UNIVERSITY OF CAPE COAST

COMMODITY PRICE SHOCKS AND FISCAL IMBALANCE IN GHANA

ISAAC KWAMENA NUNOO

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University of Cape Coast

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COMMODITY PRICE SHOCKS AND FISCAL IMBALANCE IN GHANA

BY

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Thesis submitted to the Department of Economics of the Faculty of Social Sciences, College of Humanities and Legal studies, University of Cape Coast, in partial fulfillment of the requirements for the award of Master of Philosophy degree in Economics

MAY 2016

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: Isaac KwamenaNunoo

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.

Principal Supervisor's Signature:.............................. Date:.........................

Name: Professor Vijay Bhasin

Co-Supervisor's Signature: .... Date:..........................

Name: Dr.Camara K. Obeng

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ABSTRACT

This study investigated the impact of commodity price shocks on fiscal imbalance in Ghana. The study covered the period of 1990 to 2013 where the country experienced high fiscal imbalance and external debt that led to the HIPC initiative to sustain the debt burden and macroeconomic stability. The Vector Error Correction approach to cointegrationwas used with quarterly data from Bank of Ghana, WDI and ADI. The Impulse Response Analysis from a Bayesian VAR was done to analyse shocks of commodity prices (gold and cocoa), terms of trade, capital formation and the response by fiscal imbalance.Results from the study suggest that commodity price (gold and cocoa) negatively affects fiscal account implying fiscal imbalance in both short and long run. Consumer price Index and interest payment on external debt negatively affect fiscal imbalance in the long run and fluctuate at different time lags in the short run. Terms of trade and gross fixed capital formation both suggested positive effect on fiscal imbalance in the long run and short run. Surprisingly, positive commodity price shocks increase negative fiscal imbalance. Positive shocks of terms of trade and capital formation affect fiscal imbalance both positively and negatively.The study recommended mobilizing more revenue by way of value addition to exports, export diversification, controlled inflation and debt borrowing, private investment and reduction in non-essential expenditures of government.

KEY WORDS

Commodity price

Commodity price shocks

Fiscal imbalance

Gold and cocoa exports

Impulse response analysis

Vector error correction model

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DEDICATION

To my parents Mr. Kweku Nunoo and Mad. Hannah Gyebi and all loved ones am

forever grateful.

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LIST OF ACRONYMS

ADF	Augmented Dickey-Fuller
ADI	African Development Indicators
AIC	Akaike Information Criterion
AID	Foreign Aid
BoG	Bank of Ghana
CEPS	Customs Excise and Preventive Service
CIS	Commonwealth Independent States
CPI	Consumer Price Index
CUSUM	Cumulative Sum of Recursive Residuals
CUSUMSQ	Cumulative Sum of Squares of Recursive Residuals
DB	Domestic Private sector Borrowing
DCs	Developing Countries
DW	Durbin Watson
ECM	Error Correction Model
ECOWAS	Economic Community of West African State
ECT	Error Correction Term
ERP	Economic Recovery Programme

EXP_INDEX	Commodity Price Index
FB	Foreign Borrowing
FD	Fiscal Account Balance
FPE	Final Prediction Error
FR	Foreign Exchange
GDP	Gross Domestic Product
GM	Geometric Method
GNI	Gross National Income
HIPC	Heavily Indebted Poor Countries
HQ	Hannan-Quinn information criterion
IMF	International Monetary Fund
INT_PER	Interest Payment on External Debt
IRF	Impulse Response Function
IRS	Internal Revenue Service
ISSER	Institute of Statistical, Social and Economic Research
K	Gross Fixed Capital Formation
LIC	Low Income Countries
LR	Sequential Modified LR test statistics

PDF	Probability Distribution Function
PP	Phillips-Perron
RAGB	Revenue Agencies Governing Board
REH	Ricardian Equivalence Hypothesis
SAP	Structural Adjustment Programme
SIC	SchwarzInformation Criterion
TIDD	Timber Industry Development Division
TOT	Terms of Trade
VAR	Variance Autoregressive
VECM	Vector Error Correction Model
VFD	Vertical Fiscal Difference
VFG	Vertical Fiscal Gap
VFI	Vertical Fiscal Imbalance
UNDP	United Nations Development Programme
WDI	World Development Indicators

CHAPTER ONE

INTRODUCTION

Background of the Study

The impact of commodity price shocks on fiscal imbalance remains a subject of considerable controversy in both academic and policy circles(Samaké & Spatafora, 2012). Fiscal imbalances pose problems for economic management and induce fluctuations in real income. These problems often handled badly and led to debt crises and negative economic growth. This has become an important research area in understanding the factors contributing to fiscal imbalance. World commodity prices are highly volatile and values have dropped by about 50 percent between mid-2014 and mid-2015, leading to significant losses in export earnings for commodity exporters (Kinda, Mlachila, & Ouedraogo, 2016). The large occurrence of commodity price shocks has led to a large number of researchanalyzing the impact of lower commodity prices on various macroeconomic variables such as economic growth (Deaton & Miller, 1995;Dehn, 2000), inflation (Gelos & Ustyugova, 2012;Browne & Cronin, 2010; Furlong & Ingenito, 1996), debt (Bruckner & Arezki, 2010;Arezki & Ismail, 2013), conflict (Dube & Vargas, 2013;Brückner & Ciccone, 2010), etc.

