with review of relevant literature. Chapter four focuses on the methodology used in the study. Chapter five analyses and discusses the empirical results of the estimated models in the study. The final chapter captures the summary of the study, recommendation for policy considerations and conclusion.

CHAPTER TWO

OVERVIEW OF THE GHANAIAN ECONOMY

Introduction

This chapter presents the overview of the Ghanaian economy with special emphasis on cocoa and non-traditional exports and exchange rate as well. The rationale is to give a comprehensive view and draw attention to the various developments that have characterized the various sectors over the years.

The Ghanaian Economy

Ghana is well-endowed with natural resources and so it has relied on these resources predominantly to spearhead its economic development. However, as a result of economic mismanagement and political instability the economy moved at a snail pace from a vibrant economy during the early years of independence to the 1970s and early 1980s. The economy gradually picked up in the late 1980s due to strong austerity measures and increase inflow of foreign loans and grants which resulted in high GDP growth, especially in the import sector. This also led to an accumulation of a large external debt. The economy was characterized by democratization in the 1990s and so it displayed some sort of resilience that made it stable. If not for the world economic crisis in 2008, the 2000s marked the entering of the Golden Age of Ghana's growth. Consequently, Ghana rebased its national accounts, changing the base year from 1993 to 2006. Following the rebasing, the size of the economy in real gross domestic product (GDP) terms has been raised threefold and placed Ghana among the lower middle income group of countries. The rebasing suggested greater fiscal space for Ghana with a reduced revenue-to-GDP ratio.

Ghana's current economic structure is basically dominated by the activities and structures that were established with the beginning of colonialism in the 19th century, and that has subsequently been reinforced throughout independence until today. The West African colonies were seen as an excellent location to produce cash crops like cocoa, coffee, cotton, and rubber, in exchange for manufactured items from Europe. Therefore, Gold Coast became the most important producer for cocoa and gold and so in 1911, the country became the world's largest cocoa exporter, producing about 40% of the total World supply between 1920 and 1940 at the time.

In 1983, production of cocoa, the main export product over all these years, had dropped from a peak of 572,000 tons in 1964 to 180,000 tons. Between 1960 and 1982, the productivity of labor had declined by 3.6 percent per annum. The productivity of capital also declined 2.0 percent per annum, with total factor productivity for all sectors of the economy decreasing by 2.3 percent per annum. The transfer of resources from the highly profitable cocoa sector to finance state-owned industries, coupled with a regime of import substitution that protected indigenous companies from efficient foreign competition marked the beginning of Ghana's economic downturn.

According to Hoefter (2001) the consequence of this policy was a steady decline of cocoa exports, leading to serious balance of payment deficits, high inflation, and finally to the collapse of the economy in 1983.

The deplorable state of the economy resulted from the mismanagement of the economy, coupled with its substances of corruption, brain drain, embezzlement and low growth rate of about 3.1%. Other factors included excessive government involvement in business, unregulated and undeveloped

financial system in the (banks, insurance firms, and so on), low foreign exchange earnings and weak infrastructure for growth and development. In order to arrest this situation, the government launched the economic recovery program (ERP) in April 1983. Botchway (2009) emphasized that the ERP would put the country back on its track to prepare the ground for a continuous and sustainable economic growth and development).

Ghana's Economic Recovery Program (ERP) had five key objectives: The realignment of relative prices to encourage production and exports; a progressive shift from direct intervention towards the reliance on market forces; the restoration of fiscal and monetary discipline; the rehabilitation of social and economic infrastructure; and structural and institutional reforms to enhance the efficiency of the economy and to encourage the expansion of savings and investments. The first reform step that was undertaken had to do with the devaluation of the cedi and the liberalisation of the exchange rate. As a start in 1983, the Rawlings government introduced export bonuses and import surcharges, two measures that had the same effect as devaluation but needed not to be communicated as such. After half a year, the taboo of devaluation had been broken, and the government devalued the cedi continuously until 1986. This was done by introducing the auction system to depoliticise the exchange rate policy and to remove the burden of acting from the government. As part of the reform, the government absorbed the remaining parallel market in 1988 by establishing foreign exchange bureau and this had a positive effects on livelihood.

In parallel to the liberalisation of the exchange rate reform, the country's trade and investment policies were reformed. The government eliminated the

highly complex import licensing system that had been the basis for political favouritism and corruption. As part of the liberalization, there was an establishment of a uniform imports uniform tariff. While trade reforms were implemented very rapidly, the complex legal and regulatory framework for investments and corporate taxes were dismantled only slowly. The government called in an advisory group to identify constraints on the private sector and to pave the way to revisions in the regulatory framework in 1991. Nevertheless, a fully liberalised investment code was only established in 1994, incorporating a broad range of investment incentives. The privatisation of Ghana's SOEs was initiated in 1987, but started only in 1992. During the first phase of the ERP, Ghana's reform strategy was not to reduce the SOE sector, but to expose it to competition as a forcing device. The divestiture program really started after 1992 where about 212 of the more than 300 SOEs had been either sold or liquidated in 1998. However, Hoefter (2001) argues that sectors such as transportation including airlines and ports and utility including electricity and oil are still government monopolies dominated by SOEs. Killick (2010) postulates that the period from 1992-2002 was marked by state driven macroeconomic instability. As such, the whole machinery of government was geared to supporting the efforts of individual Ghanaians and that of foreign investors in Ghana to increase their production as well as improve their competiveness.

In 2007, Ghana was recognized as the most favourable country to do business in West Africa. In 2008, the economy saw a sharp increase in credit to the private sector from 45 per cent in 2001 to 62 per cent.

Consequently, macroeconomic situation was strengthened, in particular, fiscal deficit was brought down from 7 per cent of GDP in 2002 to 3 per cent in 2005. Money supply growth was reduced from 50 per cent in 2002 to 14 per cent in 2005. As such, inflation was brought down to single-digit and the rapid depreciation of the cedi curtailed. These virtues helped the economy to expand at a rate unprecedented in Ghana's history, with GDP growth of nearly 6 per cent p.a. over 2002 to 2007. However, in 2008, the economy experienced a down turn as a result of the world economic crisis in creation of huge external debt, resulting from excessive domestic spending (Killick, 2010).

Ghana became a middle income economy after rebasing the economy in November 2010, putting the value of the economy at GH₵44.8 billion. Accordingly, the base year was changed from 1993 to 2006 resulting in a 60.3% increase in the size of the gross domestic product (GDP) with the service sector overtaking the agricultural sector as the highest contributor to GDP.

The Structure of Ghana's Economy

Ghana's reform program was implemented in three phases: In the first phase between 1983 and 1986, the focus was on getting prices right, consequently reducing the government's budget deficit by increasing revenues. Efforts were concentrated on the initiation of structural changes, such as the liberalisation of the exchange rate and the trade system, the start of the SOE divestiture program, and civil service reforms between 1987 and 1990. In the third phase, 1990 thereafter, the government began to look at the more demanding structural and institutional reforms. The implementation of these policies led to a major turnaround between 1983 and 1991. Consequently,

inflation declined, the overall balance of payment position stabilized, GDP growth recovered from negative numbers to about 5.5 percent per annum, and the real GDP per capita grew by 4.2 percent per annum. After 1991, Ghana's macroeconomic performance was characterized by a downturn. As part of its election campaign in 1992, the government granted large increases in wages and benefits for public sector employees. This fiscal shock fueled inflation, and led to an increase in government debt. As it happened in 1992, the government repeated the same mistakes of increasing spending levels which led to a rise in government deficit from 6 percent to 10 percent of the GDP in 1996 (Election year). Hoefter (2001) emphasizes that between 1992 and 1998, GDP growth averaged 4.2 percent, but real GDP per capita was 2.0 percent per annum.

The overall response of the private sector to Ghana's structural reforms has not been particularly strong, and overall investment rates are low compared to other low income countries. Total investments have risen from 14 percent of GDP in 1993 to 17 percent in 1997, but more than half of that came from government capital expenditure. Private investments had risen to about 8 percent of GDP in 1991, but in 1992 the government's fiscal policy dropped by 42 percent. After the second fiscal shock, private investments had fallen to 4 percent of GDP in 1996. In part, the low investment rates in the private sector can be tracked back to the high cost of capital and scarcity of capital available for private investments. Net savings increased from 5 percent of GDP in 1993 to 9 percent in 1997, which is very low per international as well as Sub-Saharan African standards. According to Hoefter (2001), the uncertainty about the government's long-term attitude towards private enterprises probably increased the cost of capital and further reduced the incentives for capital investments).

Foreign aid, debt, and direct investments have financed most of Ghana's increase in investments. In 1997, per capita aid averaged about USD 50, more than doubles the Sub-Saharan average, and contributed about 55 percent to the total investment level. Foreign direct investments were substantial between 1993 and 1996 when the gold mining industry was privatised, but have declined since then. This led the growth rate of Gross domestic product (GDP) to increase to 6.2 percent in 2006, bringing the average to 5 percent over the past five years, a dividend from deepening macroeconomic stability. GDP grew by 6.3 percent in 2007, which was mainly driven by the service sector with a growth of 8.2 percent.

The size of the economy in 2010 was estimated at GH₵46232 million compared with GH₵25602.5 million under the old series, with a per capita income of US$1318 following the rebasing the economy from 1993 to 2006. In 2010, the macroeconomic fundamentals of the Ghanaian economy improved significantly as price stability held firm. Inflation steadily declined throughout the year, supported by improved food production and exchange rate stability.

Agricultural Sector

Ghana's economy is basically agrarian, and agriculture is undoubtedly the largest sector. As such agriculture is Ghana's most important sector, representing 40 percent of GDP, 30 percent of export earnings, and 70 percent of employment. Its performance since 1983 has been below expectations. According to Hoefter (2001), between 1983 and 1990, the overall sector grew by 2.6 percent per year, and slowed down to 2.2 percent from 1990 until 1996.

Ghana's farming is dominated by smallholdings which are rarely larger than 4 hackers. The main production method is mixed cropping, a combination of tree crops with roots and other agricultural products. The introduction of large scale, mechanized farming during the 1960s proved to be a failure, and as of now hardly any large farms continue to be in operation. Food crops are the most important contributors to agricultural output, followed by cocoa, timber and fishing. Ghana's most important staple crops are root crops like cassava and yams. The most important tree crops are palm fruit and cocoa.

Historically, most important cash crops like palm oil and cotton had been marketed by government monopolies. During the ERP, the government removed food price controls, and abandoned most marketing monopolies except for cocoa. The results of these measures were mixed. After the removal of price controls, mainly the production of starchy staples and cereals, and fresh fruit appear to have risen, while the production of most other crops has not taken off. Overall, the productivity of Ghana's agricultural sector is quite low, estimated to operate only at 20 percent of its capacity because of low investments and poor technology. Low investments since 1983, coupled with the removal of subsidies on fertilizers and other agricultural inputs, have not helped to improve its productivity, leaving considerable unexploited potential for further expansion.

Agriculture contributes substantially to government revenue mainly through duties paid on the export of agricultural commodities, especially cocoa; and it has been the major contributor to Ghana's foreign exchange earnings for several years. Until 1992, agriculture accounted for the highest proportion of total foreign exchange earned in the country. This role is performed through exports of agricultural commodities and conservation of foreign exchange by

producing import-substituting food and raw materials. Between 1999 and 2002 for example, the agricultural sector contributed 38.5%, 35.4%, 33.9%, and 35.5%, respectively, to the country's foreign exchange earnings (Hoefter, 2001).

The agriculture sector has generally performed below potential, according to the World Trade Organization report on Ghana. Agricultural development, including food self-sufficiency, is an important component of the Government's Vision 2020. To meet these objectives, the Government adopted an "Accelerated Agricultural Growth and Development Strategy in support of Vision 2020" for 1997 to 2007. The strategy is to achieve annual real growth of 6% in the sector – substantially above the annual average of 4% recorded between 1995 and 1999 – based substantially on exports. The strategy covers all of agriculture, including crops, livestock, fisheries, forestry, and cocoa. Such growth is to be achieved by adopting open market principles to encourage private sector investment, and greater devolution of responsibilities from central government to district assemblies. The main element of the strategy is to promote export of selected products, through improved access to overseas markets, in accordance with Ghana's comparative advantage. Products expected to perform well include cocoa, maize, yam, cassava, soya bean, Asian vegetables, cashews, pineapples, and tilapia. Targeted tax incentives and trade reforms, such as facilitating regional trade arrangements, are expected to help boost the private sector. The aim is to increase Ghana's agricultural exports by an average of 15% annually, compared with annual growth of almost 9% between 1991 and 1996 (Khor & Hormeku, 2006).

The Role of Foreign Trade in Ghana's Economy

Generally, the exports of Ghana are destined for Europe, which include United Kingdom, Netherlands, Germany and France. Europe, Japan and the United State. Ghana's total volume of foreign trade, both imports and exports after exclusion of aid-funded imports, is about 35 percent of GDP – considerably lower than the trade level for other high-growth countries, which are often above 100 percent of GDP. Ghana's exports continue to be dominated by primary commodities, namely gold and cocoa. The country's terms of trade have been declining rapidly between 1989 and 1993 as a result of falling gold and cocoa prices. Capital goods, intermediate goods, and fuel and energy dominate Ghana's import bill. Increasing energy shortages requiring additional fuel imports and a decline in gold prices have led to a worsening of Ghana's trade balance particularly in 1997.

Overview of Ghana's Export Structure

Between 1990 and 1997, Ghana's total exports have grown 7.5 percent per year, from USD 897 million to USD 1.5 billion. While in 1990, exports contributed 16 percent to GDP, by 1997 its share had grown to 25 percent of GDP. Ghana's most important traditional export products, gold, cocoa, and timber, accounted for 82 percent of Ghana's export in 1997. Most of the growth in Ghana's export comes from an increase in gold production from 526,000 ounces in 1990 to 1.75 million ounces in 1997, leading to an average annual export growth of 20 percent in value per year.

The recovery of cocoa, Ghana's second most important export product, has been sluggish, with exports growing from 267,000 tons in 1990 to 314,000

tons in 1997, equal to a two percent increase in value. Over the same period, timber exports have grown from 370,000 cubic meters to 442,000 cubic meters, with a value increase of 12 percent per year.

Cocoa Production and Exports

According to Bulir (1998) cocoa has historically been a key economic sector and a major source of export and fiscal earnings. There has been a positive supply response in the cocoa sector to the price incentives and the incentives provided under the ERP through the cocoa Rehabilitation Project. As a result, cocoa production increased with export of cocoa beans rising from 19224 tonnes in 1986 to 243040 tonnes in 1991. In recent years, cocoa production more than doubled, from 395,000 tons in 2000 to 740,000 tons in 2005, contributing 28 percent of agricultural growth in 2006—up from 19 in 2001. Earlier evidence of the relatively low supply elasticities of cocoa producers in Ghana makes this development even more impressive (Abdulai & Rieder, 1995).

The boost in production has led to an increase of cocoa's share in agricultural GDP from 13.7 percent in 2000-2004 to 18.9 percent in 2005/2006. Producer prices rose by about 260 percent between 2000 and 2006, largely driven by the surge in world prices before 2003 and the reduced marketing margins since then. Together, both developments have led to an increase in producers' share of FOB prices from about 50 percent in 2002 to 75 percent in 2005/2006. Abdulai and Rieder (1995) postulate that the earlier studies found a strong correlation between producer prices and the supply of cocoa in Ghana

and the recent price increase is likely to have made a significant contribution to the strong cocoa performance.

Growth in yields, almost 40 percent between 2000 and 2004, has slowed in recent years. The Cocoa Board's promotion of technological packages and the increased access to credit, together with a partial liberalisation of cocoa marketing, are likely to have raised productivity. Vigneri (2007) identifies higher input of family labor into production and favorable weather conditions as major causes for yield increases. Despite the recent increase in yields, huge potential exists for further improvements: the Ministry of Food and Agriculture (MOFA) estimates that achievable yields for cocoa are around 1-1.5 tons per hectare, more than double the average yields in 2005 (Ministry of Food and Agriculture, 2007).

Ministry of food and Agriculture (2006), argues that area expansion has contributed to output growth from 2002 to 2004, but the area planted has since declined, from two million hectares in 2004 to 1.8 million hectares in 2006, about 25 percent of cultivated land in Ghana. A comparison of land currently devoted to cocoa production and land that is suitable for the production of cocoa indicates that future growth in production through area expansion will be limited.

According to Bank of Ghana (2007), cocoa exports, the second most important export good for Ghana, have more than doubled between 2002 and 2006. In 2005, cocoa beans (24.3 percent) and cocoa products (3.8 percent) accounted for about 28 percent of total exports, slightly behind gold and significantly behind forestry products 15 percent). Cocoa accounts for about half of agricultural exports, including forestry and fishery. In comparison, the

two major non-traditional agricultural export commodities, palm oil and fruits, together account for only about 4 percent of total agricultural exports. Despite cocoa's rapid export growth, Ghana's trade deficit has widened to about 28 percent of GDP, because of rapidly rising imports.

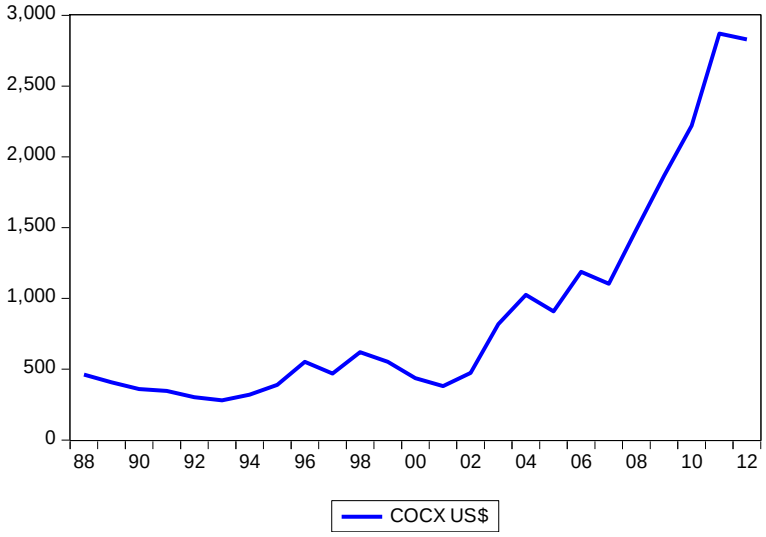

Figure 2: Trend of cocoa exports earnings from 1988 to 2012
Source: Generated by the author.

Figure 2 shows the trend in cocoa export earnings. These earnings have been unstable since 1988. As such these earnings fell from 1988 to 1993 after which it rose up 1996. It then fluctuated until 2007 and rose steadily. It is necessary to note that the lowest and highest earnings were recorded in 1993 and 2011 respectively. The steadily upward rise from 2007 could be attributed to the competitive nature in the export sector, favorable terms of trade or government policies such as mass cocoa spraying among others.