Adverse commodity price shocks can also contribute to fiscal imbalance through various channels. These channels include exchange rate, terms of trade and investment. First, when commodity prices decline, particularly in the case of countries that depends heavily on one or more export products, exchange rate falls export income declines and this tend to affect the total government revenue,

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which has a direct impact on public spending as well as increasing fiscal deficit and worsening fiscal account balance. Secondly, when there is an unfavourable term of trade from a decline in commodity price, it leads to reduction in foreign earnings. The external account balance worsens and government revenue falls and have to divert her resources in financing external debt, leading to budget shortfalls and fiscal deficits. In the opposite case of a commodity price increase, as in the case of the price of crude oil for instance, commodity exporters gain, and this is reflected in stronger external current account balances, output growth, and fiscal position(Deaton & Miller, 1995; Medina, 2010). Lastly, commodity price shocks affect investment in the domestic economy. World price decline affects the domestic interest rate and translates to the capital balance in the country and also reduces funds for domestic investment leading to lower revenue generation and hence fiscal imbalance (Aidam & Anaman, 2014).

Following Rosine (2013),we identify other macroeconomic variables which affect fiscal performance to include consumer price index, investment (gross fixed capital formation), terms of trade, and interest payment on external debts. These variables are mostly endogenous and translate shocks to fiscal imbalance. Export largely depends on exchange rate and that increase in exchange rate in commodity exporting countries encourage more trading and favourable term of trade. Volatility in exchange rate leads to deteriorating terms of trade that affects domestic earnings and impact on economic performance including fiscal performance. Commodity price shocks exert inflationary pressures on domestic countries leading to budget uncertainty and fiscal imbalance (Gelos & Ustyugova,

2012). In addition, investments in domestic economy significantly contribute to the fiscal performance of a country. The deteriorating impact on output growth due to poor investment will not encourage much revenue needed for development and controlling fiscal deficits (Aidam & Anaman, 2014). Accumulated public debt and interest payment have significantly contributed to the fiscal deficits in most countries(Kinda et al., 2016).

Medina (2010) research indicates that Latin American countries' fiscal positions react strongly to shocks from commodity prices, yet there are differences across countries. Many resource-rich countries may have to shelter their economy from commodity price fluctuations and prevent over-spending on the part of the government caused by the resource endowment. Unlike most oil exporters, Norway a resource rich nation has adopted a fiscal framework in 2001, with a view to shielding the budget, and hence indirectly also the domestic economy, from commodity price fluctuations(Bjørnland & Thorsrud, 2015b). Such concerns are especially acute in the case of low-income countries (LICs), which are relatively more affected by commodity price shocks, and may be expected to rise further as LICs continue to integrate into international markets(Ocran & Biekpe, 2008).

Most African countries largely depend on export and import of raw materials, which is a major source of revenue to these countries. Some African countries that depend largely on single commodity dominance include Chad, Congo, Equatorial Guinea, Gabon and Nigeria which have average over 80 percent oil production of merchandise exports. Others such as Guinea, Gambia,

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Cameroon, Cote d' Ivoire, and Ghana depend largely on several commodities such as gold, bauxite, cocoa, oil, timber, just to mention a few (Böwer, Geis, & Winkler, 2007). Deaton and Miller (1995)also confirmed Sub-Saharan Africa exports primary commodities that have highly volatile prices and pose challenge to macroeconomic performance.

Ghana among other Sub-Saharan Africa countries is highly dependent on commodity exports affected by their price fluctuations. The first nine years of political independence saw moderate economic growth and increased level of socio-economic development anchored on the main pillars of free compulsory basic education, free provision of health services and extensive infrastructural development financed through revenues from cocoa export for which it was the leading producer for over half a century until 1978(Aidam & Anaman, 2014). The economy suffered a severe balance of payment problem and fiscal imbalance largely due to the historically low levels of cocoa prices in 1965. During this period there was a great deterioration in the export sector as a result of a number of factors including the over-valuation of the local currency, effects of the 1973-1980 world oil price shocks and the severe droughts of 1977 and 1983 (Aidam & Anaman, 2014). The increasing deterioration in the export sector coupled with other factors posed fiscal challenges to the country.

The performance of the external sector has equally been weak in the last few years mainly due to the volatility in prices of the country's main export commodities. Large net service and income outflows and the slowdown in official and individual private transfers resulted in deterioration of the current account

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deficit that stood at 11.7 percent of GDP in both 2012 and 2013. The weakness of the external position continued through 2014, causing the exchange rate of the cedi to depreciate sharply. The currency depreciation and the economic downturn led to a substantial contraction of imports and a narrowing in the current account deficit, which nonetheless ended at 9.2 percent of GDP in 2014.

Ghana's fiscal deficit (cash basis) stood at 9.81 percent of GDP and a stock of public debt which stood at 187.3 percent of GDP in 2000 (Asiama, Akosah, & Owusu-Afriyie, 2014). Accordingly, the magnitude and rapid rate of Ghana's fiscal deficits build-up implies a diminished likelihood to generate sufficient primary surplus to restrain debt accumulation in order to promote fiscal balance in the future. This pace of debt build-up has resulted in uncertainties about revenue mobilization and its expenditure patterns. However, the oil exports helped to reduce the fiscal deficit from -7.2 percent of GDP 2010 to -3.95 percent of GDP in 2011(Amo-Yartey, 2014).

Other sustainability concerns related to economic sustainability include large current ortradedeficits, growing levels of food imports, and the recent depreciation of the national currency partly due to intermittent electricity energy shortages, widening income inequality and most significantly slump in world commodity prices. The large merchandise trade imbalances and instability of export revenues are of particular concern as they directly affect ability to generate significant revenue mobilization to the country and its fiscal performance (Amo-Yartey, 2014).

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Ghana is highly dependent on export of raw materials such as cocoa, timber and minerals such as gold, etc. The exports of these raw materials have become one major source of revenue to government; now have been involved in oil production(Ocran & Biekpe, 2008). It is becoming increasingly difficult to ignore the impact of fluctuation of these commodity prices. The dependence of Ghana on the earnings from her exports for foreign exchange earnings implies that the rate of growth of the economylargely depends on the performance of the export sector. Export commodity prices in Ghana poses problems on real income and macroeconomic management leading to unsustainable fiscal balance by affecting either tax or expenditure (Deaton & Miller, 1995). Therefore, the fluctuations in prices of commodity exports in Ghana have some effects on revenue mobilization that translates to its fiscal performance.

Statement of Problem

Ghana is among one of the fastest growing economies in sub-Saharan Africa, despite recent economic downturns (Asiama et al., 2014). There have been numerous economic reforms to help reduce external debt and fiscal imbalance. The economic recovery program and structural adjustment program implemented in the early 1980s focused on reducing both internal and external imbalance by adopting export led growth. The HIPC initiative implemented in the early 2000s reduced the country's fiscal deficits from 9.81 percent of GDP in 2000 to 2.96 percent in 2005. Similarly, the public debt that stood at 187.3 percent in 2000 reduced to 26.2 percent of GDP in 2006. In 2014, current account and fiscal

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deficit stood at 9.2 percent and 10.4 percent of GDP respectively(Asiama et al.,
2014). The continued growth in budget deficits resulted in public debt from 55.8
percent of GDP in 2013 to about 67.1 percent of GDP by 2014 ("African
Economic Report," 2015). The overall budget balance continues to be a problem
as Ghana takes steps in addressing the high deficits which affect the growth of a
country.

Ghana has traditionally produced many commodities for the international
markets. These commodities include cocoa, minerals such as gold, diamonds,
bauxite etc, and other forestry products including timber. Oil became the new
significant export commodity for Ghana starting in 2011. One major source of
revenue to government includes earnings from its major exports, cocoa and gold.
This translates into movements in revenue and fiscal performance.

The economy has faced major challenges including severe energy crisis,
unsustainable domestic and external debt burden and deteriorating financial and
fiscal imbalances (Sowa, 1994). In addressing these increasing unsustainable
macroeconomic and fiscal imbalances, the country negotiated for stabilization
programme early 2015 with International Monetary Fund (IMF)("African
Economic Report," 2015).

Commodity price shocks tend to undermine economic
performance(Rosine, 2013). Many studies have examined the impact of
commodity price shocks on different economic variables including economic
growth, conflict, inflation, debt, financial fragility, fiscal performance or policy
cycles among others. Deaton and Miller, (1995) and Deaton (1999) concluded

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volatility in international commodity prices led to slow economic growth. In the same vein, Dehn (2000) found that per capita growth rates among countries were significantly reduced by large negative commodity price shocks. Furthermore, Brückner and Ciccone (2010) found out that not only were commodity price shocks negatively associated with GDP growth, but they also increased the probability of civil war outbreak in Sub-Saharan Africa. Dube and Vargas, (2013) also researched on commodity price shocks and conflict. Dallas (2012),Gelos and Ustyugova, (2012), Browne and Cronin, (2010)Furlong and Ingenito, (1996), link commodity price shocks to inflation. Others such as Arezki and Ismail (2013), Bruckner and Arezki (2010), Alberola, Montero, Braun, and Cordella (2006),Manzano and Rigobon, (2001), Gilbert, (1989) focused on commodity price shocks and debts of a nation.

The impact of commodity price shocks and fiscal imbalance cannot be overemphasized. This is evident in the works of Kinda et al., (2016), Rosine (2013), Medina, (2010), Alesina, Campante, & Tabellini (2008). Lopez-Murphy and Villafuerte (2010)showed that countries' responses to the decline in commodity prices illustrated pro-cyclical fiscal policies, with most of the fiscal adjustment coming from reduction in current expenditures and fiscal imbalance existence.

Fiscal performance in commodity exporting countries depends significantly on commodity prices. A decline in international commodity price reduces tax revenue and worsens the terms of trade. A negative price shock translates directly into lower revenues, and it increases fiscal deficit(Kinda et al.,

2016). Therefore, an increase in commodity price should lead to significant increase in earnings and a surplus fiscal account on commodity exporting countries including Ghana.