Non-Traditional Exports

Between 1990 and 1997, Ghana's non-traditional exports have grown 27 percent per year, and increased their share in total exports from 7 percent in 1990 to 22 percent in 1997. The most significant factor for this growth is the effort to export both cocoa and timber in semi-processed forms. Excluding these two products, nontraditional exports have grown by 20 percent. Responsible for the growth were mainly increases in horticultural exports such as pineapples and yams, and other cash crops like palm oil, sheanut, coffee and cashew, canned tuna fish among others.

The bulk of Ghana's exports are destined for Europe, which accounted for 54 percent of all exports in 1996, in particular to the UK, Netherlands, Germany and France. Europe, Japan and the US are mainly importing minerals, agricultural products and timber. Ghana's manufactured products such as textiles, plastic goods and aluminum household ware are mostly destined for neighboring ECOWAS (Economic Community of West African States) countries. Compared to the overall volume of trade, Ghana participates very little in interregional trade. In 1996, only 2.5 percent of the total export value went to neighboring countries and ECOWAS members.

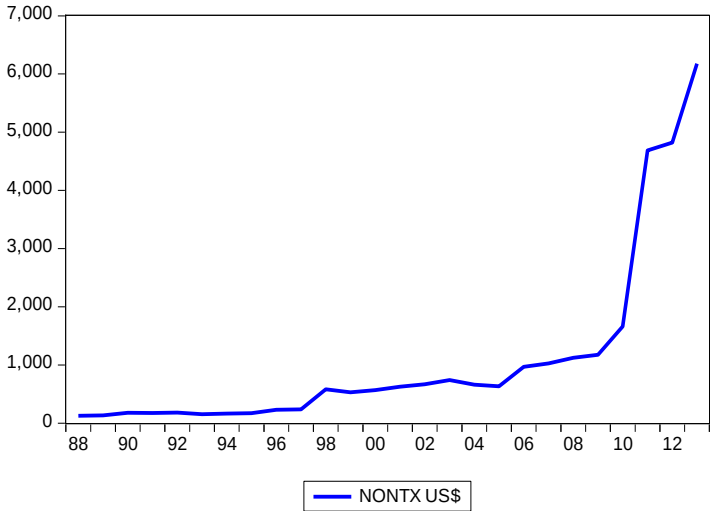

Figure 3: Trend of non-traditional exports earnings from 1988 to 2012
Source: Generated by the author.

Figure 3 shows the trend in non-traditional exports earnings. These earnings have not been stable since 1988. Here, the earnings were relatively stable between 1998 and 1995 after which it trended upwards with mild fluctuations. It is necessary to note that the lowest and highest earnings were recorded in 1988 and 2011 respectively. The steadily upward rise from 2007 could be attributed to the competitive nature in the export sector as well as improvement in technology.

Trends of Other variables.

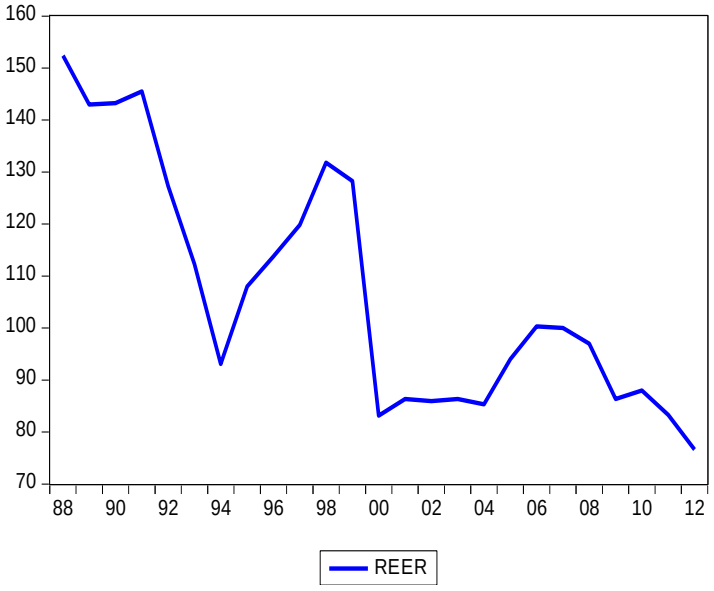

Figure 4: Trend of real effective exchange rate from 1988 to 2012
Source: Generated by the author.

Figure 4 shows the trend of real effective exchange rate. The figure indicates much fluctuations in the real effective exchange rate. As such, the country recorded the lowest in 2004 after which it rose until 1998. It then fell and became relatively stable between 2000 and 2004. It rose again until 2007 and fell thereafter.

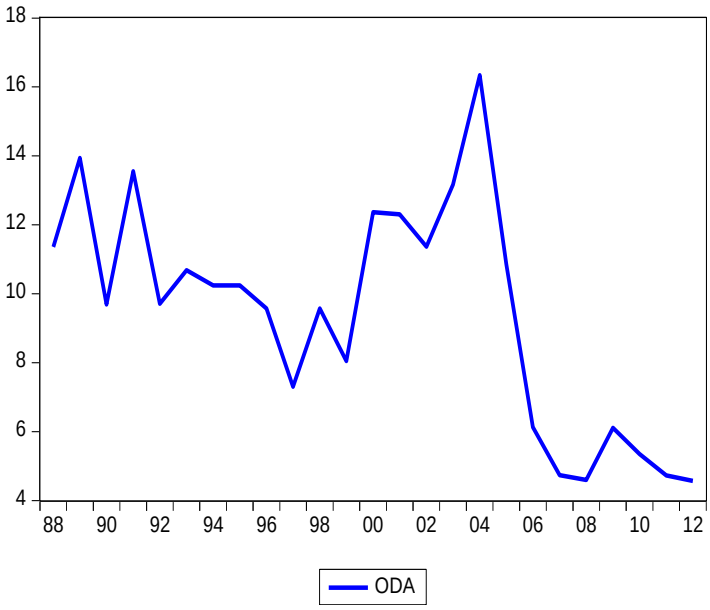

Figure 5: Trend of foreign aid (ODA) from 1988 to 2012
Source: Generated by the author.

Figure 5 shows the trend of foreign aid. From the figure it is clear that foreign aid has been unstable since 1988. As a result it fluctuated pretty much between 1988 and 2002. It then increased, attained it maximum ever in 2004 and began to fall sharply until 2008. The fall in foreign aid could be attributed to the global financial crises that hit the world in 2008. However, it began to pick up again until 2009 and fell thereafter. The country recorded the lowest and highest aid in 2004 and 2008 respectively.

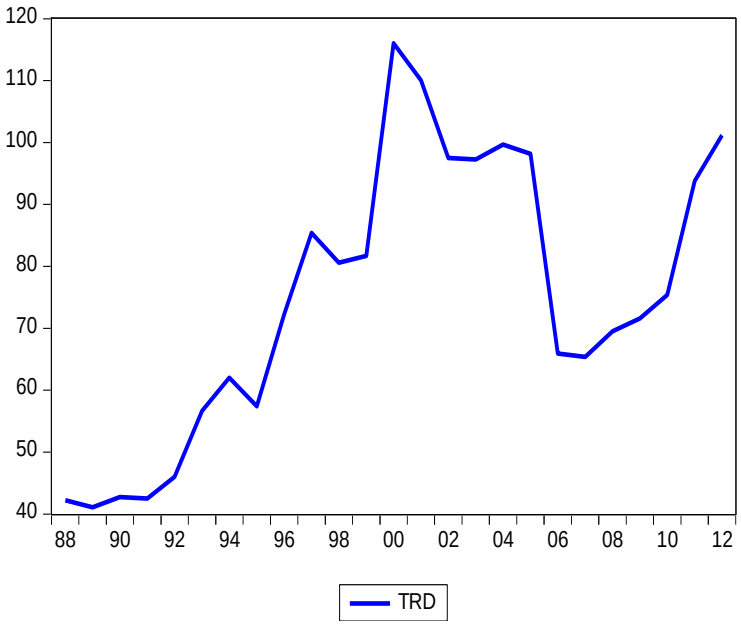

Figure 6: Trend of trade openness (TRD) from 1988 to 2012
Source: Generated by the author.

Figure 6 shows the trend of trade openness, 1988-2012. It can be seen from the figure that trade openness has not been stable since 1988 and so it exhibited some level of fluctuations (rise and fall) between 1988 until 2006 beyond which it rose steadily. Further, the lowest and highest level of openness were 1989 and 2001 respectively.

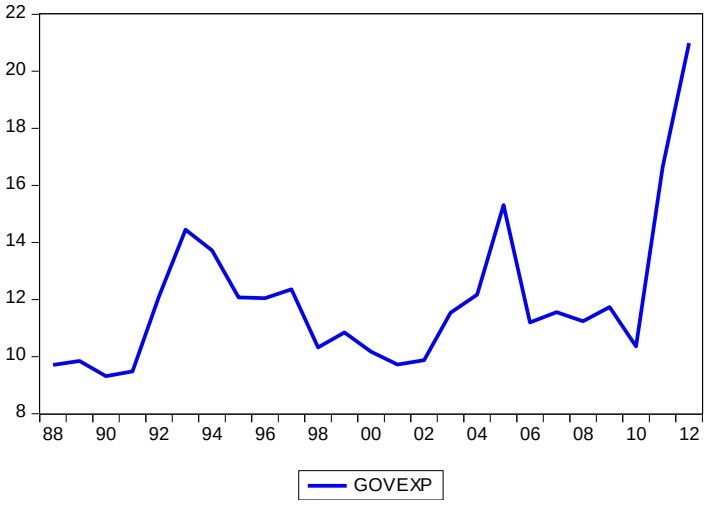

Figure 7: Trend of government expenditure from 1988 to 2012
Source: Generated by the author.

Figure 7 shows the trend of government expenditure, 1988-2012. It can be seen from the figure that government expenditure exhibited some fluctuations between 1988 and 2010. Government expenditure rose from 1990 to 2003 and fell thereafter with mild fluctuations until 2002. It then rose again up to 2005, fell thereafter and rose sharply from 2010. The country recorded the lowest and highest government spending and highest aid in 1990 and 2012 respectively.

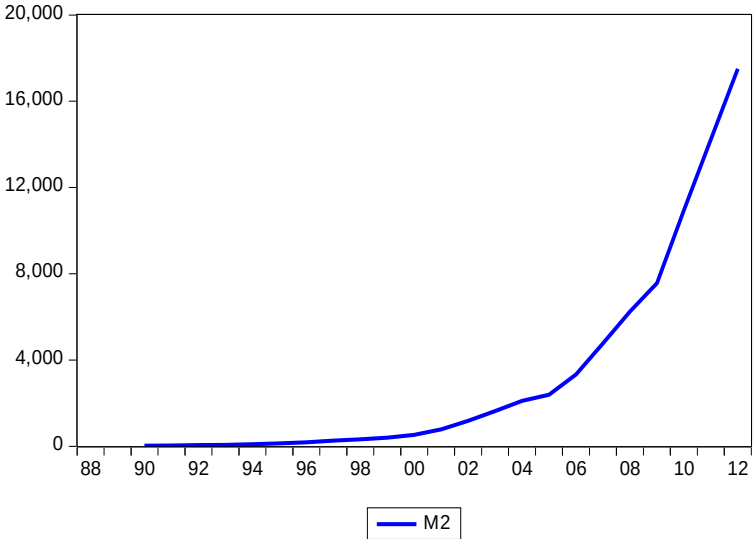

Figure 8: Trend of money supply from 1988 to 2012
Source: Generated by the author.

The figure 8 shows the trend of money supply. It can observed that money supply has been exhibiting a stable trend since 1990. However, the lowest was recorded in in 1990 while 2012 recorded the highest.

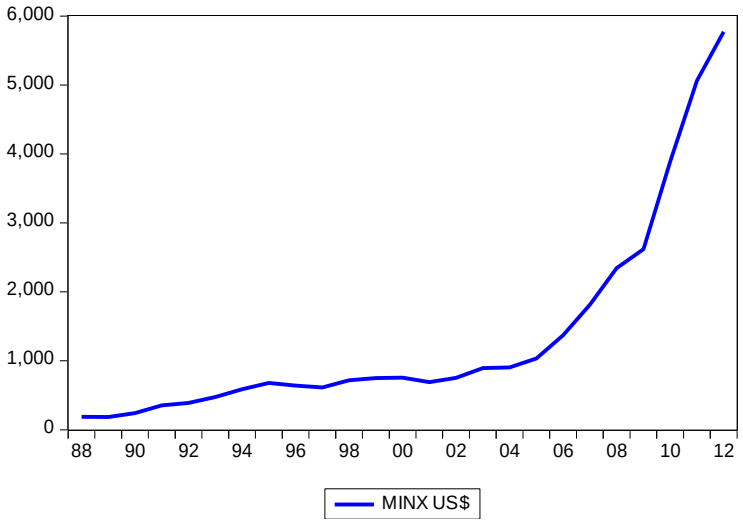

Figure 9: Trend of mineral export from 1988 to 2012
Source: Generated by the author.

The figure shows the trend of mineral export earnings which is relatively stable within the time frame. However, the earnings rose steadily from 1988 until 2005. The country then experienced a sharp increase in the earnings of mineral export thereafter. The country recorded the lowest and highest aid in 2004 and 2008 respectively. The lowest earnings was recorded in 1988 though.

CHAPTER THREE

LITERATURE REVIEW

Introduction

This chapter discusses the phenomenon of the core issues with regards to the real exchange rate and exports in Ghana. The chapter is organised into three sections. The first section presents the definitional and measurement of the phenomena, with the second section touching on related theoretical issues. The third section reviews the related empirical work on real exchange rate and cocoa and non-traditional exports.

Theoretical Review

Definition of Concepts

Measurement of the actual real exchange rate is the first step in estimating the long run equilibrium real exchange rate. Unfortunately, there are both conceptual and empirical challenges in the measurement of the real exchange rate. There are several definitions of both the nominal and real exchange rate, which are based on different analytical frameworks and used for different purposes. These multiple conceptual definitions are often misunderstood and have difficult analysis of exchange rate issues.

The real exchange rate is determined in the exchange rate market. Thus, for trade to take place, one country's currency is converted to the other. The exchange rate is the price of one currency in terms of another currency. Put differently, it is the rate at which currencies are exchanged, for example the units of cedis needed to buy a unit of a dollar. Spot exchange rate and forward

exchange rates are the two major types of exchange. The former being the predominant one, is the exchange rate for immediate (two-day) exchange of bank deposits or currencies while the latter refers to the rate for the exchange of bank deposits at some specified future date (forward transaction). When a currency falls in value in relation to another, it is said to be depreciating. Conversely, when a currency increases in value in relation to other currencies, it is referred to as appreciation (Takaendesa, 2006).

Exchange rates could also be Nominal, Real, Bilateral and Multilateral. The nominal exchange rate is simply the price of one currency in terms of the other. Takaendesa (2006), argues that the nominal exchange rate can be expressed in two forms namely the indirect European quotation and the direct American quotation. The indirect European quotation is the price of a unit of foreign currency in terms of the units of local currency while the direct American quotation is the price of the local currency in terms of units of foreign currency.

Concerning the real exchange rate, the literature has indicated that there has not been a general agreement among economist on its measurement in that economists use different types of macroeconomic models for different purposes, a series of analytical real exchange rate definitions tend to be used. Theory has shown that the definition of the real exchange rate can be grouped into internal and external real exchange rate. The internal real exchange rate refers to the ratio of the domestic price of tradable to non-tradable goods within a single economy whereas the external exchange rate is the nominal exchange rate adjusted for price level differences among countries (Black, 1994).

The internal real exchange rate indicates the domestic resource allocation incentives in the home country, as it is defined as the internal relative price incentive for producing or consuming tradable goods as opposed to non-tradable goods. Different expressions of the internal real exchange rate can be derived depending on whether we are looking at two or multi-good models. The most used definition of the internal real exchange rate derives from the Salter-Swan non-traded goods model (Black, 1994). The real exchange rate in this case is expressed as the ratio of the price of tradable goods to non-tradable goods as follows:

$$RER \equiv e \equiv E \frac{P_T^*}{P_N} \quad (1)$$

Where P_T^* is the world price for traded goods is, P_N is the (domestic) price of non-traded goods and *E* is the nominal exchange rate. In this case, therefore, an increase in real exchange rate implies depreciation, while a decrease means an appreciation. The real exchange rate stated in equation one above can be stated indirectly which will then mean that, an increase in real exchange rate implies an appreciation of the domestic currency, while a decrease will imply a depreciation.

According to (Montiel, 2003) the external real exchange rate starts from the purchasing power parity (PPP) theory, which compares two countries and the relative prices of baskets of goods produced or consumed. In this case, the real exchange rate is defined as the ratio of the price of foreign goods to that of domestic goods, expressed in domestic currency. The external real exchange rate is calculated as:

$$RER \equiv e \equiv E\frac{P^*}{P} \quad (2)$$

Where e is the real exchange rate, E is the nominal exchange rate expressed as the domestic currency price of a foreign currency, P^* is the foreign price level and P is the domestic price level. This definition is PPP-based, and it is widely used in empirical studies on developed countries.

There are also concepts of nominal effective exchange rates and real effective exchange rates. Hirsch and Higgins (1970) introduced the concept of nominal effective exchange rates. The nominal effective exchange rates index is a multilateral rather than bilateral and can also be defined as a weighted average of a basket of currencies over time, deriving from nominal exchange rate movements. It shows the effects of exchange rate movements relative to a selected basket of currencies in a given base period. However, the concept of real effective exchange rate does not only find the weighted average of currencies but also include differences in inflation rates between countries. In other words, it incorporates both the concepts of nominal effective exchange rates changes and inflation differentials, with the main aim of deflating the exchange rate indices by corresponding indices of relative prices. Deflating the nominal effective exchange rates has a silent benefit under conditions of worldwide inflation at nationally different rates. The real effective exchange rate is thus the nominal effective exchange rates of a currency adjusted for inflation differentials between the home country and other nations to be included in calculating the index. Takaendesa, (2006) argues that as is the case with the nominal effective exchange rates, the real effective exchange rate is

multilateral, the exchange rate of a currency in relation to a basket of other currencies, rather than bilateral.

Korsu and Braima (2011) postulate that most studies that have looked at the real exchange rate have used the notion of real effective (multilateral) rather than real effective bilateral exchange rate. Real effective exchange rate using geometric mean (GM) method of averaging can be the product of the nominal effective exchange rate and the effective relative price indices, following (Hinkle & Nsengiyumva, 1999)

$$REER = \frac{NEER_{jit} * EP_{gft}}{Pgdt} \quad (3)$$

Where $NEER_{jit} = \prod_{i=1}^{k} E_{dt}$, defined as the index of nominal exchange rate (period average rates) in units of domestic currency per unit of foreign currency for home country J.