Samaké and Spatafora (2012)analysis of a positive commodity price shock and fiscal outcome was ambiguous. They found out that increase in export price resulted in higher fiscal deficits. The inconsistencies in the results of the effects of commodity price on the fiscal outcome have motivated many researchers on providing empirical analysis to this effect. Some researchers have focused on the types of commodities and that primary commodity prices tend to be less important in ensuring fiscal balance, that is the resource curse(Van der Ploeg & Poelhekke, 2009). Others have focused on the time difference by considering permanent or temporary price shocks orthe short run and long run price effect on fiscal performance (Céspedes & Velasco, 2014).

The literature analyzing the impact of commodity price shocks on fiscal imbalance in Ghana is rather limited.Could Ghana's dependence on export of primary commodities infer the rising fiscal deficits in the country or may be counter cyclical to fiscal imbalance? Ghana's exports are about 80 percent or more primaryand these prices have fallen resulting in difficulties in re-aligning itsfiscal and trade deficits(Deaton, 1999). There is some gap in the literature analyzing the relationship between commodity price shocks and fiscal imbalance in Ghana. The issue of commodity price volatility has resurfaced as an important international trade issue with increasing fiscal deficits of many developing countries in Africa.

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Kinda et al. (2016) concluded that commodity price shocks lead to financial fragility among some African countries and this extend to fiscal deficits including Ghana. A similar research by Aidam & Anaman(2014)also concluded that export earning instability affects investment in Ghana, however the research did not consider the price of these export commodities.

This researchwas motivated by considering the prices of gold and cocoa exports in Ghana. These commodities exported in raw states provide significant revenue in undertaking development projects. In addition, gold and cocoa prices have fluctuated across different times. The international prices of gold have been falling, while cocoaprices have experienced some gains. The globalprice of cocoa beans increased from $2,275 permetric tonne in January 2013 to $3,270 per metrictonne in August 2014, it has since declined to some extent, andstood at $3,096 in May 2015(Collier, 2007). The time difference in the commodity exportprice is very important in considering the types of commodities and their responsiveness to increasing output for a given price change.

Objectives of the Study

The general objective of this study is to investigate how commodity price shocks affect fiscal imbalance in the Ghanaian economy.

The specific objectives of this study seekto:

1. Examine the long run relationship between commodity (gold and cocoa) price index and fiscalimbalance in Ghana.

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2. Examine the short run relationship between commodity (gold and cocoa)price index and fiscal imbalance in Ghana.

3. Investigate the relationship of commodity price shocks on fiscal imbalance.

Hypotheses of the Study

1. **H$_0$**: There is nolong run relationship between commodity price index and fiscal imbalance

   H$_1$: There is a positive long run relationship between commodity price index and fiscal imbalance.

2. **H$_0$**: There is no short run relationship between commodity price index and fiscal imbalance

   H$_1$: There is positive short run relationship between commodity price index and fiscal imbalance.

3. **H$_0$**: Positive commodity price shocks have no significant effect on fiscal imbalance

   H$_1$: Positive commodity price shocks have significant effect on fiscal imbalance

Scope of the Study

Commodity price is crucial in influencing revenue and fiscal account balance in Ghana.This study aims to investigate empirically and examine the relationship between commodity price fluctuations and fiscal imbalance. The

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studyused mainly secondary data for the period between 1990 to 2013 quarterly observations for variables included in the model. The data set contain the following variables: commodity price index (cocoa and gold), fiscal deficit (overall surplus/deficit excluding grants), consumer price index, interest payment on external debt, investment (gross fixed capital formation) and terms of trade. The study used the Vector Autoregressive Regression and Vector Error Correction Model to examine the relationship between the variables under consideration. Impulse Response Functionwas employed to analyze shocks among variables.

Significance of the Study

Commodity price shocks may distort the management of fiscal and debt policy, by increasing budget uncertainty, encouraging a procyclical fiscal policy, and threatening debt sustainability. First, is there evidence that commodity price shocks including cocoa and gold significantly influence fiscal outcomes, inducing fiscal imbalance in Ghana? One would expect that since the world commodity market price keeps fluctuating, the economy is worse off by decreasing its revenue, expenditure, growth as well as increasing fiscal imbalance. There is undoubted fact the recent fall in world commodity prices has reduced revenue either through taxes on export goods or export earnings leading to a fiscal deficit of about 10.4 percent of GDP in 2014 in Ghana("African Economic Report," 2015). These export price shocks do not only induce fiscal imbalance but also affect the price level (consumer price index) in domestic economy hence inflation

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and other macroeconomic issues such as exchange rate, gross fixed capital formation (investment), terms of trade and interest payment on external debt.

Ghana has operated budget deficits for quite a number of years. Recent economic conditions led Ghana to seek for IMF bailout. One important recommendation was to ensure fiscal discipline believedwould help reduce our debt burden and help stabilize exchange rate, reduce inflation and growth of the economy. Fiscal imbalance and inflation areaffected by prices of commodity exports. More importantly, commodity exports and importsare influenced by shocks to not just prices, but also volumes. Are price shocks sufficiently dominance and that export volume controlled would help stabilizing export revenue? Finally, the detrimental effects are more common in countries with unstable exchange rate, which leads to unfavourable terms of trade and worsens the fiscal imbalance of the country. The significance of this research is to analyze how commodity price volatility translates to fiscal imbalances in the Ghanaian economy.

Organization of the Study

This study has been divided into six (6) chapters, Chapter One to Six. Chapter One (1) is the introduction of this research which represents background of study, statement of problem, objectives of research, significance of study, statement of hypothesis and scope of research. Chapter Two (2) considered an overview of the Ghanaian economy. Chapter Three (3) reviewed both theoretical and empirical literature available for this research work. The literature review

examines related article and older texts to provide information in relation to this study to look for a better approach to this research. Chapter Four (4) discusses the methodology together with the estimation techniques, and issues relating to data measurement and analysis of the study. Chapter Five (5) formulates the estimated model, analysis and presentation of empirical results. Finally, Chapter Six (6) deals with the conclusion, policy recommendations, limitations of the study and directions for future research.

CHAPTER TWO

OVERVIEW OF THE GHANAIAN ECONOMY

Introduction

This chapter discusses a brief overview of the Ghanaian economy. This is followed by analysis the trend among the variables under consideration and some topical issues in this research.

The Ghanaian Economy

Ghana relies on her natural resources to generate revenue for economic development. Early years of independence in 1957, Ghana had good prospects for economic growth and development. However, the economy suffered a decline of more than 30 percent during the 1970s and early 1980s.Inthe late 1980s, saw a gradual awakening of the economy due to the implementation of Economic Recovery Programme (ERP) and Structural Adjustment Programme (SAP)(Institute of Statistical Social and Economic Research (ISSER), 2013). These austerity measures increased foreign inflows and grants, which resulted in high GDP growth and infrastructure development. The democratic process made impressive gain in the 1990s, which resulted in political rights, civil liberties among others. In the 2000s marked the entering of the Golden Age of Ghana's growth despite world economic crises. In 2010, Ghana statistical service announced the rebasing of the national account from the year 1993 to 2006. The rebasing reflected in change in goods and services, improvements in sector contributions and social developments(Killick, 2010).

In the 15t century, the Portuguese were the first Europeans to establish trade relations with Gold Coast, then by the English, Swedish, Danish and Dutch. They traded in gold and later slaves which were abolished somewhere in the 19t century. Ghana, then Known as Gold Coast, was colonized by the Britain until 1957 when it gained independence(Agbodeka, 1992).

At the time of independence, Ghana was as the world's top exporter of cocoa and produced about 10 percent of world's gold. Few years of political independence, she saw moderate economic growth and increased level of socio-economic advancement anchored on the main pillars of free compulsory basic education, free provision of health services and extensive infrastructural development financed through revenues from the cocoa exports.The economy suffered a severe balance of payment problem largely due to fallen cocoa prices in 1965.Historically, the decline in the price of export commoditiesand the dependence on foreign exchange earnings formed a significant proportion of foreign exchange inflows. Very low world prices of cocoa in 1965, was one of the identified causes of both the 1966 and 1972 military coups and the decline in the growth of this sector. The origin of the decline was the transfer of resources from the highly profitable cocoa sector to finance state industries(Aidam & Anaman, 2014).

The agriculture sector's contribution to GDP has decreased for some years nowwith the service sector becoming the major driver of growth. The domestic manufacturing sector is still highly import-dependent with most small-scale industries relying on imported raw materials for a significant proportion of total

requirement. Shortages in raw materials needed, spare partsand capital goods were important determinants of excess capacity in the manufacturing sector.

The implementationsof ERP and SAP helped to restructure the economy after the black years of economic downturn. The objectives of these programs include the realignment of the relative price to encourage production and exports; restoration of fiscal and monetary discipline; rehabilitation of social and economic infrastructure and institutional reforms to enhance the efficiency among others(Aryeetey, Harrigan, & Nissanke, 2000).

The entering into the Golden Age of Ghana economic history from 2003-2008 was promising for private investors. In 2007, Ghana was reported as the most favourable country to do business in West Africa. Macroeconomic situation was strengthened; fiscal deficit was brought down from 7 percent of GDP in 2002 to 3 percentin 2005. Money supply growth reduced from 50 percent in 2002 to 14 percent in 2005, with inflation brought down to a single digit and rapid depreciation of the cedi curtailed. These virtues helped the economy sustain an average GDP growth of 7 percent in the late 2000s.The economic achievements over the last 20 years make the economy buoyant and well prepared for future growth("African Economic Report," 2015).

Trends of Macroeconomic Variables

This sub section shows the trends in all the variables of the study, which include fiscal imbalance (overall surplus/deficit excluding all grant), commodity price index (gold and cocoa), consumer price index, gross fixed capital formation

(investment), terms of trade and interest payment on external debt. The data used were obtained from World Development Indicators, African Development Indicator and Bank of Ghana from 1990Q1 to 2013Q4.