P_{gft} and P_{gdt} are the foreign price index (using WPI as a proxy) and the domesticprice index (using CPI as a proxy) respectively, with W_{it} as the appropriate weights for each country and denotes the product of the variables.

Also $P_{gft} = \prod_{i=1}^{k} P_{gft}$, where EP_{gft} is the GM weighted average (or effective) foreign price index at time t, and P_{gft} is the WPI of trading partner at the time t with other notation as defined as above.

The Purchasing Power Parity (PPP)

Korsu and Braima (2011) argued that a strand of the literature on real exchange rate is the case of the developed economies. This strand uses the purchasing power parity (PPP) or the macroeconomic balance approach to

determine the equilibrium real exchange rate and hence the degree of real exchange rate misalignment without paying attention to the determinants of the real exchange rate. Hence, the focus of this strand is mainly the determination of the degree of misalignment of the real exchange rate rather than the determinants of the real exchange rate. Another strand in the literature is the case of developing countries. This was pioneered by Edwards (1989) and later by (Rodríguez, 1989; Elbadawi, 1994).

According to Elbadawi, (1994) there are two research agendas dealing with the analysis of the real exchange rate, its determinants, and the effects of its misalignment. The first is based on the purchasing power parity or PPP hypothesis, while the second focuses on behavioral and fundamental models and connecting the RER to a set of determining variables or fundamentals. Being the first approach in the literature, Cassel (1918) formulated for the first time and defined the theoretical nominal exchange rate as a report between national and foreign prices: $E^{PPP} = P/P^*$. But the market value of the exchange rate could presents deviations from the former value, deviations which are considered as over-or under valuations of the national currency. By this, the real exchange rate according to the PPP theory is the report between the market and theoretical value of the national currency expressed in other currency: $Q = E/E^{PPP}$. Therefore, a real exchange rate higher than one reflects the under-valuation of the national currency, while if it is less than one it can be said that the national currency is over-valued of PPP. Cassel (1918) by formulating the theory used a number of hypotheses which should be fulfilled in order that the theory could be valid. This theory is based on the law of one price which supposes that a given good costs the same in two different countries

when the price is expressed in the same currency. Thus, the international arbitrage mechanism should work, perfect competition must prevail both in home and foreign markets, capital movements and trade should be free without any barrier (taxes) or restriction.

Taking into account the above mentioned hypothesis, there are a number of reasons why the PPP might be wrong and misleading indicator for equilibrium exchange rate, especially in developing economies. First of all, there are significant differences between the compositions of the price of basket of goods because of the fact that consumers' preferences and the structure of the manufacture production differ from one country to another. Secondly, if the perfect competition is not working (the costs of transportation are different), the Law of One Price (LOOP) does not hold. This problem is present especially in the case of developing countries where governments control the level of regulated prices, subsidies certain categories of services, like public transportation, telecommunication and others. Consequently, the price of non-tradable goods in developing countries will be lower than that in developed countries, (Cassel, 1918).

The PPP hypothesis implies that in equilibrium foreign and domestic currencies should have the same purchasing power. Given a basket of goods, this definition gives an easy-to calculate benchmark for the equilibrium real exchange rate. Mussa (1986) postulated that empirical evidence, however, ends up rejecting PPP-based models in both developed and developing economies because they fail to explain continuous deviations of the real exchange rate from the PPP benchmark and/or because the rate of convergence to equilibrium is too slow to be compatible with the PPP hypothesis, even if one is to allow for

plausible nominal rigidities (Rogoff, 1996). However, Elbadawi, (1994) argues that even if one is willing to use such long-horizon benchmark, it should be acknowledged that PPP-based models are unlikely to provide an adequate description neither of the causes of the RER fluctuations nor of its fluctuations.

The Balassa Samuelson Effect

Balassa (1964) and Samuelson (1964) were the first who proved that the PPP approach is not compulsory in practice. They considered an economy split into two sectors tradable and non-tradable. Also, they supposed that: demand and supply are at work in both sectors; wages are linked to the level of productivity in the open sector; tradable prices are equal in each country, so PPP holds in the open sector; while the increase of labour productivity is higher in the tradable sector than in the non-tradable sector; wages tend to equalize between sectors. Next, they considered the developing country having lower productivity level in the open sector than the developed country. Considering the above mentioned hypothesis, if the home country is in a catching-up process with the developed economy, productivity tends to increase in the open sector, so there is a possibility of wage increase in tradable sector without any inflationary effect. However, due to the wage equalization assumption between sectors, the productivity gain in the open sector will create inflationary pressures in the non-market based sector. In this way, the overall price level will rise faster in the home country (creating a positive inflation differential vis-à-vis the foreign country) than in the foreign country because of the positive productivity differential between sectors in the home country, which in turn will result to a real appreciation of the home country‘s real exchange rate. This phenomenon is

known in the literature as the Balassa-Samuleson effect to which the trend appreciation of the real exchange rate in the developing countries can be attributed.

Other Real Exchange Rate Models

A consensus has formed that the long-run equilibrium RER is subject to the influence of a relatively wide range of time-varying exogenous and policy fundamentals. In this strand of the literature, the equilibrium RER is defined as the relative price of traded to non-traded a goods that is in line with internal and external balance. For Elbadawi (1994), despite the simplicity of this concept, its practical implementation gives a number of different methodological approaches.

We distinguish between two broad classes of models: the fundamental equilibrium RER (FEER) and the behavioral equilibrium RER (BEER) following (Clark & MacDonald, 1999; Edwards, 1988; Elbadawi, 1994).

The Fundamental and Behavioral Equilibrium Real Exchange Rate Models

Williamson (1985) originally proposed the fundamental equilibrium real exchange rate concept and extended, among others, by (Isard & Faruqee, 1998). In the fundamental equilibrium real exchange rate approach, internal and external balances are usually defined as those compatible with ideal conditions determined by the econometrician. Thus, the equilibrium exchange rate is derived as a function of what the researcher thinks is the optimum internal balance (example the non-accelerating inflation-rate unemployment) and the

sustainable external flows (usually projected or assumed to obtain in the medium-to-longer run). Because these conditions are imposed ex-ante, and may not exist in the future, the fundamental equilibrium real exchange rate corresponds to a normative idea of equilibrium real exchange rate (Elbadawi, 1994).

Williamson (1994) emphasized that fundamental equilibrium real exchange rate is a real effective exchange rate which ensures the external and internal balance at the same time for more than two countries. The internal equilibrium is characterized not only by an output which is equal to its potential level (the economy produces the maximum level of output), but also by the Non-Accelerating Inflation Rate of Unemployment. This approach allows the researcher to reflect the effect of other factors on the real exchange rate than the productivity differential as it appears in the Balassa-Samuelson framework. More so, the real interest rate differential, fiscal policy, determinants of savings and investments are potential determinants of the level of real exchange rate. Considering all the features of the above mentioned approach, one can confidently say that Balassa-Samuelson framework seems to be the most realistic one, but at the same time the most challenging framework to implement in practice because it supposes a great amount of work, high statistical and data availability for a long period of time.

According to Edwards (1989), the behaviourable equilibrium exchange rate models, however, consider short-term flow variables as well as factors influencing long-run stock equilibria. The approach is intertemporal as the equilibrium is assumed to be influenced not only by the current value of the fundamentals, but also by anticipations regarding the future evolution of these

variables. Elbadawi (1994) developed a methodology in the context of a cointegrating-error correction time-series model. First, it computes the equilibrium real exchange rate as a forward-looking function of the fundamentals, second it allows for flexible dynamic adjustments toward equilibrium; and third allows the identification of the influence of macroeconomic policies on the equilibrium real exchange rate. Equally, Edwards and Savastano (2000), postulated that the empirical application of behaviourable equilibrium exchange rate models is subject to problems. Particularly, the lack of a general equilibrium connection between the equilibrium real exchange rate and the current account position, and the frequent disconnect between the econometric specification and the analytical model. Consequently, the interpretation of the results is debatable and policy evaluation is not always rigorous (Elbadawi, 1994).

In addition, MacDonald and Clark (2000) with respect to the FEER and the BEER propose a new approach, known in the literature as Permanent Equilibrium Exchange Rate (PEER), which is a derivative of the BEER approach using new statistical tool. The only difference between the BEER and PEER approaches is the econometric tools used to estimate the equilibrium exchange rate. Another approach is the Natural Rate of Exchange (NATREX) by (Stein, 1995). This approach gives the differences between a medium and a long term equilibrium exchange rate. The medium term rate is defined similarly to the FEER approach. In addition to that a system of interlinked equations also includes the capital stock and the stock of foreign debt. For the medium term the current values are assumed while for the long term steady state levels are calculated.

The Evolution and Determinants of the Real Exchange Rate

Williamson (1994) provides a simple and excellent account of the way the concept of real exchange rate evolved through the desire by economists to determine what the equilibrium exchange rate is. Williamson himself has been central in the development and evolution of the real exchange rate concept. In brief, the motivation behind the preoccupation with issues of the real exchange rate has been the desire to "identify an appropriate concept of equilibrium exchange rate and estimating its value", (Williamson, 1994:178). Once an appropriate nominal exchange rate is determined, then necessary adjustments can be made to achieve it. The accepted practice now is to consider a nominal exchange rate as appropriate if it is such that the actual real exchange rate coincides with the long-run equilibrium real exchange rate.

Mundell (1971) provided an early formal analysis of the determination of the equilibrium real exchange rate, using a macroeconomic model of a monetary economy. Mundell's model assumed a small, open monetary economy that faces given prices (no influence over terms of trade) and defined the equilibrium real exchange rate as the relative price of international to domestic goods that equilibrates the money market. The problem with Mundell's model and the other models mentioned above, with the exception of the ―fundamentals models, is that they do not allow for a distinction to be drawn between the effects of short run and long run changes in the determinants of the real exchange rate (Takaendesa, 2006).

Edwards (1989) developed a theoretical model of real exchange rate behaviour and devised an empirical equation of how to estimate the real exchange rate dynamics. According to him, the long-run equilibrium real

exchange rate is affected by real variables only, which can be classified as internal and external fundamentals. In the short-run however, the real exchange rate may be affected by both real and nominal factors. The important fundamentals that determine the real exchange rate are the terms of trade, level and composition of government consumption, controls on capital flows, exchange and trade controls, technological progress, and capital accumulation.

The literature has shown that the two most used models used for empirical analysis of the determinants of the real exchange rate are the Inter Temporal Optimizing Model by Edwards (1989). Rodríguez (1989), Elbadawi (1994) adopted the Edwards model and applied them to some countries. According to Montiel (1999) the second model is the analytical model on the determinants of the long-run equilibrium real exchange rate.

According to Takaendesa (2006), the Montiel‘s (1999) model is an extension to Edwards‘model and is based on the idea that the real exchange rate is an endogenous variable. Here, the economy‘s endogenous variables are determined by three types of variables such as predetermined variables, exogenous policy variables and other exogenous variables

Predetermined variables are endogenous variables that change slowly over time, for instance economy‘s capital stock, technology, net international creditor position and nominal wage. Exogenous policy variables include fiscal and monetary policies, trade policies and other variables under the control of the domestic authorities. Other exogenous variables include observable variables, such as the terms of trade, world interest rates etc., unobservable variables (random shocks) and bubble variables. Bubble variables are those that affect the economy only through their influence on sentiment (Takaendesa,

2006). Thus from the two models above, the variables that affect the real exchange rate include the Balassa-Samuelson effect, changes in the value of international transfers, changes in international financial situations, changes in commercial policy, the terms of trade, changes in fiscal and monetary policy, changes in foreign exchange reserves and changes in nominal exchange rate policy.

Following MacDonald (1998) the relationship between the real exchange rate and these factors, theory indicates that with regards to the Balassa-Samuelson effect an increase in differential productivity growth in the tradable goods sector creates an appreciation of the real exchange rate whiles a decrease in the differential productivity growth in the tradable sector result to a depreciation of the real exchange rate.

Concerning international transfers (Edwards, 1988) and Montiel (1999) agrees that an increase in capital inflows permits an expansion of absorption and consequently an appreciation of the real exchange rate and a decrease in capital inflows consequently leads to a depreciation of the real exchange rate.

Montiel (1999), concerning the changes in international financial conditions, argues that it is caused by the differences in the real interest rate between countries and hence if the real interest rate differential increases, has the real exchange rate will appreciate and vice versa irrespective of the channel chosen to trace their transmission.

Generally, the relationship between the real exchange rate and fiscal indicators is positive; respectively an increase in the government‘s expenditures or a decrease of taxation (expanding budget deficit) will generate inflation pressures, depreciating the national currency. But also, there may be specific

structural problems, particularly in the case of transition economies, which change the sign of correlation (Cottani, Cavallo, & Khan, 1990).

Empirical Review

Various studies have been done on the real exchange rates both in developing and developed economies. This section therefore reviews some empirical works done on the real exchange rate, its determinants and the relationship between the real exchange rate and export.

The determinants of the real exchange rate has been studied by several researchers. Among these studies include Güçlü (2008) who empirically analyzed the determinants of exchange regimes for the period from 1970 to 2006. He used ordered probit model and found that exchange rate is depreciated due to GDP, GDP per capita, openness, capital account to GDP ratio, capital account openness, terms of trade and capital account restriction. He also found that inflation, geographical trade and money growth may depreciate and appreciate exchange rate. However, bank reserves and nationalist are causes of lower exchange rate. The inclusion of both GDP and GDP per capita are likely to correlate and so might have influenced his result.

In the same light, Aron et al., (1997) presented short run and long run influences in the real exchange rate model in South Africa. Using a quarterly data from 1970 to 1995, they found that real exchange rate depreciation is due to a number of factors such as terms of trade, real dollar gold price, tariffs, capital flows, gross reserves of bank and government expenditure.

Similarly, Parveen, Khan, and Ismail (2012) collected data from economic survey of Pakistan and International Financial Statistics from 1975 to

2010 to examine the major factors which contribute to exchange rate variability. They employed ordinary least square method for analysis of results and concluded that inflation, economic growth, exports and imports are the causes of variation in exchange rate of Pakistan. Drine and Rault (2001) also analysed the factors effecting real exchange rate in MENA countries by applying new panel data unit root tests as well as panel co-integration technique. They found that per capita output, government consumption, real interest rate differentials and openness are factors affecting real exchange rate.

Again, Ahmed, Awan, Sial, and Sher (2012) undertook an econometric analysis of determinants of exchange rate for US Dollar in terms of Pakistani rupee within the framework of monetary approach. Having utilized monthly data from 1982 to 2010, they applied Autoregressive Distributed Lag (ARDL) technique to cointegration for estimation. They concluded that relative money, relative forex reserves and relative debt are depreciating exchange rate.

Further, Fida, Khan, and Sohail (2012) examined the relationship with respect to the Pakistani economy between exchange rates and external debt. Using quarterly data from 1983 to 2008 and employing Johansen co-integration test, they examined that terms of trade, government expenditure and productivity are the causes of exchange rate appreciation.

Misalignment of the exchange rate occurs when the real exchange rate deviates from its equilibrium path. Studies on the determinants of the real exchange rate and the effects of real exchange rate misalignment have assumed an important part in research over the past decades. Edwards (1989) investigated whether there was any link between real exchange rate misalignment and economic performance. His conclusion was that the countries whose real

exchange rates were closer to equilibrium out-performed those with misaligned real exchange rates.

Edwards' (1989) work inspired a number of studies on not only the determinants of the real exchange rate, but also on issues of misalignment of the real exchange rate. It led to increasing consensus to the effect that one of the crucial conditions for improving economic performance in less developed countries (LDCs) is a stable real exchange rate and one that is correctly aligned. (Cottani et al., 1990) also argued that in parts of Latin America, unstable real exchange rates inhibited export growth, while in Asia, export expansion was fostered by stable real exchange rates. On the other, in Africa, the widespread poor performance of the agriculture sector and economic growth in general could be attributed to persistently misaligned real exchange rates.

Empirical findings by other researchers have also concurred that a chronic misalignment in the real exchange rate is a major factor responsible for the poor economic performance of most developing countries6. For example, Ghura and Grennes (1993) used a panel of Sub-Saharan countries to investigate the impact of real exchange rate misalignment on economic performance. They too found that real exchange rate misalignment negatively affected income growth, exports and imports, and investment and savings.

Another study Mkenda (2001), also focused on the main determinants of the real exchange rate in Zambia and estimated the degree of misalignment in the real exchange rate. Having employed the Johansen cointegration in the study conducted on time series data from 1971 to 1993 explored that terms of trade and government consumption are depreciating real exchange rate while investment share, growth of real GDP, central bank reserves and trade taxes are

appreciating real exchange rate. However, the study did not indicate sources of the reserves of the central bank. Zakaria, Ahmad, and Iqbal (2007) have provided estimates of a model for the determination of nominal bilateral exchange rates of Pak – rupee vis–a–vis its twelve major trading partners. Using time series data from 1983 to 2004 and autoregressive method, they deduced that terms of trade, technological progress, net capital inflows and foreign exchange reserves are causes of depreciation of bilateral nominal exchange rate of Pak rupee and relative price of foreign tradable, trade restrictions and excess supply of domestic credits appreciated Pak rupee on another hand. With reference to foreign exchange reserves, both authors had conflicting results. Perhaps, the differences might have resulted from the different estimation techniques they used in their model.

In addition, The equilibrium real effective exchange rate was also studied by Hyder and Mahboob (2006). They estimated the equation of equilibrium real effective exchange rate, measured the degree of exchange rate misalignment and provided guidance to policy makers in implementing exchange rate policy. Having used annual data from 1978 – 2005, they found that terms of trade, real investment, workers' remittances, and total factor productivity differentials are significant cause of depreciation of Pak rupee while trade openness, government expenditure and capital to GDP ratio are appreciating Pak rupee.

Zalduendo (2006) disentangled the effects of oil prices from other factors underlying Venezuela's equilibrium real exchange rate and examined the role of the foreign exchange controls in supporting the official exchange rate. It was concluded from the study that real exchange rate is appreciated by

UK Brent oil price deflated, differentials in PPP based real GDP per capita and differentials in real interest rate. However, real exchange rate is depreciated by government expenditure.

Adding up, Frankel (2007) has econometrically investigated the determinants of real value of the South African rand. Having utilized quarterly data from 1981 to 2006, he employed ordinary least square method to analyse the relationships. He concluded that real weighted mineral and metal price index and real interest rate differentials are increasing real exchange rate whereas dummy for capital market liberalization and dummy interacted with real interest rate differentials are appreciating real exchange rates. Carrera and Restout (2008) took Latin American data from the time period from 1970 to 2006 for investigating the behavior of real exchange rates by using non stationary panel econometrics. They explored various factors that influence exchange rate in the long run. These are government spending, terms of trade, the openness, foreign capital flows.