Trend of Fiscal Imbalance
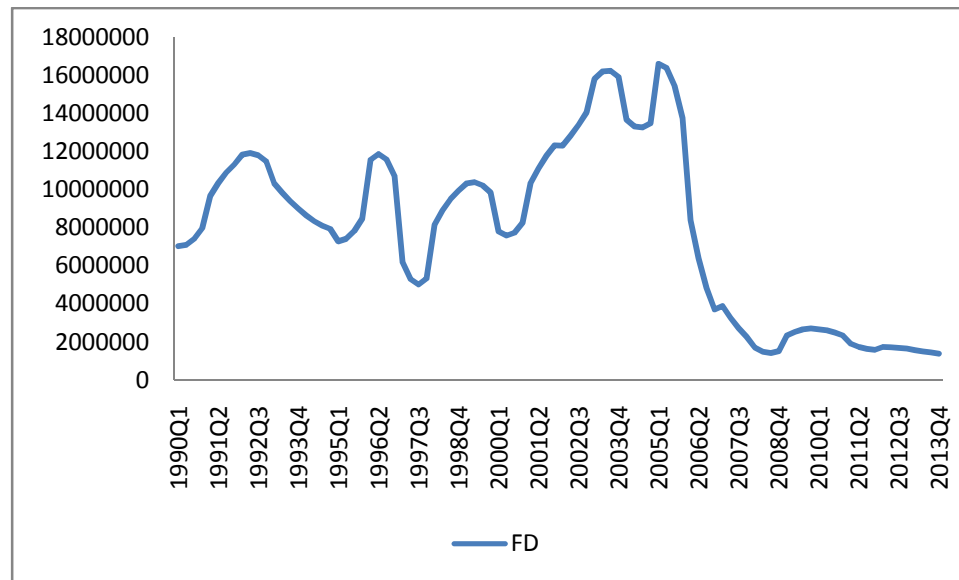
Figure 1: Trend of Fiscal Imbalance

Source: Generated from African Development Indicator (ADI), (2015)

Figure 1 shows the trend of fiscal imbalance in Ghana that is the difference between expenditure less revenue from 1990Q1-2013Q4. It can be seen that Ghana's fiscal account has beenunstable from 1990. From the first quarter in 1990, the country recorded about 7.03 million cedis and a mean value of about 7.9 millioncedis. The country experienced a rise and fall from 1990Q1 to a sharp fall in 1997Q3 to about 2.7 million cedis. The trend continued to fluctuate and recorded the highest value in 2005Q1 of about 13.8 million cedis. The oscillating

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nature of the fiscal imbalanceis attributed to unstable revenue generation and high expenditures from government.

Trend of Commodity Price Index
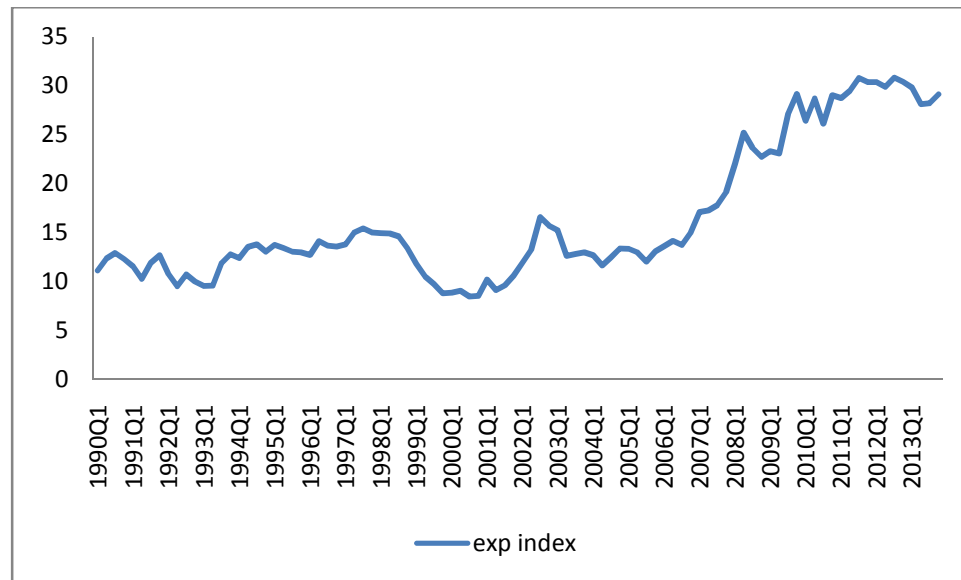
Figure 2: Trend of Commodity Price Index

Source: Author's Computation (2015).

Figure 2 shows the trend in commodity price index in Ghana's main export of gold and cocoa. These commodity prices have been unstable since 1990 and the country recorded the lowest in the third quarter of 2000. It rose again in 2002Q3, droppedand rose to 25.2 in 2008Q2. The highest index was recorded in 2012Q3 of about 30.9 and the average is about 16.4. The steadily upward rise since 2000Q3 in commodity export price could be attributed to the competitive nature in the export sector, favourable terms of trade or government policies such as mass cocoa spraying and measures of reducing illegal mining. Since

2000Q3,there has been rise in gold and cocoa price but has not been stable and therefore fluctuating.

Trend of Consumer Price Index
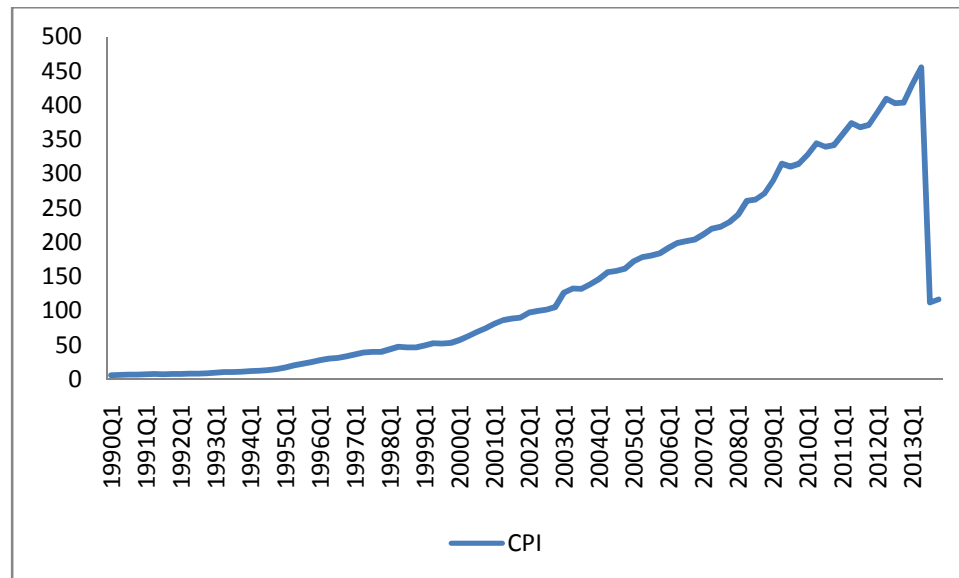
Figure 3: Trend of Consumer Price Index

Source: Generated from Bank of Ghana (BoG), (2015)

Figure 3 shows the trend in consumer price index from 1990Q1 to 2013Q4. It can be seen from the consumer price index trend that there was a gradual increase in consumer prices from the year 1990Q1 to 2013Q2 until there was a sharp drop in consumer prices in 2013Q3. Consumer price index recorded a highest value of about 445 in 2013Q2 and lowest in 1990Q1 of about 5.9 compared to the base year. The country recorded an average consumer price index of about 138.7. This trend shows a fairly stable and increase in CPI could be attributed to the level of inflation.

Trend of Terms of Trade
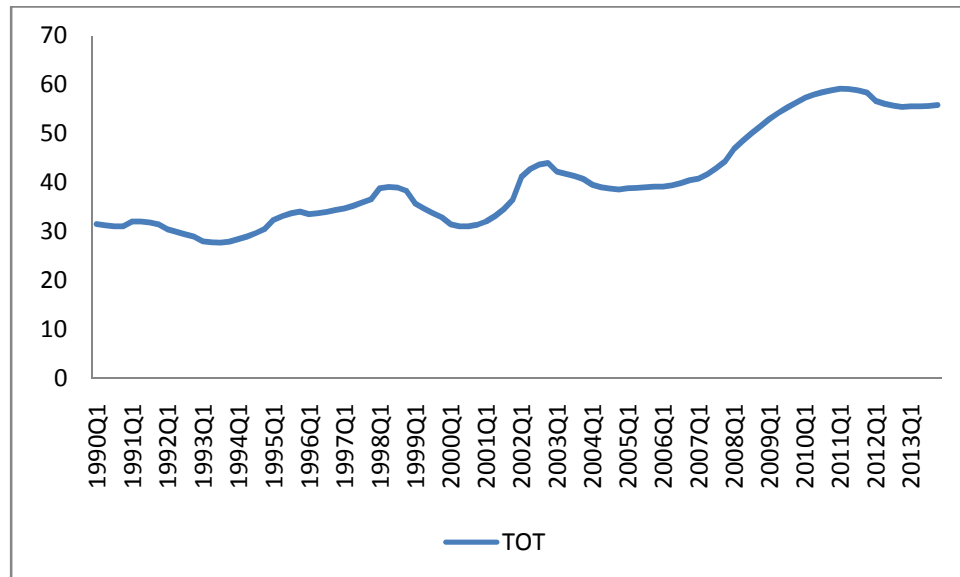
Figure 4: Trend of Terms of Trade

Source: Generated from World Development Indicator (WDI), (2015)

Figure 4 shows trend in net barter terms of trade for Ghana from 1990Q1 to 2013Q4. The above diagram shows that the distribution is positively skewed. The country recorded a maximum value of about 59.2 in 2011Q1 and a minimum of about 27.8 in 1993Q3. The average value was about 40.4 and there has been rise and fall though the general values have increased in the latter years. The trend in terms of trade could be attributed to the rising global competitive in international market and trade.