Al Samara (2009) described the factors which determine the equilibrium real exchange rate as well as its volatility. They applied the Autoregressive Conditional Heteroscedasticity (ARCH) on the time series data from 1980 to 2009. The study concluded that productivity differentials, trade openness and gross capital formation and total government spending depreciate and appreciates the exchange rate in Syrian economy respectively. Moreover, Fida et al., (2012) attempted to estimate the long run equilibrium real exchange rate for Pakistan economy by employing natural real exchange rate (NATREX) given by Stein (1985) for the period of 1983 to 2010. Having used Johansen Co-

integration technique, they determined that terms of trade, government expenditure and productivity are appreciating Pak rupee in the long run.

Likewise, Iossifov and Loukoianova (2007) estimated a behavioral equilibrium exchange rate model for Ghana. Regression results show that most of the REER‘s long-run behaviour can be explained by real GDP growth, real interest rate differentials (both relative to trading partner countries), and the real world prices of Ghana‘s main export commodities. On the basis of these fundamentals, the REER in late 2006 was found to be very close to its estimated equilibrium level. The results also suggest that deviations from the equilibrium path are eliminated within two to three years. Further, according to Takaendesa, (2006), the real exchange rates have important effects on production, employment and trade and so it is crucial to understand the factors that account for their variations. This study analyses the main determinants of the real exchange rate and the dynamic adjustment of the real exchange rate following shocks to those determinants. By using quarterly South African data covering the period 1975 to 2005, the study applied the cointegration and vector autoregression (VAR) analysis with impulse response and variance decomposition analyses to provide robust long run effects and short run dynamic effects on the real exchange rate. The variables that have been found to have a long run relationship with the real exchange rate include the terms of trade, real interest rate differential, domestic credit, openness and technological progress. The estimate of the speed of adjustment coefficient found in this study indicates that about a third of the variation in the real exchange rate from its equilibrium level is corrected within a quarter.

With a reference to the monetary approach to exchange rate determination, Mumuni and Owusu-Afriyie (2004) used a simple monetary model of exchange rate determination for Ghana and employed the technique of co-integration analysis to empirically investigate the principal factors driving the Cedi/Dollar rate of exchange since the adoption of floating exchange rate regime in the country. The study augment the basic model with political variables to examine any potential impact on the exchange rate. Also, the empirical results corroborate the model in that macroeconomic fundamentals play an important role in the cedi-dollar rate dynamics. Similarly, speculation based on recent past behaviour of the Cedi/Dollar is crucial and this has been linked largely to underdevelopment of the financial system and the exchange rate market. Nonetheless, while the country's political variable is correctly signed, it is not significant at conventional levels of significance. Finally, the government on the day examined the effectiveness of Bank of Ghana intervention (as measured by non-oil forex sales) on the value of the cedi.

Moreover, using an error correction mechanism, Bawumia and Otoo (2003) explored the relationship between monetary growth, exchange rates and inflation in Ghana. The empirical result confirms the existence of a long-run equilibrium relationship between inflation, money supply, the exchange rate, and real income. Consistent with theory, the findings demonstrate that in the long-run, inflation in Ghana is positively related to the money supply and the exchange rate, while it is negatively related to real income. The empirical deductions from the study also show that inflation adjusts to its equilibrium value fairly rapidly. More so, the impact of the exchange rate on inflation is

transmitted with a one month lag, while the effect of real income and money on inflation takes place with a 2 and 4- month lag, respectively.

MacDonald (1998) undertook a study to present a reduced form model of the real exchange rate in order to re-examine the determinants of real exchange rates in the long run. His model featured productivity differentials, terms of trade effects, fiscal balances, net foreign assets and real interest rate differentials as key fundamental determinants of the real exchange rate. By using multivariate cointegration methods, the model is implemented for the real effective exchange rates of the US dollar, Yen and the Deutschmark, over 1974 to 1993 sample period. With respect to the results, he found evidence of a significant long run relationship for his model. Again the results showed that the fundamentals mentioned above have an important and significant bearing on the determination of both long and short run real exchange rates. All the variables were found to have a positive relationship with the real exchange rate hence, an increase in any of them leads to an appreciation of the real exchange rate.

In his theoretical model of exchange rate, Edwards (1989) developed a theoretical model for developing countries to explain the short and long run determinants of the real exchange rate. He applied the model to twelve countries over the sample period 1962 to 1985 by using fixed effect model. His sample included Brazil, Columbia, Elsavador, Greece, India, Israel, Malaysia, Philippines, South Africa, Srilanka, Thailand and Yugoslavia. His finding was consistent with his theoretical prescription that in the short run both real and nominal variables affect the real exchange rate. However, only real variables affect the real exchange rate in the long run. His findings showed that the long-

run determinants of the real exchange rate are the terms of trade, level and composition of government consumption, controls on capital flows, exchange and trade controls, technological progress and capital accumulation. His study revealed that in the short run the nominal exchange rate, domestic credit as well as the real variables that determine the long run real exchange rate are the determinants of the real exchange rate.

From the results, coefficient of terms of trade was found to be negative, the coefficient of the ratio of government expenditure to GDP was found to be negative, the coefficient of exchange and trade controls (proxied by parallel market premium) was found to be negative, the coefficients of technological progress (proxied by output growth) was found to be positive (contradicting the Ricardo-Balassa hypothesis), the coefficient of capital flow (lagged) was found to be negative and the coefficient of capital accumulation (measured as investment- GDP ratio) was found to be positive. He also found that in the short run nominal exchange rate depreciation leads to a depreciation of the real exchange rate while an increase in domestic credit leads to an appreciation of the real exchange rate.

From the literature, the studies on the determinants of real exchange rate have not been fully exhaustive since there are several factors which are likely to determine the real exchange rate. With respect to the literature, however, Mkenda (2001) conducted a study on the main determinants of the real exchange rate in Zambia and estimated the degree of misalignment in the real exchange rate. By employing the Johansen cointegration analysis on time series data from 1971 to 1993, she found that central bank reserves is one of the factors that appreciate real exchange rate for exports. However, the study failed to show

specific exports commodities that characterize the reserves of the central bank of Zambia. Therefore, the current study endeavours to disaggregate export earnings as a source of foreign exchange reserves into cocoa and non-traditional exports so we could determine the driver of forex in terms of food exports.

CHAPTER FOUR

METHODOLOGY

Introduction

This chapter presents the econometric framework employed to test the effect of earnings of cocoa and non-traditional export on exchange rate in Ghana. The chapter basically discusses the methods, data and estimation techniques used in achieving the objectives of the study. The first section presents the research design used for the study. The second section captures the theoretical and empirical models that were used in the study. The third section explains the estimation techniques. Finally, data source and sample size are presented along with the data analysis procedure.

Research Design

The term research design is widely used in education, yet it takes on different meanings in different studies. Harwell (2011), emphasized that a research design may reflect the entire research process, from the conceptualization of a problem to the literature review, research questions, methods, and conclusions, whereas in another study, research design refers only to the methodology of a study.

This work is a time-series study which employs the positivist philosophy. Positivist philosophy allows the researcher to study social processes in an objective manner as well as explain relationships between variables. Also, positivist philosophy is suitable for the development of mathematical models to investigate the relationship between quantitative measurements.

The research design for a study can be qualitative, quantitative or one that involves both qualitative and quantitative approaches, known as a mixed method. Qualitative research methods place emphasis on discovering and understanding the experiences, perspectives, and thoughts of participants – that is, qualitative research explores the meaning, purpose, or reality (Hiatt, 1986). However, quantitative research attempts to maximize objectivity, replicability, and generalizability of findings, and are typically interested in prediction (Lincoln & Guba, 1985). As such, the research design adopted in this study for the data analysis follows the quantitative approach.

The quantitative approach to research is built on the fundamental expectation that a researcher will set aside his or her experiences, perceptions, and biases to guarantee objectivity in the conduct of the study and the inferences that are drawn. Some important features of numerous quantitative studies have been the use of instruments such as tests or surveys to collect data, and reliance on probability theory to test statistical hypotheses that match the research questions of interest. The quantitative approach is frequently described as deductive in nature, in the sense that conclusions from tests of statistical hypotheses lead to general inferences about characteristics of a population. Quantitative methods assume that there is a single "truth" that exists, independent of human perception (Lincoln & Guba, 1985). Quantitative methods have a long history, dating to at least the 1930s, that has produced strong professional norms that impact research activities, such as the criteria used to make funding decisions (Clearinghouse, 2008) and decisions about the kinds of studies and results likely to be published (Leech, Morgan, Wang, & Gliner, 2010).

Theoretical Models of Real Exchange Rate

The basic theoretical framework used in this study was adopted from Edwards' (1989) model of real exchange rate determination. The theoretical framework employed to modeling the dynamics of the real exchange rate is the intertemporal optimizing model developed by Edwards (1989). This choice distinguishes factors that determine the equilibrium real exchange rate from those that determine the short-run dynamics of the real exchange rate unlike other theoretical models that focus only on the determinants of the equilibrium real exchange rate, moreover, the model was developed to capture the structure of a typical developing country. This model has been used to estimate real exchange rate models in many developing countries (For example, Mungule (2004) for Zambia and Ghura & Grennes (1993) for sub-Sahara Africa).

The determinant of equilibrium real exchange rate in this study is based on the internal and external balance approach. In this approach, the equilibrium real exchange rate is defined as the relative prices of tradables to non-tradable goods that, for given sustainable (equilibrium) values of other relevant variables, result in the simultaneous attainment of internal and external equilibria (Edwards, 1989; (Baffes, Elbadawi, O'connell, & Group, 1997). The internal balance is defined as a situation in which the demand for and supply of non tradable goods are equal, as shown in the following equation.

$$Y_N(RER) = C_N + G_N = (1-\theta)RER \cdot C + G_N \quad (4)$$

Where Y_N is the supply of nontradable goods $(\frac{\partial y_N}{\partial RER} \prec 0)$, c_N and g_N are private and Government spending on nontradable goods, respectively, θ, is the share of total private spending on tradable goods, and *C* is total private spending

in terms of tradable goods. Equation 4 depicts the relationship between *RER* and *C* that is consistent with the internal balance.

However, the external balance implies reaching the steady state of change in total net foreign asset ($\dot{f}$) in the economy (Faruqee, 1995; Baffes et al., 1997). The change in net foreign assets is defined as follows:

$$\dot{f} = y_T(RER) - \theta c - g_T + rf \quad (5)$$

Where y_T is the supply of tradable goods $(\frac{\partial y_T}{\partial RER} \succ 0)$, rf is the real yield on net foreign assets and g_T is the government spending in tradable goods. When net foreign assets reach steady state that is $(\dot{f} = 0)$, equation 5 can trace out the relationship of *RER* and *c*.

Real exchange rate equilibrium is attained when the country simultaneously reaches internal and external equilibria. This can be determined by solving equations 4 and 5. The equilibrium real exchange rate is given by equation 6:

$$RER^* = f(\underset{-}{G_N}, \underset{+}{G_T}, \underset{-}{rf^*}) \quad (6)$$

Where * denotes the steady-state values of endogenous variables with the signs of the corresponding partial derivative with respect to *RER**. Under the assumption of credit constraint (thus, demand for credit tends to exceed supply of credit), an assumption which is more relevant for developing countries (Baffes et al., 1997), the steady state level of *rf** can be proxied by the actual level of a country's net foreign assets (*NFA*).

Equation 6 can be extended to capture other variables that shift internal and external balance and affect the equilibrium real exchange rate. Three variables are generally included to determine equilibrium real exchange rate in developing countries, which are productivity differentials, terms of trade, and trade policy regime (Edwards, 1989). In all, equilibrium real exchange rate under this approach can be rewritten as follows:

$$RER^{*} = f(\underset{-}{G_N}, \underset{+}{G_T}, \underset{-}{NFA}, \underset{-}{PROD}, \underset{-}{TOT}, \underset{+}{OPEN}) \quad (7)$$

Empirical Model Specification

Due to availability of data, modifications are made to the original model to suit the current study by virtue of testing the effects of earnings of cocoa and non-traditional exports on real exchange rate. Hence, equation 7 becomes,

$$REER_t = A_t COCX_t^{\alpha} NONTX_t^{\beta} \ell_t^{\varepsilon} \quad (8)$$

Where $REER$ is real effective exchange rate, $COCX$ represents total export earnings of cocoa beans in real monetary value, $NONTX$ is total earnings of non-traditional export in real monetary value.

Where $A_t = f(ODA, TRD, GOVEXP, M2, MINX)$ (9)

Therefore, $A_t = ODA_t^{\beta_2}, TRD_t^{\beta_3}, GOVEXP_t^{\beta_4}, M2_t^{\beta_5}, MINX_t^{\beta_6})$ (10)

By substituting (10) into (8), we obtain;

$$REER_t = \eta COCX_t^{\alpha}, NONTX_t^{\beta_1}, ODA_t^{\beta_2}, TRD_t^{\beta_3}, GOVEXP_t^{\beta_4}, M2_t^{\beta_5}, MINX_t^{\beta_6}, \ell_t^{\varepsilon} \quad (11)$$

By taking the logarithm of the variables in equation (11) yields;

$$\ln REER_t = \ln \eta + \alpha \ln COCX_t + \beta_1 \ln NONTX_t + \beta_2 ODA_t, \\ \beta_3 \ln TRD_t + \beta_4 GOVEXP_t + \beta_5 \ln M2_t + \beta_6 \ln MINX_t + \varepsilon_t \ln \ell_t \quad (12)$$

Letting $\ln \eta = \beta_0$ and $\ln \ell = 1$, equation (12) can be written as

$$\ln REER_t = \beta_0 + \alpha \ln COCX_t + \beta_1 \ln NONTX_t + \beta_2 ODA_t + \\ \beta_3 \ln TRD_t + \beta_4 GOVEXP_t + \beta_5 \ln M2_t + \beta_6 \ln MINX_t + \varepsilon_t \quad (13)$$

Where ε represents error term assumed to be normally and independently distributed at zero mean and constant variance, also captures all other explanatory variables which influence the real exchange rate but not included in the model and t is time. The coefficients parameters $\alpha, \beta_1, \beta_2\ \beta_3, \beta_4, \beta_5$ and β_6 are the elasticities of the respective variables, β_0 is the drift component whiles t denotes time. The following are the a priori expectations:

$$\alpha < 0, \beta_1 < 0, \beta_2 < 0, \beta_3 > 0, \beta_4 < 0, \beta_5 < 0, \beta_6 < 0$$

From equation (13), the Error Correction Term is specified as

$$ECT = \ln REER_t - \beta_0 - \alpha \ln COCX_t - \beta_1 \ln NONTX_t - \beta_2 ODA_t - \\ \beta_3 \ln TRD_t - \beta_4 GOVEXP_t - \beta_5 \ln M2_t - \beta_6 \ln MINX_t \quad (14)$$

Justification, Measurement of Variables and A priori Expectations

In order to examine the relationship between earnings of cocoa and non-traditional exports and real exchange rate in Ghana, the study used a disaggregated data for exports and quarterly series from 1990 to 2011. The study intended to focus on exports characterized mainly by cash crops such as cocoa, cashew, cowpea among others hence the choice and inclusion of cocoa and non-traditional exports earnings in the model. Furthermore, these variables entered

the real exchange rate model as policy variables so we would test if they could influence the real exchange rate.

Real Effective Exchange Rate (REER)

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 cost. With respect to Ghana, it was weighted against the currencies of the major trading partners which include United Kingdom, United State, Germany and Netherlands. Accordingly, a decrease in the index of the real exchange rate implies an appreciation whiles a rise implies a depreciation which corresponds to a loss of competiveness and improvement in competiveness respectively.

In addition, the real effective exchange rate (REER) using geometric mean (GM) method of averaging can be the product of the nominal effective exchange rate and the effective relative price indices, following (Hinkle & Nsengiyumva, 1999).

$$REER = \frac{NEER_{jit} * EP_{gft}}{Pgdt} \quad (15)$$

Where $NEER_{jit} = \prod_{i=1}^{k} E_{dt}$, defined as the index of nominal exchange rate (period average rates) in units of domestic currency per unit of foreign currency for home country J.

P_{gft} and P_{gdt} are the foreign price index (using WPI as a proxy) and the domesticprice index (using CPI as a proxy) respectively, with W_{it} as the appropriate weights for each country and denotes the product of the variables.

Also $P_{gft} = \prod_{i=1}^{k} P_{gft}$, where EP_{gft} is the GM weighted average (or effective) foreign price index at time t, and P_{gft} is the WPI of trading partner at the time t with other notation as defined as above. The trading partner's weights are defined to allow for time variation in the weights and so that weight sum to unity:

For export:

$$x_{it} = \frac{X_{it}}{\sum_{J=1}^{K} X_{jt}} \quad (16)$$

For imports;

$$m_{it} = \frac{M_{it}}{\sum_{j=1}^{k} M_{jt}} \quad (17)$$

For total trade we have

$$w_{it} = \frac{X_{it} + M_{it}}{\sum_{j}^{k} (X_{jt} + M_{jt})} \quad (18)$$

Where $\sum_{j=1}^{k} X_{jt,} \sum_{j=1}^{k} M_{jt}$ and $\sum_{j=1}^{k} (X_{jt} + M_{jt})$ are total exports from domestic country to all the trading partners, total imports of the domestic country from all the trading partners and total between the domestic country and all the trading partners respectively. Similarly, X_{it}, M_{it} and $X_{it} + M_{it}$ represent export of trading partner i by the domestic country, imports from the trading partner i by the domestic country and total trade between trading partner i and domestic country respectively. The subscript t represents the time period in all definitions.

One strong argument in favour of this approach in computing the weight is the time variation component (rolling weighting system). Since what we are trying to capture with these indices change over time (macroeconomic shocks such as export price shocks and fiscal imbalance) a fixed weighted index will misrepresent the dynamics and hence impact on real exchange rate (Chinn, 2002).

Cocoa Export (COCX)

Cocoa exports are the total exports earnings of cocoa beans in real monetary value as a percentage of GDP. Hence, real earnings of cocoa exports are the value of cocoa beans exports deflated by consumer price index, CPI. An increase in export earnings of cocoa will increase forex, foreign exchange reserves, and this will end up appreciating the real exchange rate. Therefore a negative sign is expected between the real effective exchange rate and export earnings of cocoa in the long-run. We don't expect earnings cocoa exports to appear in the short-run dynamics because of the gestation period of cocoa. It is

worth noting that earnings of cocoa and non-traditional exports enter the model as policy variables (Bank of Ghana)

Non-Traditional Export (NONX)

Non-traditional exports are the total exports earnings of cashew, cowpea, and pineapple among other commodities in real monetary value as a percentage of GDP. This is deflated by consumer price index, CPI. An increase in earnings of non-traditional exports will cause the foreign exchange reserves to rise. This will eventually cause real exchange rate to fall, hence an appreciation of the real exchange rate. We therefore expect a negative sign between the real effective exchange rate and earnings of non-traditional exports in both the short-run long-run.

Foreign Aid (ODA)

External aid inflows has been defined in the literature as official development assistance (ODA) from one government or organization to another in another country through the government of a particular country. This variable is operationally defined as official development assistance. Following (Issa & Ouattara, 2004), in other to obtain its real value the official development assistance variable was deflated by the GDP. Further, foreign aid is usually provided to alleviate foreign exchange constraint, ease service of external debt burden and support investment in infrastructure and human capital. Nevertheless, at certain levels and under poor macroeconomic management, it can bring out undesirable effects in the form of upward pressures on inflation

and real exchange rate appreciation. Hence, this variable is expected to have a negative relationship with the real exchange rate.

Trade Openness (TRD)

Trade openness is measured by the ratio of imports plus exports to GDP. The openness variable proxies trade restrictions. An increase in import tariffs, for instance, increases import prices and hence results in a terms of trade deterioration. Such an event affects prices of non-tradables through an income effect and a substitution effect. The negative income effect from a terms of trade deterioration decreases demand for all goods and services, resulting in lower prices of non-tradables and hence a depreciation of the real exchange rate. On the other hand, the substitution effect implies increased demand for domestic non-tradables as consumers switch from imported goods. This increases prices of non-tradables leading to an appreciation of the real exchange rate. Thus, the income effects uses non-tradables prices to decrease whereas the substitution effect leads to an increase in these prices. Although one cannot state which effect dominates a priori, (Edwards, 1989) argues that the income effect is less likely to dominate, and therefore trade liberalization should lead to real depreciation. In other words, the more open an economy is, the more likely it is for the real exchange rate to depreciate of less developed economies, especially from a trade tax perspective, tend to have high dependency on the international trade sector, an increase in the degree of trade openness is expected to bring higher trade tax. Thus, a positive relationship is expected between them.

Government Expenditure (GOVEXP)

Government consumption spending also affects the real exchange rate. The impact of government consumption depends on whether such consumption is predominantly on traded goods or non-traded goods. Following Edwards (1989), we will illustrate this by assuming two periods. We can further simplify the illustration by assuming away distortionary taxes. Now, let us assume an increase in government consumption of non-tradables in period 1. Suppose further that borrowing from the public or international sources finances this. The equilibrium real exchange rate will be affected in two possible ways. Period 1 may witness an increase in demand for goods and services, which will lead to an increase in the price of non-tradables. This will lead to an appreciation in the equilibrium real exchange rate.

In period 2 however, the government may have to hike taxes to pay the debt. This may reduce disposable income, and hence reduce aggregate demand. Such a movement will reduce the price of non-tradables, and thus lead to a depreciation in the equilibrium real exchange rate. From this, it may be noted that it is not possible to tell a priori the effect of changes in government consumption of non-tradables on the equilibrium real exchange rate. The same situation obtains in analysing the impact of changes in government consumption of tradables on the equilibrium real exchange rate (Edwards, 1989). Edwards (1989) found that an increase in government consumption appreciated the real exchange rate in four of the equations he estimated for a group of twelve developing countries, while in the other two equations, an increase in government consumption depreciated the real exchange rate.

Broad Money Supply (M2)

Excess money supply growth puts an upward pressure on the prices of non-tradable goods thereby inducing inflation, which in turn causes the real exchange rate to appreciate. When a central bank pursues a non-sterilized intervention in the foreign exchange market upon excessive inflow of foreign capital, the outcome is an increase in domestic money supply which gives rise to inflationary tendencies and puts pressure on the real exchange rate to appreciate.

Mineral Exports (MINX)

Mineral exports are the total exports earnings of minerals (gold, diamond, manganese, etc) in real monetary value as a percentage of GDP. Hence, real earnings of mineral exports are the value of cocoa beans exports deflated by consumer price index, CPI. We expect a negative sign between the real effective exchange rate and earnings of mineral exports in both the short-run long-run in that an increase in earnings of mineral exports will cause the foreign exchange reserves to rise. Consequently, this will cause the real exchange rate to fall, hence an appreciation of the real exchange rate (Bank of Ghana)

Description and Source of Data

This study employed a disaggregated data for exports as well as quarterly time series from 1990Q1-2011Q4, using the Gandolfo approach. The data was obtained from the International Bank for Reconstruction and Development (IBRD), commonly referred to as World Bank, International

Monetary Fund (IMF), Bank of Ghana (BoG) and the State of the Ghanaian economy annual publications. The World Bank data was taken from its annual publication, World Development Indicators, whilst the data from the IMF was sourced from series of its annual publication International Financial Statistics Yearbook.

Estimation Technique

The study presents summary statistics and unit root tests on the variables as well as the estimation technique employed to achieve the desired objectives of this study. The Appendix lists data sources, sample periods among others. To investigate the relationships as well as the dynamic interaction between, cocoa and non-traditional export earnings and real exchange rate, the Johansen approach to cointegration, variance autoregressive regression (VAR) and Impulse Response Function (IRF) were applied. The study first investigated the time series properties of our data by using the Augmented Dicky-Fuller (ADF) and the Phillip- Perron tests. The unit root test was used to check the stationary position of our series. In the second step, we tested for cointegration using the Johansen cointegration framework.

Stationarity Tests (Unit Root Test)

This section examined the time series properties of the variables to be modeled. The underlying process that generates time series variables need to be known as to whether they are stationary or non-stationary. Naceur and Ghazouni (2007), emphasized that many macroeconomic time series contain unit roots, which tend to be dominated by stochastic trends. Unit roots are important in

determining the stationarity of a time series because the presence of non-stationary regressors invalidates many standard hypothesis tests.

The drawback for using non-stationary economic series in the study would be that the presence of deterministic time trends could lead to spurious regression; in this case, the results may suggest statistically significant relationships between the variables in the model, when in fact, this is just evidence of contemporaneous correlation. Time series data are rarely stationary in level forms. Regression involving non stationary time series variables often leads to spurious regression. This occurs when the regression results show a high and significant relationship among variables when it doesn't actually exist. Moreover, Stock and Watson (1988) argue that the usual test statistics (t, F, DW, and R-Squared) will not possess standard distribution if some of the variables in the model have unit roots. Thus to avoid inappropriate model specification and to increase the confidence of the results, time series properties of the data are investigated. Although there are a number of methods used to test for stationarity and the presence of unit roots, this study employed the Augmented Dickey-Fuller (ADF) and the Philips Peron (PP) test accordingly.

By definition a series is stationary if it has a constant mean and a constant finite variance. On the other hand, a non-stationary series contains a clear time trend and has a variance that is not constant overtime. A series will display a high degree of persistence i.e. shocks do not die out, if it is non-stationary. A series Z_t is said to be integrated of order *d*, denoted as I(*d*), if it must be differenced *d* times for it to become stationary. For example, a variable is said to be integrated of order one, or *I*(1), if it is stationary after differencing

once, or of order two, *I*(2) if differenced twice. If the variable is stationary without differencing, then it is integrated of order zero, *I*(0).

The presence of a stochastic trend is determined by testing the presence of unit roots. Several tests for the presence of unit roots in time series have appeared in the literature (Dickey & Fuller, 1979; Dickey & Fuller, 1981; Phillips & Perron, 1988; Kwiatkowski, Phillips, Schmidt, & Shin, 1992). As such the study employed both Augmented Dickey Fuller (ADF) and the Phillip-Perron (PP) since they are considered reliable and as such accepted by many in econometric analysis for the test for unit root. There are similarities in the tests except that they differ with respect to the way they correct for autocorrelation in the residuals. The PP non parametric test simplifies the ADF procedure and allow for less restrictive assumptions for time series in question. Thus, the null hypothesis to be tested is that the variables under study have a unit root

In each instance, the lag length is chosen using the Akaike Information Criterion (AIC) and Swartz Information Criterion (SIC) for both the ADF and PP test. The sensitivity analysis ADF tests to lag selection renders the PP test a crucial extra tool for making inferences about unit roots. The ADF is specified as follows:

$$\Delta X_t = \alpha + \delta_t + \rho X_{t-1} + \sum_{t-1}^{\rho} \beta_i \Delta X_{t-1} + V_t \quad (19)$$

Where X_t denotes the time series at time t, Δ is the difference operator, α, δ, β are parameters to be estimated and *V* is the stochastic random distribution term.

The PP test is superior to ADF and this include of the following reasons. First, ADF test do not consider cases of heterocedasticity and non-normality that are regularly present in the raw data of economic time series variables. Second, ADF is unable to discriminate between stationary and non-stationary series that have a high degree of autocorrelation. Lastly, in circumstances where the time series variables under study have serial correlation and structural breaks.

The hypotheses tested in both ADF and PP unit root test are as follows

H0: Series contain unit root

H1: Series is stationary

The null hypothesis implies non stationary against the alternative hypothesis that it does not contain unit roots, implying stationarity. The decision rule is that, if the ADF and PP statistic are higher (in absolute terms) than the critical values, we fail to accept the null hypothesis and conclude that there is no unit root implying stationarity. Also, if the ADF and PP statistic are less negative than the critical values then we fail to reject the null hypothesis and conclude that there is unit root implying non stationarity.

Cointegration Tests

An appropriate solution to a series which are non-stationary with unit root is by taking first difference. But, first differencing results in eliminating all the long-run information which are invariably the interest of economists. Granger (1986) identified a link between non-stationary processes and preserved the concept of a long-run equilibrium. Two or more variables are said

to be cointegrated (that is a long-run equilibrium relationship exist among variables), if they share common trend. Cointegration exists when a linear combination of two or more non-stationary variables is stationary.

Johansen (1988) and (1992a) Juselius et al., (1992) developed multivariate method that explicitly used the Vector Autoregressive (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. Johansen (1988) postulates that cointegration techniques allow us to test and determine the number of cointegrating relationships between the non-stationary variables in the system using a maximum likelihood procedure. Johansen (1988, 1991) and Johansen and Juselius (1990) proposed the used of two test statistics namely, the trace statistic and the maximum Eigen value statistics in order to make references about the number of cointegrating relations.

The VAR Framework

VARs have the desirable property of focusing to the impact of shock first, the relevant shocks are identified, and then the response of the system to shocks is described through the analysis of impulse responses (the propagation mechanism). The VAR model expresses the current value of an endogenous variable as a function of deterministic terms and the lagged values of the endogenous variables. In other words, in VAR, each endogenous variable is explained by its lagged or past values and the lagged values of all other endogenous variables in the model. Furthermore, the use of variance

decomposition analysis makes it possible to quantify the relative importance of the policy variables in the determination of exchange rate.

Another advantage of using VARs over cross-sectional regressions is evident in their dynamic effects on macroeconomic variables; the cross-sectional method, in contrast, estimates only a one period effect. In addition, the VAR is suitable for multiple time series analysis as it supplies different criteria to suggest the optimal lengths for the variables.

In essence, the use of VAR offers two distinct advantages. First, the VAR model explicitly allows for endogeneity of variables, thereby accommodating the interdependence between export earnings and real exchange rate. Second, in contrast to a large-scale fully specified structural model, the VAR analysis focuses on reduced form relationship and thus only requires a simple model with a small number of variables to achieve optimal efficiency.

Consider a VAR of order p :

$$X_t = A_1 X_{t-1} + A_2 X_{t-2} + ... + A_p X_{t-p} + \varepsilon_t \quad (20)$$

Where

$X_t = (reer_{t,} cocx_t, nontx_t, oda_t, trd_t, gov\exp_t, m2_t, \min x_t)'$ is a vector of non-stationary I(1) variables. We can therefore rewrite the $VAR(p)$ as

$$\Delta X_t = \pi X_{t-1} + \sum_{i=1}^{p-1} \pi_i X_{t-i} + \varepsilon_t \quad (21)$$

Where $\pi = -(1 - \sum_{i=1}^{p} A_i)$ and $\pi_i = -\sum_{j=i+1}^{p} A_j$. The rank of π is equal to the number of independent cointegrating vectors. The study used Schwartz Information Criterion (SIC) to select the number of lags.

Stability Test

Following Brown, Durbin and Evans (1975), this study employed cumulative sum (CUSUM) and cumulative sum of squared (CUSUMSQ) tests to test for the stability of parameters on real exchange rate. The null hypothesis tested is that there is no structural break against the alternative hypothesis of there is structural break. This test becomes necessarily because of the volatile nature of the exchange rate in Ghana

Data Analysis

The study employed both descriptive and quantitative analysis. Unit roots tests were carried out on all variables. Furthermore, the study adopted the maximum likelihood econometric methodology using the Vector Autoregressive, (VAR) and the Bayesian VAR models.

Impulse Response

The study conducted the impulse response functions so we could analyze the impact of unanticipated shocks that emanate from other variables in the VAR model to one endogenous variable. The response functions trace the effect of each shock on each variable in the VAR model over a given time horizon. Enders (2004) argues that a shock to the i^{th} variable directly affects the

i^{th} variable and is also transmitted to all the endogenous variables through the dynamic structure of the VAR. The response functions of the VAR model are used to trace the effect of unanticipated shocks of earnings of cocoa and non-traditional exports on the real exchange rate. The empirical evidence on impulse response functions would enable the policy makers to predict the consequences of these unanticipated shocks in advance so that they would be well prepared to react to these changes in future.

We employed the Bayesian VAR in conducting the impulse response for the real exchange rate model instead of using the Unrestricted VAR. This is because the Bayesian statistics assume random variables to which we can assign a probability distribution. Therefore, the prior distribution $\pi(\theta)$, the likelihood $l(y|\theta)$, and the posterior distribution $\pi((\theta|y)$ is the distribution of θ given the data y and may be derived by

$$\pi(\theta|y) = \frac{\pi(\theta)\, l(y|\theta)}{\int \pi\,(\theta) l(y|\theta)\, d\theta} \qquad (22)$$

Note that the denominator part $\int \pi\,(\theta) l(y|\theta)\, d\theta$ is a normalizing constant which has no randomness, and thus the posterior is proportional to the product of the likelihood and the prior given by

$$\pi(\theta|y) \propto \pi(\theta) l(y|\theta)$$

The main target of Bayesian estimation is to find the posterior moments of the parameter of interest. In order to relate this general framework to Bayesian VAR (BVAR) models, suppose that we have the

VAR *(p)* model:

$$y_t = a_0 + \sum_{j=1}^{p} A_j y_{t-j} + \epsilon_t \qquad (23)$$

where y_t for $t = 1, \dots, T$ is an $m \times 1$ vector containing observations on m different series and ϵ_t is an $m \times 1$ vector of errors where we assume is i.d. $N(0, \Sigma_\epsilon)$. For compactness we may rewrite the model as:

$$Y = XA + E \qquad (24)$$

Where Y and E are $T \times m$ matrices and $X = (x_1, \dots, x_t)'$ is a $T \times (mp + 1)$ matrix for$x_t = (1, y'_{t-1,\dots,} y'_{t-q})$, I_m is the identify matrix of dimension m, $\theta = vec(A)$, and $e \sim N(0, \Sigma_\epsilon \otimes I_T)$

Using (24), the likelihood function is

$$l(\theta, \Sigma_t) \propto |\Sigma_\epsilon \otimes I_T|^{-\frac{1}{2}} \exp\left\{-\frac{1}{2}(y - (I_m \otimes X)\theta)'(\Sigma_\epsilon \otimes I_T)^{-1}(y - (I_m \otimes X)\theta)\right\} \qquad (25)$$

To illustrate how to derive the posterior moments, let us assume Σ_ϵ is known and a multivariate normal prior for θ:

$$\Pi(\theta) \propto |V_o|^{-\frac{1}{2}} \exp\left\{-\frac{1}{2}(\theta - \theta_o)' V_0^{-1}(\theta - \theta_0)\right\} \qquad (26)$$

Where θ_0 is the prior mean and V_0 is the prior covariance. When we combine this prior with the likelihood function in (26), the posterior density can be written as

$$\Pi(\theta|y) = \exp\{-\frac{1}{2}.\left(\left(V_0{}^{-\frac{1}{2}}(\theta-\theta_0)\right)'\left(V_0{}^{-\frac{1}{2}}(\theta-\theta_0)\right) + \left\{(\Sigma_\epsilon{}^{-\frac{1}{2}} \otimes I_T)\, y \right.\right.$$

$$\left. - \left(\Sigma_\epsilon{}^{-\frac{1}{2}} \otimes X\right)\theta\right\}' \left\{(\Sigma_\epsilon{}^{-\frac{1}{2}} \otimes I_T\right)$$

$$\left. - \left(\Sigma_\epsilon{}^{-\frac{1}{2}} \otimes X\right)\theta\}\right)\} \qquad (27)$$

Which is a multivariate normal pdf. For simplicity, we define

$$w = \begin{bmatrix} V_0{}^{-\frac{1}{2}}\theta_0 \\ \left(\Sigma_\epsilon{}^{-\frac{1}{2}} \otimes I_T\right) y \end{bmatrix}$$

$$W = \begin{bmatrix} V_0{}^{-\frac{1}{2}} \\ \left(\Sigma_\epsilon{}^{-\frac{1}{2}} \otimes X\right) \end{bmatrix} \qquad (28)$$

Then the exponent in (28) can be written as

$$\Pi(\theta|y) \propto \exp\left\{-\frac{1}{2}(w - W\theta)'(w - W\theta)\right\}$$

$$\propto \exp\left\{-\frac{1}{2}(\theta - \bar{\theta})'W'W(\theta - \bar{\theta})\right.$$

$$\left. + (w - W\bar{\theta})'(w - W\bar{\theta})\right\} \qquad (29)$$

Where the posterior mean $\bar{\theta}$ is

$$\bar{\theta} = (W'W)^{-1}\mathrm{W}' = [\, V_0{}^{-1} + \left(\Sigma_\epsilon{}^{-1} \otimes X'X\right)]^{-1}\left[\ \bar{V}_0{}^{-1^{-1}}\theta_0 + \left(\Sigma_\epsilon{}^{-1} \otimes X\right)'y\right]$$

$$\pi(\theta|y) = \propto \exp\left\{-\frac{1}{2}(\theta - \bar{\theta})'W'W(\theta - \bar{\theta})\right\}$$

$$= \exp\left\{-\frac{1}{2}(\theta - \bar{\theta})'\ \bar{V}_0{}^{-1}(\theta - \bar{\theta})\right\} \qquad (30)$$

Therefore, the posterior covariance $\bar{V}$ is given as

$$\bar{V} = [\, {V_0}^{-1} + \left({\Sigma_\epsilon}^{-1} \otimes X'X\right)]^{-1} \qquad (31)$$

Conclusion

This chapter developed and presented the methodological framework suitable for conducting the study. The theoretical framework employed to modeling the dynamics of the real exchange rate is the intertemporal optimizing model developed by Edwards (1989). Quarterly time-series data such as real effective exchange rate, earning of cocoa and non-traditional exports as well as mineral exports, foreign aid, trade openness, government expenditure and broad money supply from 1990 to 2011 was employed for the study.

Stationarity was conducted using Augmented Dickey-Fuller (ADF) and the Philips Peron (PP). Also, Johansen (1988) and Johansen approach to cointegration as well as the VAR model were adopted.

CHAPTER FIVE

RESULTS AND DISCUSSION

Introduction

This chapter presents and analyzes the regression results of the functions specified in chapter four. As indicated earlier, the objective of this study is to investigate the long-run and short-run relationships between the earnings of cocoa and non-traditional export and real exchange rate. The chapter presents a thorough analysis and discussion of the results of the study. The results of the descriptive statistics of the variables are examined in the first section. The time series properties of the variables where the results of both Augmented Dickey Fuller and Philip Peron unit root tests are presented constitute the second section. In the third section, the results of Johansen's approach to co-integration are presented. Section four presents and discusses the results of the estimated long-run growth equation using the vector autoregressive approach. The final section presents and discusses variance decomposition analysis, and granger causality test and stability test. These results are discussed in relation to the hypotheses of the study.

Descriptive Statistics

The study undertook the descriptive statistic test of the variables involved. The descriptive comprised the mean, median, maximum, minimum, standard deviation, skewness, kurtosis, sum, sum squared deviation and a number of observations. These statistics are illustrated in Table 1. It can be observed from Table 1 that all the variables have positive average values (mean and median). This is normal considering the series involved. Also the minimal

deviation of the variables from their means as shown by the standard deviation gives indication of a slow growth rate (fluctuation) of these variables over the period of consideration. Real effective exchange rate, cocoa and mineral exports, aid, trade openness and government expenditure are positively skewed while non-traditional export and money supply are negatively skewed.

The Jarque-Bera statistic which shows the null hypothesis that all the series are drawn from a normally distributed random process cannot be rejected for foreign aid, (ODA) and degree of trade openness, (TRD) implying that they are normally distributed. However, real effective exchange rate, (REER), earnings of cocoa export, (COCX), earnings of non-traditional export, (NONTX), money supply (M2) and earnings of mineral export, (MINX), are not normally distributed. This may be attributed to the economic fundamentals as well as the nature and volatility of the variables especially the exchange rate. For this reason, the study used the Bayesian VAR which assumes a normally distributed series. The Bayesian VAR was also used in conducting the impulse response.

Table 2: Summary Statistics

	LNREER	LNCOCX	LNNONTX	ODA	LNTRD	GOVEXP	LNM2	LNMINX
Mean	3.349493	5.123262	4.580694	2.348503	2.913739	2.934467	6.323077	5.426179
Median	3.274036	4.943408	4.669279	2.443137	2.914618	2.884148	6.298731	5.226197
Maximum	3.731284	6.607771	6.451455	4.188329	3.402043	4.643995	9.563857	7.208002
Minimum	3.074787	4.235950	2.642900	1.098245	2.351211	2.258884	3.135494	3.974337
Std. Dev.	0.192949	0.680402	1.099064	0.798204	0.290413	0.479154	1.910609	0.754904
Skewness	0.579717	0.600842	-0.361168	0.110712	-0.388832	1.130263	-0.050556	0.664707
Kurtosis	1.902846	2.213558	2.076419	2.334227	2.272181	4.343990	1.793273	2.928237
Jarque-Bera	9.342787	7.562637	5.040828	1.805036	4.159768	25.35970	5.376851	6.499128
Probability	0.009359	0.022793	0.080426	0.405547	0.124945	0.000003	0.067988	0.038791
Observations	88	88	88	88	88	88	88	88

Source: Author's (2016) computation, using Eviews 9.0 Package

Unit Root Test

It was necessary to conduct the unit root tests so we could investigate the stationarity properties of the series before applying the Johansen's approach to co-integration. As such, all the variables were examined by first inspecting their trends graphically (Appendix A). From the graphs in Appendix A, it can be observed that the variables exhibit features of non-stationary series at their levels. However, plotting all the variables (Appendix B) in their first differences show stationay behavior. In addition, we applied the both the Augmented Dickey-Fuller (ADF) and the phillips and Peron (PP) tests to all the variables in both levels and first difference so we could formalized their order of integration. The Schwartz-Bayesian Criterion (SBC) and Akaike Information Criterion (AIC) were used to determine the optimal number of lags included in the tests. The study employed the p-values for making the unit rot decision which were consistent with the conclusion with the critical values. The results of both tests for unit root for all the variables at their levels and first difference with reference to intercept and trend are presented in Tables 3 and 4. It's worth nothing that except for money supply which had both intercept and trend the rest had intercept only.

Table 3: Unit Root Test for the Order of Integration (ADF and Philips Peron) at Levels with (Intercept and Trend)

VARIABLES	ADF STATS	P-VALUE	[LAG]	PP STATS	P-VALUE	[BW]
LNREER	-1.532	0.5175	[0]	-1.8709	0.3444	[5]
LNCOCCX	1.729	0.9982	[0]	0.7055	0.9917	[5]
LNNONTX	-0.466	0.8986	[0]	-0.5166	0.8819	[5]
ODA	-0.892	0.7906	[0]	-1.5621	0.4975	[4]
LNTRD	-1.651	0.4567	[0]	-1.7949	0.3808	[5]
GOVEXP	-0.140	0.9453	[0]	-1.6114	0.4725	[5]
LNM2	-0.052	0.9540	[0]	0.2097	0.9718	[6]
LNMINX	1.646	0.9980	[0]	0.5727	0.9882	[6]

Source: Computed using Eviews 9.0 Package
Note: *,**, ** and * represent significance levels at the 1%, 5% and 10% respectively.

From the results of unit root test in Table 3, the null hypothesis of unit root for all the variables cannot be rejected at levels. This means that all the variables are not stationary at levels since their p-values for both Augmented Dickey Fuller and Philip Peron tests are not significant at all conventional levels of significance.

Table 4: Unit Root Test for Order of Integration: (ADF and Philips Peron) at First Difference with (Intercept and Trend)

VARS	ADF STATS	P-VAL	*OI LAG*	PP STATS	P-VAL	*OI BW*
DLNREER	-4.814	0.0001	*I*(1) [0]	-4.8397	0.0001	*I*(1) [4]
DLNCOCX	-4.776	0.0000	*I*(1) [0]	-4.7272	0.0002	*I*(1) [5]
DLNNONTX	-4.947	0.0000	*I*(1) [0]	-4.9954	0.0001	*I*(1) [4]
DODA	-5.490	0.0000	*I*(1) [0]	-5.4878	0.0000	*I*(1) [4]
DLNTRD	-4.654	0.0001	*I*(1) [0]	-4.7249	0.0002	*I*(1) [4]
DGOVEXP	-4.815	0.0001	*I*(1) [0]	-4.7437	0.0002	*I*(1) [5]
DLNM2	-12.337	0.0000	*I*(1) [0]	-20.094	0.0001	*I*(1) [22]
DLNMINX	-4.020	0.0023	*I*(1) [0]	-3.9775	0.0024	*I*(1) [4]

Note: IO represents order of integration and D denotes first difference.
***, ** and * represent significance at the 1%, 5% and 10% levels respectively.
Source: Computed using Eviews 9.0 Package

Table 4 shows that, at first difference all the variables are stationary and we reject the null hypothesis of the existence of unit root. We therefore reject the null hypothesis of the existence of unit root in all the variables at the 1 percent level of significance. One can therefore conclude from the above analysis that all variables are integrated of order one *I*(1) and in order to avoid spurious regression the first difference of all the variables must be employed in the estimation of the short run equation.

VAR Lag Length Selection

The estimation of Vector Autoregressive (VAR) models requires the selection of an appropriate lag length since it plays a vital role in diagnostic tests as well as in the estimation of VAR models for co-integration, impulse response and variance decomposition (Bhasin, 2004). Therefore an appropriate lag length (p) is chosen using standard model selection criteria such as the Akaike Information Criterion and Swartz Information Criterion that ensure normally distributed white noise errors with no serial correlation. Table 5 presents the results of the VAR lag selection criteria.

Table 5: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-42.00820	NA	4.75e-10	1.234770	1.471259	1.32965
1	944.2522	1753.352	6.17e-20	-21.53709	-19.40869	-20.6832
2	1073.139	203.6727	1.30e-20	-23.13923	-19.11892	-21.5262
3	1106.596	46.26209	3.10e-20	-22.38509	-16.47287	-20.0130
4	1179.856	86.82588	3.12e-20	-22.61372	-14.80959	-19.4826
5	1527.744	343.5939	4.29e-23	-29.62332	-19.92728*	-25.7331
6	1634.058	84.00099*	3.08e-23*	-30.66810	-19.08015	-26.0187
7	1733.857	59.14017	4.22e-23	-31.55203*	-18.07217	-26.1437*

Source: Computed Using Eviews 9.0 Package.
* indicates lag order selected by the criterion

With reference to Table 5, it can be observed that asterisks are attached to some statistics of the five lag selection criteria within the VAR lag selection criteria. From, Table 5 above, lag 5 has the minimum asterisks therefore the appropriate lag length for the model is 5 since we aim at minimizing the lag length within the framework of Bayesian VAR.

Cointegration Test

Johansen cointegration analysis results are presented in this section. First differencing appears to provide the appropriate solution to the problems considering non stationary series with a unit root. However, first differencing will eliminate all the long-run information which economists are most interested in. Cointegration can be used to establish whether there exists a linear long-term economic relationship among variables according to (Johansen, 1991). Again, Pesaran and Smith (1995) added that cointegration enables researchers to determine whether there exists disequilibrium in 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 the series are integrated of order one, $I(1)$, the cointegration of the series is a necessary condition for the existence of a long run relationship. The results of both the trace and maximum-Eigen value statistic of the Johansen cointegration test are presented and displayed in Tables 6 and 7 under the assumption of linear trend in the data, and an intercept and trend in the co-integration equation.

Table 6: Johansen's Cointegration Test (Trace) Results

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.656495	338.9748	159.5297	0.0000***
At most 1 *	0.596305	251.3533	125.6154	0.0000***
At most 2 *	0.481453	176.9714	95.75366	0.0000***
At most 3 *	0.434217	123.1199	69.81889	0.0000***
At most 4 *	0.325112	76.41723	47.85613	0.0000***
At most 5 *	0.271591	44.17416	29.79707	0.0006***
At most 6 *	0.191723	18.18898	15.49471	0.0192**
At most 7	0.008926	0.735197	3.841466	0.3912

Note: ***, ** denote rejection of the null hypothesis. The Trace test indicates 7 cointegrating equations at the 1% and 5% significance level respectively.
Source: Computing Using Eviews 9.0 package

From table 6, we observe that the trace statistics indicate the presence of cointegration among the variables and so the null hypothesis of no cointegrating relationship or vector (r = 0) is rejected since the computed values of the trace statistics of 338.9748 is greater than the critical value of 159.5297 (5%). Therefore, applying the Johansen test to the quarterly series spanning from 1990:Q1 to 2011:Q4 leads to conclusion that there exits at most one cointegrating relationship. This confirms the existence of a stable long-run relationship among real effective exchange rate (REER), government consumption (COCX), non-traditional exports (NONTX), aid (ODA), OPENESS (TRD), government expenditure (GOVEXP), money supply (M2) and mineral export (MINX).

Table 7: Johansen's Cointegration Test (Maximum Eigenvalue) Results

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.656495	87.62151	52.36261	0.0000***
At most 1 *	0.596305	74.38192	46.23142	0.0000***
At most 2 *	0.481453	53.85149	40.07757	0.0008***
At most 3 *	0.434217	46.70270	33.87687	0.0009***
At most 4 *	0.325112	32.24306	27.58434	0.0117**
At most 5 *	0.271591	25.98518	21.13162	0.0096***
At most 6 *	0.191723	17.45379	14.26460	0.0151**
At most 7	0.008926	0.735197	3.841466	0.3912

Note: ***, ** denote rejection of the null hypothesis. The Maximum Eigenvalue indicates 7 cointegrating equations at the 1% and 5% significance level respectively.
Source: Computing Using Eviews 9.0 package

Also, Table 7 shows that the maximum-Eigen value statistics indicate the presence of cointegration among the variables. As such, the null hypothesis of no cointegrating relationship or vector (r = 0) is rejected since the computed values of the maximum-Eigen value statistics of 87.62151 is greater than the critical values of 52.36261 (5%). Hence applying the Johansen test to the quarterly series spanning from 1990:Q1 to 2011:Q4 leads to conclusion that there exits at most one cointegrating relationship. This confirms the existence of a stable long-run relationship among real effective exchange rate (REER), government consumption (COCX), non-traditional exports (NONTX), aid

(ODA), OPENESS (TRD), government expenditure (GOVEXP), money supply (M2) and mineral export (MINX).

Again, it can be observed from Table 8 below that the first vector and row appears to be the one on which we can normalize the real exchange rate. Therefore, since both the Trace and Maximum Eigen Value indicate 7 cointegrating equations, we normalized on the first cointegrating equation which is the real effective exchange rate model (REER).

Table 8: Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LNREER	LNCOCX	LNNONTX	ODA	LNTRD	GOVEXP	LNM2	LNMINX
13.19703	16.48020	3.396289	0.120976	-9.684381	-3.586906	-3.913594	-3.880243
-2.046983	-41.05752	34.50389	9.725099	-40.54101	4.606547	-7.958505	18.62125
-19.84503	1.202680	9.456009	1.884414	-2.389135	-3.914055	-8.556599	4.935417
-23.60884	0.888972	-5.369065	-7.254750	8.887176	-2.544269	0.932470	-6.034786
39.25010	-21.43948	-14.09310	4.366201	0.987035	-1.410527	14.06971	13.49246
7.344460	2.467155	0.694727	-1.815072	7.230432	-2.050433	-0.498003	-3.191892
8.203262	2.699285	-0.649484	0.262372	3.782554	0.544341	-2.333675	4.756536
-3.371317	-4.161338	8.427793	1.051756	-4.816926	1.551978	-5.204646	7.600040

Source: Author's Computation Using Eviews 9.0 Package.

Long Run Estimation

We estimated the long run relationship among the variables based on the results of the cointegration analysis. In order to establish the long-run equation, we normalized the real exchange rate in the VAR model. Therefore, the estimated long-run equilibrium relationship for real exchange rate from the normalized vectors and the appropriate rows as discussed above are presented as follows:

Real exchange rate model

$$LNREER = -4.2818C + 0.3613LNCOCX + 0.1967LNNONTX + 0.1798ODA \quad (32)$$
$$-0.5852LNTRD - 0.1727GOVEXP - 0.1136LNM2 + 0.1342LNMINX$$

Where C is constant, COCX is cocoa export earnings, NONTX is non-traditional export earnings, ODA is official development assistant (AID), TRD is trade openness, GOVEXP is government expenditure, M2 is money supply and MINX is mineral export earnings.

The error correction term is specified as

$$ECM = LNREER + 4.2818C - 0.3613LNCOCX - 0.1967LNNONTX - 0.1798ODA \quad (33)$$
$$+0.5852LNTRD + 0.1727GOVEXP + 0.1136LNM2 - 0.1342LNMINX$$

From (32), real exchange rate in Ghana grows (depreciates) by about 4% each quarter in the long run, all other things held constant. Also, the equation shows that earnings of cocoa and non-traditional exports have an appreciating effect on real effective exchange rate in the long-run. Thus, a percentage increase in earnings of cocoa and non-traditional export will cause real

exchange rate to appreciate by about 0.6%. This is consistent with the findings of Mkenda (2001).

More specifically, from the long run estimation, it can be observed that earnings of cocoa exports have an appreciating effect on real exchange rate. This implies that a percentage increase in the world price of cocoa, earnings of cocoa exports, real exchange rate will fall or depreciate by about 0.36% in that an increase in the world price of cocoa prices will increase coca export earnings. This will intend increase the country's foreign exchange reserves for cocoa exports thereby causing an appreciation of the real exchange rate. This is consistent with the findings of Mkenda (2001) but contradicts the findings of Aron et al. (1997).

Again, with reference to non-traditional exports, it can be seen from the equation that earnings of non-traditional exports have an appreciating effect on real exchange rate. This means that a percentage increase in the relative price of non-traditional export, earnings of non-traditional export, real exchange rate falls by about 0.17%. This is because an increase in the relative price of non-traditional export or earnings of non-traditional export will intend increase the country's foreign exchange reserves for non-traditional exports thereby causing the real exchange rate to appreciate. This is consistent with the findings of Mkenda (2001).

It is also evident from the equation that foreign aid (ODA) in the long-run has an appreciating effect on real effective exchange rate. That's for every 1% increase in foreign aid, real effective exchange rate appreciates by about

18%. This confirms the Dutch disease theory which stipulates that an increase in foreign aid to a small country such as Ghana will cause demand for both tradables and non-tradables to rise. Thus, the price of non-tadables will increase because its determined domestically thereby causing loss of competitiveness due to exchange rate appreciation. This is consistent with the findings of Younger (1992).

The degree of trade openness leads to a depreciation of real exchange rate. This implies that any increase in the degree of openness will cause real exchange rate to depreciate about 0.59% in the long run. This means that a reduction in trade barriers will lead to a fall in price of non-tradables and consequently cause the currency to depreciate in that international trade will eventually lead to varieties of imported products on the domestic market which is relatively cheaper in terms of the domestic product. Consequently, the demand for these domestic products will fall thereby causing an increase in the demand for the foreign products and this will eventually lead to a depreciation of real exchange rate. Consequently, the price of the domestic products will fall. This finding is consistent with Guclu (2008) and Takaendesa (2006).

Government expenditure has a depreciating effect on real exchange rate implying that a percentage increase in government expenditure will cause real exchange rate to rise by about 17%. This implies that government consumption is tradable based. That is if government raises taxes to service its debt it will end up reducing the disposable income hence a fall in aggregate demand. Such a movement will reduce the price of non-tradables, and thus lead to a

depreciation in the equilibrium real exchange rate. This is consistent with the findings of Aron et al. (1997) and Zalduendo (2006).

Money supply has a positive coefficient which shows that an expansionary monetary policy will raise the general price level. Consequently, this will lead to varieties of imported products on the domestic market which is relatively cheaper in terms of the domestic product. Consequently, the demand for these domestic products will fall thereby causing an increase in the demand for the foreign products and this will eventually lead to a depreciation of real exchange rate for exports. This is consistent with the findings of Güçlü (2008) and Ahmed et al. (2012). In addition, Aron *et al* (1997) also found that in the case of South Africa an increase in reserves appreciate the real exchange rate.

Finally, it can be inferred from the equation that earnings of mineral exports have an appreciating effect on real exchange rate. This means that a percentage increase in the earnings of mineral exports will cause real exchange rate to fall or appreciate by about 0.13%. This is because an increase in the relative price of mineral exports or earnings of mineral exports will end up increasing the central bank's foreign exchange reserves for mineral exports thereby causing an appreciation of the real exchange rate. This is consistent with the findings of Mkenda (2001)

Vector Error Correction Estimates (VECM)

According to Engle and Granger (1991) when variables are cointegrated, their dynamic relationship can be specified by an error correction representation

in which an error correction term (ECT) computed from the long-run equation must be incorporated in order to capture both the short-run and long-run relationships. Basically, the error correction term indicates the speed of adjustment to long-run equilibrium in the dynamic model giving a disequilibrium. Put differently, the magnitude of the error correction term shows how quickly the variables converge to equilibrium given a distortion or disequilibrium. The error correction term is expected to be less than one and statistically significant with a negative sign. The negative sign means that any distortion or shock that occurs in the short-run will be corrected in the long-run. The larger the error correction term in absolute terms, the faster the convergence to equilibrium

Given that the variables are non-stationary but cointegrated, the estimation of the vector error correction model, which included a first differenced VAR with one period lagged error correction term yielded an over-parameterized model. However, we employed the general to specific approach to arrive at a more parsimonious model where insignificant variables were deleted on the bases of the p-values. According to Rutaysire (2010), the process of moving from general to specific brings about a simplification of the model that makes the estimation more reliable and increases the power of the test. The general to specific models for the exchange rate has been discussed in Table 5.

Table 9: Parsimonious Results (VECM)

	Coefficient	Std. Error	T-Statistic	Prob.
ECT(-1)	-0.140810	0.035437	-3.973520	0.0002***
D(LNREER(-1))	1.086031	0.243261	4.464474	0.0000***
D(LNREER(-2))	0.190118	0.109975	1.728733	0.0891*
D(LNREER(-5))	0.682239	0.203623	3.350500	0.0014***
D(LNNONTX(-1))	-0.248893	0.117093	-2.125609	0.0377**
D(LNNONTX(-4))	0.311291	0.089753	3.468323	0.0010***
D(LNNONTX(-5))	-0.268946	0.121858	-2.207038	0.0312**
D(ODA(-1))	0.049008	0.022804	2.149075	0.0357**
D(ODA(-4))	0.083901	0.018534	4.526938	0.0000***
D(LNTRD(-5))	0.299112	0.130455	2.292835	0.0254**
D(GOVEXP(-2))	-0.044088	0.024486	-1.800491	0.0769*
D(GOVEXP(-4))	-0.067125	0.028208	-2.379613	0.0206**
D(LNM2(-2))	-0.172363	0.073284	-2.351989	0.0220**
D(LNM2(-4))	-0.155581	0.071687	-2.170278	0.0340**
D(LNM2(-5))	-0.180306	0.073598	-2.449880	0.0173**
D(LNMINX(-1))	0.463956	0.133301	3.480509	0.0009***
D(LNMINX(-4))	-0.329091	0.133443	-2.466155	0.0166**
D(LNMINX(-5))	0.577981	0.180682	3.198879	0.0022***
C	0.041561	0.019696	2.110099	0.0391**

Source: Author's Estimate Using Eviews 9.0 Package
Note: *, **, *** denotes 10%, 5% and 1% significance level respectively.

With reference to Table 5, the estimated coefficient of the error correction term (ECT) is significant, less than one and has the expected sign. This indicates that there is a joint significance of the long-run coefficients.

Kremers, Ericsson, and Dolado (1992) argue that a more efficient way of establishing cointegration is through the error correction term. In Table 5, the estimated coefficient of the error correction term is -0.140810 implying that the speed of adjustment is approximately 14 percent per quarter. This is an indication that cointegrating relationship exists among the variables. The size of the coefficient on the error correction term (ECT) shows that about 14 percent

of the disequilibrium in the product market caused by previous quarter's shocks converges to the long-run equilibrium in the current quarter.

Again, the size of the coefficient on the error correction term suggests that in the short-run the variables in the model show evidence of relatively slow response to equilibrium upon distortion. Acheampong (2007) argues that the rule of thumb is that, the larger the error correction coefficient (in absolute term), the faster the variables equilibrate in the long-run when shocked. However, the magnitude of the coefficient in this study suggests that the speed of adjusting to long-run changes is slow.

The results of the error correction model in Table 9 shows that the previous quarter values of real exchange rate affect the current values. Considering the p-values for the lagged real exchange rate values, we observe that the first and fifth lags are significant at 1% while the second lag is significant at 10% yet they are all positive to the fifth lag. Holding all other factors constant, this implies that for any percentage increase in the first to the sixth lag of real exchange rate will lead to depreciation of the current real exchange rate 1.09%, 0.19% and 0.68% respectively as expected. This finding is consistent with theory as well as the findings of Takaenddesa (2006).

From the short run analysis, it can be seen that cocoa export is nonexistence in the short run model. This an indication of long gestation period of cocoa and so we did not expect cocoa to be appear in the short run model.

Non-traditional exports in the short run dynamics is negative, positive and negative as well as significant at 5%, 1% and 5% in the first, fourth and

fifth lags respectively. The result indicates that earnings of non-traditional exports have appreciating effects on real exchange rate by about 0.25% and 0.27% in the first and fifth lags while it exerts a depreciating effects on real exchange rate by about 0.31% in the fourth lag. However, the net effect of the coefficient is negative though implying that an increase in earnings of non-traditional exports will cause real exchange rate to fall and or appreciate by about 0.21%. This is consistent with the findings of Mkenda (2001).

Foreign aid showed a depreciating effect on real exchange rate in the short run thereby confirming the long run result. Implying that a percentage increase in aid inflows will cause real exchange rate to rise or depreciate in the short-run by about 5% and 8% in the first and fourth lags respectively.

Also, the short run dynamics indicates a positive relationship between openness and real exchange rate only in the first and fifth lags. Moreover, trade openness is not significant at lag one but significant in the fourth lag. This means that any further reduction in trade restrictions will cause real exchange rate to depreciate by about 0.3% only in the fourth lag. This is also confirms the long run results thereby implying that openness causes a reduction in price of non tradeables.

Government expenditure on the other hand indicates a negative relationship with real exchange rate in the short run dynamics. This means that a percentage increase in government expenditure will cause the real exchange rate to fall and or appreciate by about 4.4% and 6.7% in the second and fourth lags respectively. This shows that government spends more on nontradeables

than on tradables. This finding contradicts that of the long run results but consistent with Fida et al. (2012) and Hyder and Mahboob (2006).

Further, there is a negative relationship between money supply and real exchange in the short run dynamics for the second, fourth, fifth and the seventh third lags. Money supply carrying a negative sign means that an expansionary monetary policy will eventually raise the general price level in the domestic economy and hence appreciation of real exchange rate for export. Accordingly, an increase in money supply or an expansionary monetary policy will lead to appreciation of the real exchange rate by about 0.17%, 0.15%, and 0.18% for the second, fourth and fifth lags respectively. This is consistent with the monetarist theory as well as the finding of Zakaria et al. (2007) but contradicts the long run result. Also, Aron *et al* (1997) also found that in the case of South Africa an increase in reserves appreciate the real exchange rate.

Again, in the short run dynamics, mineral exports is positive, negative and positive and significant as well at 1% , 5% and 1% in the first, fourth and fifth lags respectively. The result indicates that earnings of mineral exports have a depreciating effects on real exchange rate by about 0.46% and 0.58% in the first and fifth lags while it exerts an appreciating effects on real exchange rate by about 0.33% in the fourth lag. However, the net effect of the coefficient is positive though implying that an increase in earnings of mineral exports will cause real exchange rate to rise and or depreciate by about 0.7%. This is consistent with the finding of Aron et al., (1997) but contradicts that of Mkenda (2001)

The coefficient of the lagged error correction term is negative and statistically significant meaning that when there is any deviation from equilibrium in the short run, the model will adjust to it long run equilibrium by 14% each quarter.

Post estimation test for VECM

The estimated regression post estimation results showed that the model was correctly fit. The adjusted R-square shows that 58% of the variation in the real exchange rate is explained by the variables in the regression model. Further, the variance of the error term is constant over time as seen from the heteroscedasticity test by employing the Breusch-Pagan-Godfrey and ARCH test in Table 10. Similarly, there was no serial correlation among the variables used for the regression. Thus the past values of the dependent variable do not depend on each other.

Table 10: Post Estimation Test for VECM

Diagnostic	Statistic
R-squared	0.713054
Adjusted R-squared	0.581887
Breusch-Godfrey Serial	F-statistic0.022442 (0.9778)
Correlation LM Test:	Obs*R-squared 0.062946 (0.9690)
Heteroskedasticity Test	F-statistic 0.882187 (0.6492)
Breusch-Pagan-Godfrey	Obs*R-squared 34.98447 (0.5639)

Author's Computation Using Eviews 9.0 Package
Note: the values in ( ) are the p-values

Stability Test Results

Cumulative sum of square and cumulative sum test: According to Brown et al., 1975) the stability test is based on the cumulative sum of the recursive residuals. Pesaran and Pesaran (1997) suggest that once the models have been estimated, it is necessary to apply the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) tests to assess the parameter constancy. This aims to check the stability of the parameters in the model for the sample period. This option plots the cumulative sum and the cumulative sum of squares together with the 5 percent critical lines. The test finds parameter instability if the cumulative sum and cumulative sum of squares goes outside the area between the two critical lines. From figure 10 below, the plotted CUSUM line and CUSUMSQ

respectively can be found within the 5 percent critical lines, indicating no systematic changes in the regression coefficients. This is shown below:

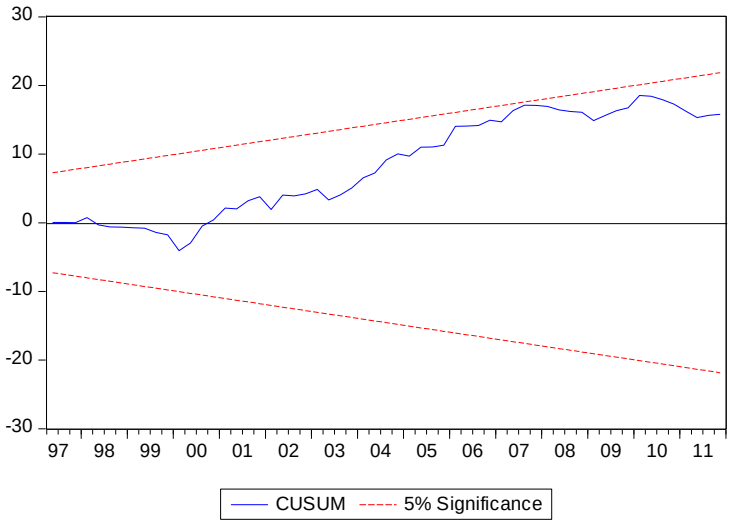

Figure 10: CUSUM

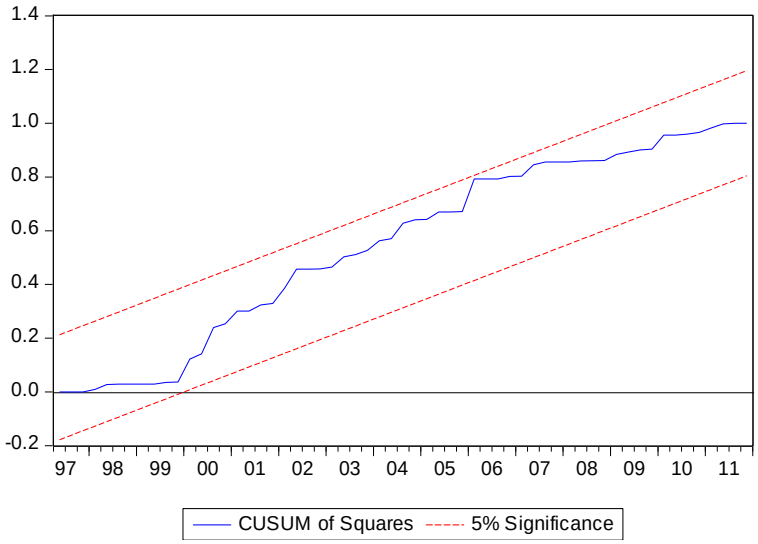

Figure 11: CUSUM of Squares

Impulse Response Functions

Real exchange rate model

The literature on real exchange rate argued that unanticipated shocks in its fundamentals such as earnings of cocoa and non-traditional exports, foreign aid, trade openness, government expenditure, money supply and mineral exports among others can cause distortions in the real exchange rate market. Some shocks were found in such fundamentals to have affected the real exchange rate significantly, (Korsu & Braima, 2011) and (Takaendesa, 2006).

The effects of these unanticipated distortions in the real exchange market (deviation of the short-run equilibrium values from the long-run equilibrium values) can be ascertained from the impulse response functions from the VAR model. According to (Bhasin, 2004) if the response is such that the short-run values converge to the long-run values, then it can be deduced that stability can be achieved in the future. The impulse response of the real exchange rate to one standard deviation shock in the innovation of earnings of cocoa and non-traditional exports are presented in figures 12 and 13 respectively. It is evident from the functions presented in Appendix C that, the real exchange rate is more responsive to a shock in itself followed by a shock in earnings of cocoa and non-traditional exports.

Selected Impulse Response Functions from the BayesianVAR

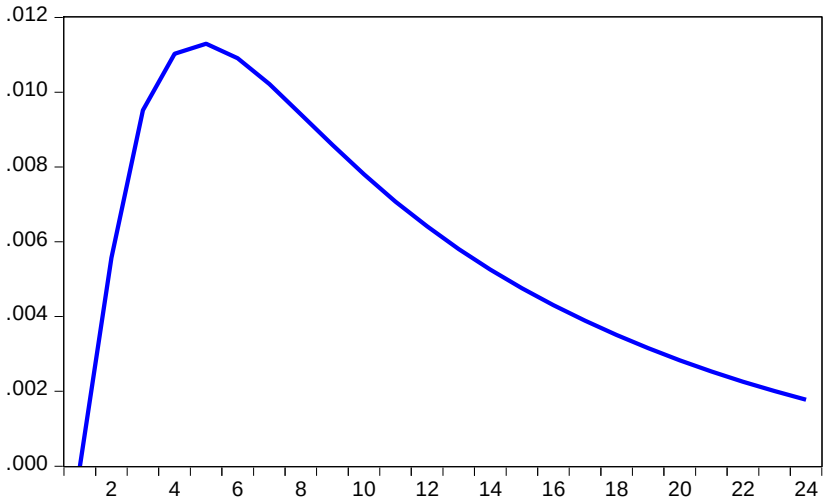

Figure 12: Response of LNREER to Cholesky One S.D. LNCOCX Innovation
Source: Generated by the author.

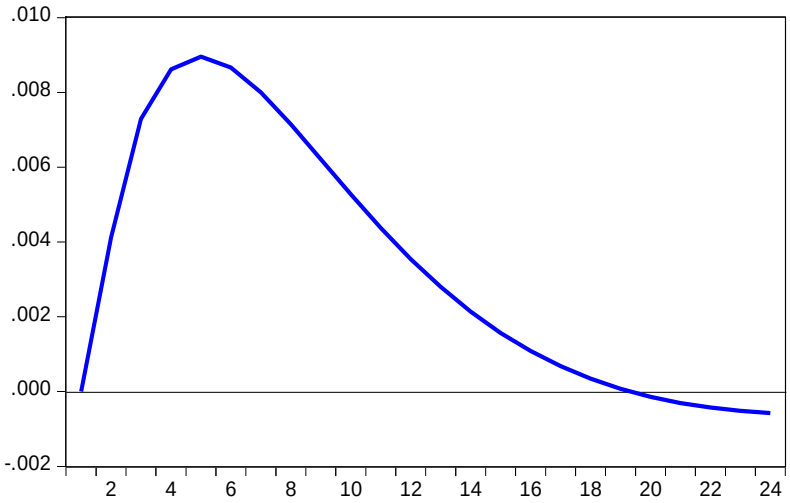

Figure 13: Response of LNREER to Cholesky One S.D. LNNONTX Innovation
Source: Generated by the author.

From figure 12, any unanticipated one period standard deviation shock to the earnings of cocoa export will eventually cause a positive wide deviation

between the short run equilibrium value of the real exchange rate and its long run equilibrium value throughout the fifth quarter after which it begins to maintain some level of deviations, but still positive though. Specifically, it maintains a minimal deviation from the nineteenth quarter and gradually converges to its long run equilibrium beyond the twenty-fourth quarter. Hence, the real exchange rate stabilizes gradually beyond the sixth year when disturbed by shocks in export earnings of cocoa.

With reference to the non-traditional export as shown in figure 13, a one period standard deviation shock to the earnings of non-traditional export would lead to a positive wide deviation in real exchange rate until about the sixth quarter after which it maintains a downward but still positive deviations up to the nineteenth quarter. However, it converges to its long run equilibrium level at the nineteenth quarter with some negative deviations after. Hence, the real exchange rate stabilizes about the fifth year when disturbed by shocks in non-traditional export.

Conclusion

The study aimed at investigating the effects of earnings of cocoa and non-traditional exports on real exchange rate in Ghana. In order to achieve, the chapter presented the descriptive on the variables. The ADF and PP unit root tests suggested the presence of unit root in the variable at their levels but became stationary after first difference. Since all the variables were of order one (I(1)), the study employed the Johansen cointegration approach to examine the

cointegration relationship of the variable. The study also employed the Bayesian VAR in examining the response of the real exchange rate to unanticipated shocks in the model. The results that emanated from the analysis found support for the theoretical arguments.

The model diagnostics presented also suggested a robust and well behaved model for the period under investigation. The CUSUM and CUSUMSQ were within bound. The study also passed serial correlation and heteroscedasticity test. The study therefore went ahead to present the final chapter.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter presents the summary, conclusion and policy recommendations as well as the limitations and direction for future research. The aim of the study was to investigate empirically the impact of earnings of cocoa and non-traditional exports on real exchange rate. The empirical results showed that the objectives of the research were met. As such, the summary will briefly capture the overview of the research problem, objectives, methodology as well as the findings of the study. The conclusion will touch on the overall findings of the study in relation to the hypothesis. In addition, the recommendations will present specific remedies to be examined carefully and implemented by specific bodies and institutions.

Summary

Basically, the study meant to build and develop an empirical model of the real exchange rate in the Ghanaian context with special emphasis on the role of earnings of cocoa and non-traditional exports so the country could examine her export performance. Specifically, the study investigated both the long-run and short-run impact of earnings of cocoa and non-traditional exports on real exchange rate in Ghana.

Following the shocks to their determinants, the study investigated the dynamic adjustment of earnings of cocoa and non-traditional exports and real

exchange rate. The study developed and specified an empirical model of exchange rate based on the extensive review of literature on the determinants of real exchange rate. And so the potential variables included in the determinants of real exchange rate are cocoa and non-traditional exports, foreign aid, degree of trade openness, government expenditure, money supply and mineral exports.

The Johansen cointegration technique and error correction methodology were employed to determine both the long run and short run determinants of real exchange rate. It is necessary to note that the choice of the estimation technique was informed by it numerous advantages as well as the volatility of the data for the study. The study began the estimation process by first testing and analysing the time series properties of the data in order to determine their stationarity behaviour using the Augmented-Dickey Fuller (ADF) and Phillips-Perron test statistics. The unit root tests results suggested that all the variables were stationary after taking their first difference when stationarity was not attainable among the variables at levels. We then proceeded with the estimations by employing the Johansen (1988) approach to cointegration and VECM to examine the long run and short run dynamics among the variables. Further, the study went forth to estimate the general to specific model in obtaining the short-run parsimonious results. The Bayesian VAR model was employed to explore the response of the real exchange rate to some unanticipated shocks of the variable of interest, basically the earnings of cocoa and non-traditional exports.

From the real exchange rate model, the cointegration analysis indicated seven economically interpretable long-run relationships among the real

exchange rate and its fundamentals. Giving the cointegration analysis, one could observe from the long-run equation that earnings of cocoa, non-traditional and mineral exports as well as foreign aid, had an appreciating effect on real exchange rate. The negative effect on real exchange rate stipulate the Dutch Disease Theory. Also, degree of trade openness, government expenditure and money supply had positive or depreciating effect on real exchange rate.

In the general to specific model of real exchange rate, earnings of cocoa export was found to be insignificant among others and this could be attributed to its gestation period and so we did not actually expect cocoa to appear in the model anyway. Again, the general to specific model of real exchange rate also indicated that earnings of non-traditional export, government expenditure and money supply exhibited a negative effect on real exchange rate whiles foreign aid, degree of trade openness and earnings of mineral exports showed a positive effect. However, the impacts of government expenditure, money supply, foreign aid and earnings of mineral export contradicted the long run results in terms of their signs due to volatility of the exchange rate as well as the economic fundamentals in the Ghanaian economy.

The speed of adjustment of the lagged error correction term was negative and statistically significant. Therefore, the size of the coefficient suggested that about 14 percent of the disequilibrium caused by previous quarter's shocks converges back to the long-run equilibrium in the current quarter.

The diagnostic tests results showed that the model passed the test of serial correlation, functional form misspecification, non-normal errors and

heteroscedasticity. The graphs of the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) exhibitd that there exists a stable relationship between real effective exchange rate and export earnings of cocoa and non-traditional export.

Conclusion

The main focus of the research was to investigate the effect of earnings of cocoa and non-traditional export (forex) on real exchange rate in Ghana. Therefore, we adopted the intertemporal model developed by Edwards (1989) in the determination of the real exchange rate so we could fetch policy implications from the findings for macroeconomic management.

The study employed the Johansen (1988) approach to cointegration as well as the Bayesian VAR to achieve the objectives of the study. The empirical results of the study suggested that in the long-run earnings of cocoa, non-traditional and mineral exports, foreign aid, degree of trade openness government expenditure and money supply are the determinants of the real exchange rate in Ghana. It is worth noting that cocoa export disappeared in the short-run dynamics of the real exchange rate. Except for government expenditure, money supply, foreign aid and earnings of mineral export whose signs were not consistent with both the short-run and long-run, all the variables maintained their sign as good determinants of real exchange rate.

With reference to the empirical literature, the findings of the study was found to confirm the assertion that growth in forex will lead to a fall in the real

exchange rate in the long-run owing to the fact that cocoa and non-traditional exports are mostly primary, agrarian, and land based with relatively longer gestation period, typically cocoa. That is to say increase in the country's earnings of cocoa and non-traditional export as a proxy for forex, foreign exchange reserves, will appreciate the real exchange rate for exports.

Recommendations

The following recommendations are made based on the findings of the study. Basically, the earnings of cocoa and non-traditional exports variables were employed in the model as policy variables in order to test their effect on the real exchange rate.

Accordingly, it can be observed from the findings of the long-run results that cocoa export earnings had an appreciating effect on real exchange rate in the long run whiles it has no impact in the short run perhaps due to its gestation period. This implies that all other things remaining constant, producing more cocoa in the long-run is effective in curbing the rapid rise in the real exchange rate. In other words increasing or boosting cocoa exports in the long run will eventually fetch more forex thereby increasing the country's stock of foreign exchange. This will end up reducing or appreciating the real exchange rate for exports. As such, the government in collaboration with Export Promotion Council should further strengthen and deregulate the market system to encompass a number of local and foreign cocoa purchasers to enhance

competition among these companies. This will eventually help increase farm gate prices of cocoa farmers and improve cocoa output.

Again, the Export Promotion Council should provide exports incentives in the form of logistics and lower export tariffs to motivate export companies to facilitate the movement of cocoa from collection to conveying point to reduce waste and encourage cocoa exports.

The Ministry of Trade should tirelessly identify and educate all cocoa farmers so they can be trained on new technological practices in cocoa productivity.

Second, we observe from both the short run and the long run that the earnings of non-traditional exports also had an appreciating effect on real exchange rate. We therefore recommend that in as much as the government puts in measures to boosting the cocoa produce, it is equally expedient to channel a little more resources into the non-traditional export sector especially when the sector has been booming in recent times. A typical example is cashew whose value comes nearer to that of cocoa. Yet, there is an urgent need to diversify and add more value to our non-traditional export by way of improving the quality as well as the taste through the expansion of knowledge in relation to technology exchange. This will end up appreciating the real exchange rate for exports. Generally, it's about time we diversified and added value to our exports in order to attract more forex so we can stabilize the exchange rate as well as the Cedi.

Third, it is evident from the findings that foreign aid (ODA) had an appreciating and a depreciating effects on the real exchange rate in the long-run

and short-run respectively. The government of Ghana should strengthen its relationship with the advanced economies in order to attract more external inflows.

Fourth, trade openness had a depreciating effects on the real exchange rate in both long-run and short-run. There is the need for Export Promotion Council to manage trade restrictions as less restrictions of trade causes the exchange rate to depreciate.

Fifth, it is so clear from the findings that government expenditure had a depreciating and appreciating effects on the real exchange rate in the long-run and short-run respectively. It is therefore recommended that government expenditure should be geared towards the tradables in order to cause future appreciation in the exchange rate and the cedi as well.

Sixth, money supply had a depreciating and appreciating effects on the real exchange rate in the long-run and short-run respectively. Therefore, it is worth recommending that monetary authorities keep money supply relatively low in order to reduce inflation so the country can avoid international uncompetitiveness.

Finally, based on the findings of the study, earnings of mineral export had an appreciating and a depreciating effects on the real exchange rate in the long-run and short-run respectively. The Trade Ministry should focus on value addition to our mineral export so as to attract more foreign exchange.

Limitations of the Study

The study encountered numerous challenges. Basically, the study was impeded by time and financial constraints as well.

The other issue has to do with unavailability of data which has always been a major challenge confronting previous researchers, particularly in developing countries such as Ghana. As a result, some of the variables suggested by the theoretical models on the determination of the real exchange rate were not obtained. This means that some of the variables have to be excluded in the empirical model with the risk of an omitted variable bias. Inadvertently, this poses a serious challenge to empirical studies on the determinants of the real exchange rate and so this may have affected the findings presented in this study since they corroborate both the theoretical and empirical determinants of the real exchange rate.

Direction for Further Studies

It is pertinent to note that, the study set out to examine the impact of earnings of cocoa and non-traditional export (forex) on real exchange rate in Ghana where both the long-run and short-run relationships were established. However, the study could not establish the direction of causality as well as the forecast error variance among the variables. Therefore, future studies may explore granger causality test and variance decomposition to measure the linear causation as well as the forecast error variance among the variables.

For the sake of unavailability of data, the study used quarterly data spanning from 1990 to 2011 which may not necessarily reflect the reality. Therefore, future studies should make use of annual data.

The study only concentrated on supply-side factors that affect cocoa and non-traditional exports by using variables like openness, money supply, among others. Consequently, future studies can focus on demand-side factors. Again, future studies can also explore other estimation techniques.

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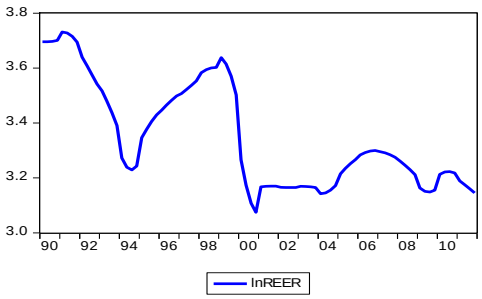
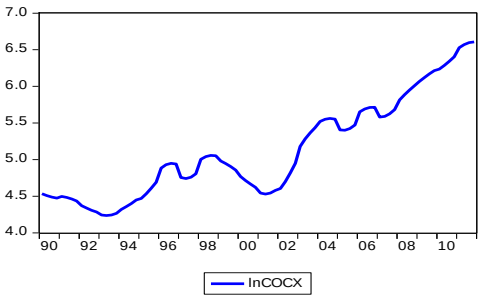
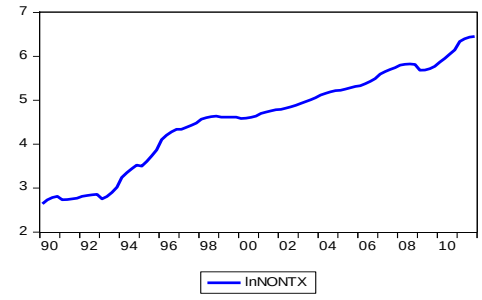
APPENDICES

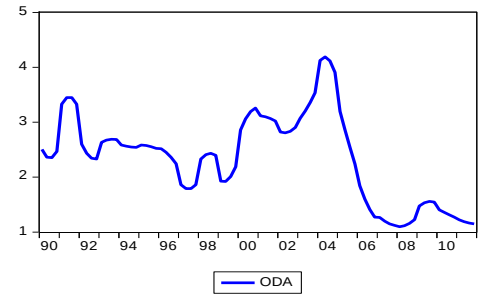
APPENDIX A

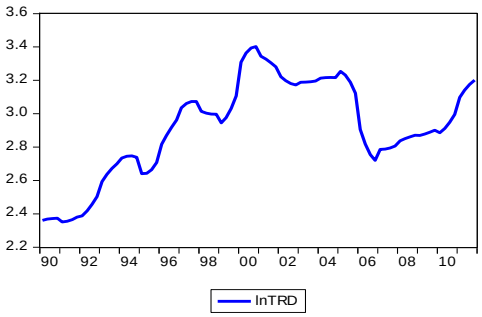
GRAPHS OF VARIABLES AT LEVELS

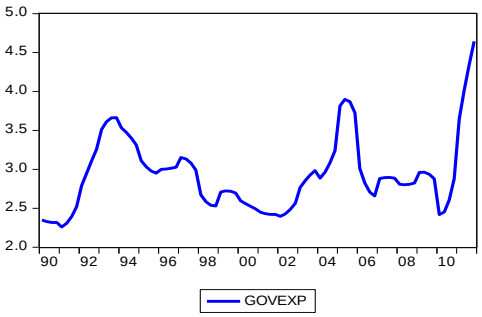


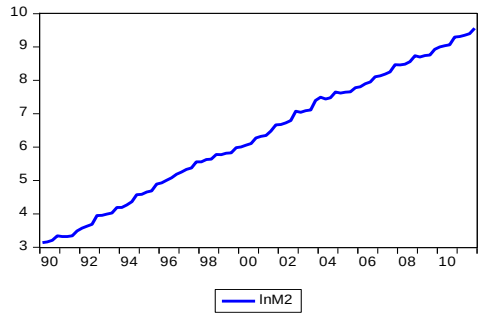


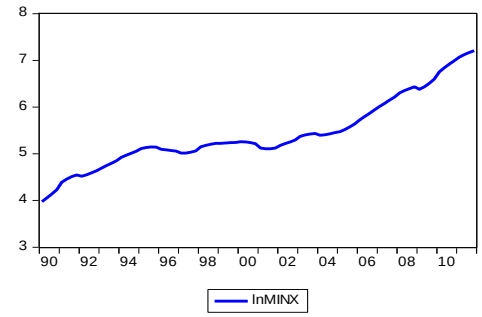






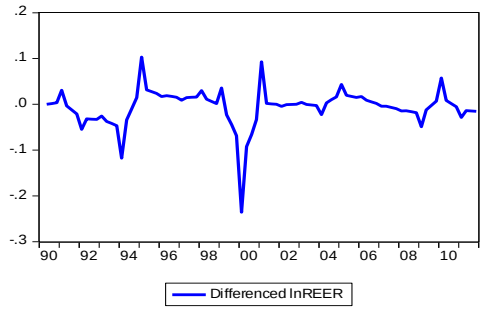


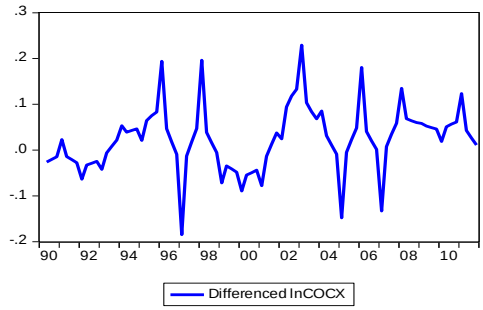


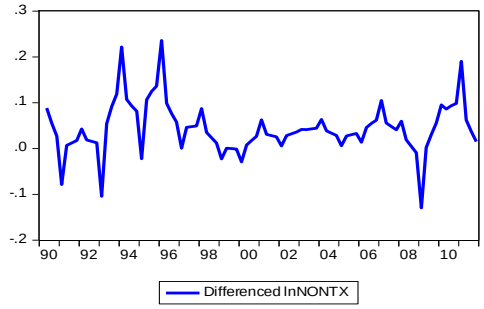


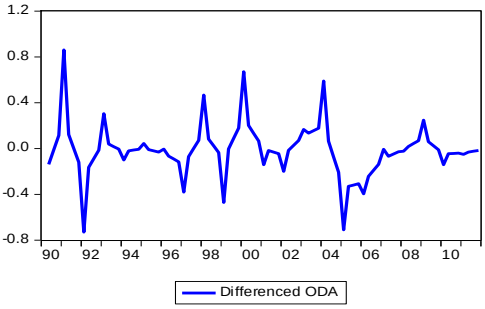
APPENDIX B

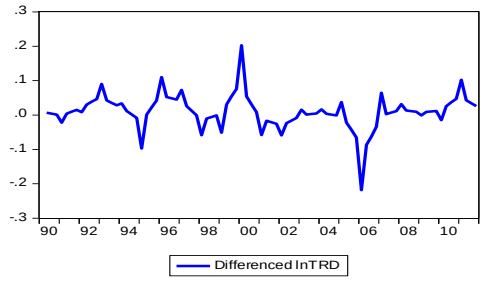
GRAPHS OF VARIABLES AT FIRST DIFFERENCE

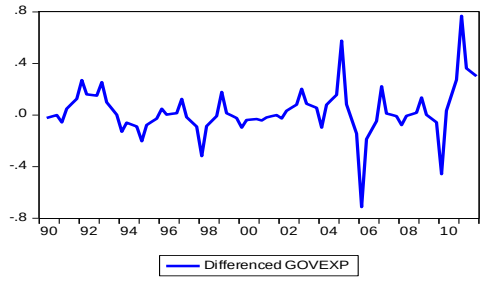


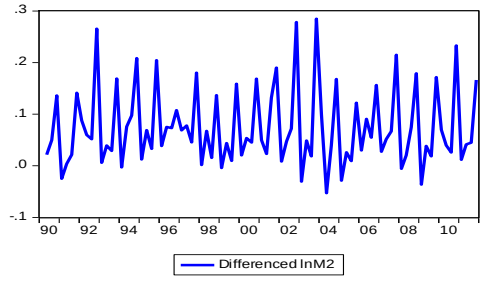


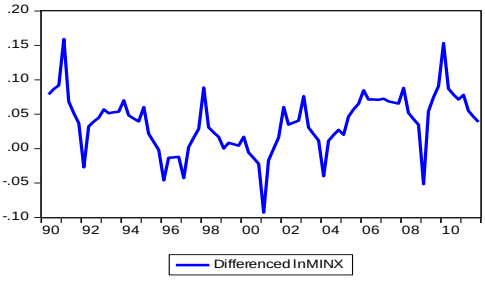












APENDIX C

ESTIMATED MODEL

LNREER LNCOCX LNNONTX ODA LNTRD GOVEXP LNM2 LNMINX

Table 11: General Short-Run Result

	Coefficient	Std. Error	T-Statistic	Prob.
ECT(-1)	-0.140810	0.035437	-3.973520	0.0002***
D(LNREER(-1))	1.086031	0.243261	4.464474	0.0000***
D(LNREER(-2))	0.190118	0.109975	1.728733	0.0891*
D(LNREER(-5))	0.682239	0.203623	3.350500	0.0014***
D(LNCOCX(-1))	0.043421	0.241322	0.179929	0.2134
D(LNCOCX(-2))	0.033422	0.159325	0.209772	0.3112
D(LNCOCX(-3))	0.014325	0.032591	0.439538	0.1242
D(LNNONTX(-1))	-0.248893	0.117093	-2.125609	0.0377**
D(LNNONTX(-4))	0.311291	0.089753	3.468323	0.0010***
D(LNNONTX(-5))	-0.268946	0.121858	-2.207038	0.0312**
D(ODA(-1))	0.049008	0.022804	2.149075	0.0357**
D(ODA(-4))	0.083901	0.018534	4.526938	0.0000***
D(LNTRD(-5))	0.299112	0.130455	2.292835	0.0254**
D(GOVEXP(-2))	-0.044088	0.024486	-1.800491	0.0769*
D(GOVEXP(-4))	-0.067125	0.028208	-2.379613	0.0206**
D(LNM2(-2))	-0.172363	0.073284	-2.351989	0.0220**
D(LNM2(-4))	-0.155581	0.071687	-2.170278	0.0340**
D(LNM2(-5))	-0.180306	0.073598	-2.449880	0.0173**
D(LNMINX(-1))	0.463956	0.133301	3.480509	0.0009***
D(LNMINX(-4))	-0.329091	0.133443	-2.466155	0.0166**
D(LNMINX(-5))	0.577981	0.180682	3.198879	0.0022***
C	0.041561	0.019696	2.110099	0.0391**

APPENDIX D

IMPULSE RESPONSE FUNCTIONS OF REAL EXCHANGE RATE FROM THE BAYESIAN VAR