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Trend of Gross Fixed Capital Formation (Investment)
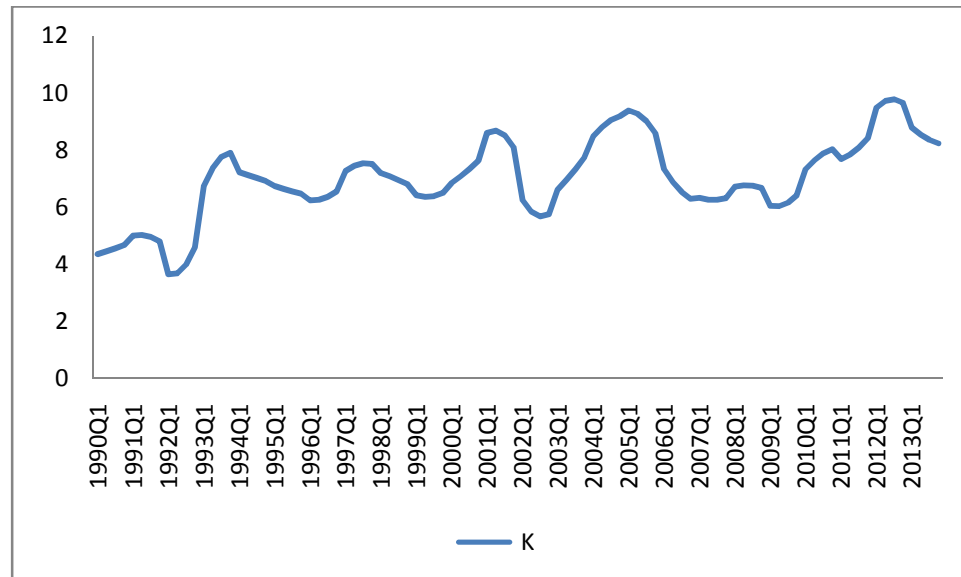
Figure 5: Trend of Gross Fixed Capital Formation (Investment)

Source: Generated from World Development Indicator (WDI), (2015).

Figure 5 shows the trend of gross fixed capital formation as a percentage of GDP from the period's 1990Q1-2013Q4.The minimum rate of the gross fixed capital as a percentage of GDP was 3.6 percent thatwas recorded in the year 1992Q1 while a maximum rate was recorded as 9.8 percent in the year 2012Q3. The distribution negatively skewed and the general trend analysis shows an increase in gross fixed capital formation as a percentage of GDP though highly unstable. The fluctuations in the distribution were due to high inflation rate that discourage investors and stops them from investing in Ghana

Trend of Interest Payment on External Debt
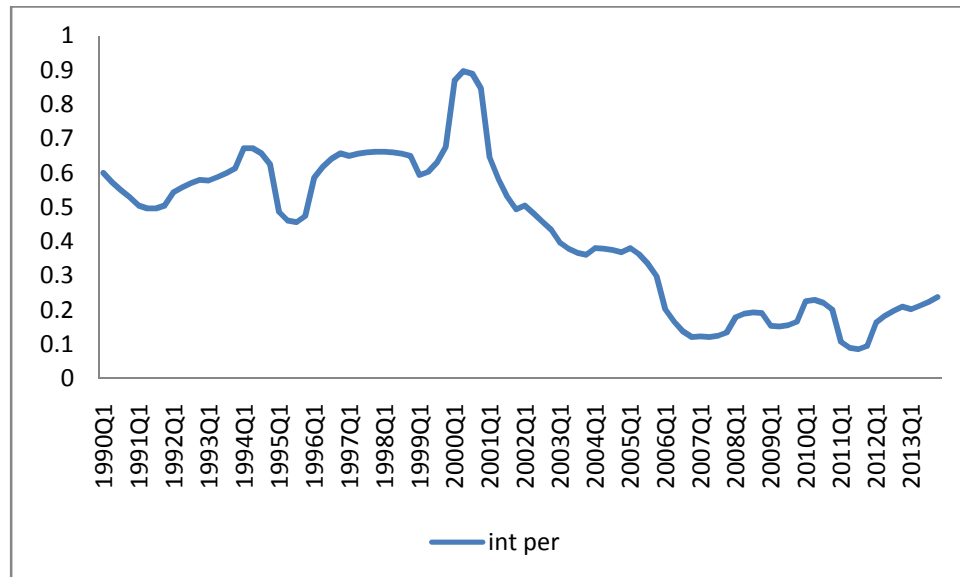
Figure 6: Trend of Interest Payment on External Debt

Source: Generated from World Development Indicator (WDI), (2015)

Figure 6 shows trend in interest payment on external debt percentage of GNI from 1990Q1 to 2013Q4. The trend shows a maximum of about 0.9 percent and a minimum of about 0.1 percent of interest payment. An average of about 0.4 percentwas recorded between these periods. The diagram above shows that the trend in interest payment on external debt percentage of GNI is positively skewed and the payment is declining, however, oscillating. The HIPC relief is the reason accounting for decline in interest payment since 2000. There have been fluctuations in interest payment on external borrowing as shown above.

The Concept of Fiscal Imbalance

Since an unsustainable debt path may eventually lead to sharp adjustment, and crisis that distorts the behaviour of economic agents, the concept of fiscal imbalance is key (Ley, 2010). Contemporary literature has provided various definitions of fiscal imbalance.

Fiscal imbalance is a mismatch in the revenue mobilization and expenditure responsibilities in a country. Alternatively, "fiscal imbalance" is calculated as the current national debt plus the present value of future expenditures lessthe present value of future revenues; future expenditures and revenues are estimated or predicted to the infinite horizon (Gokhale and Smetters, 2003; Auerbach, Gale, & Center, 2009). This imbalance can be positive or negative. Fiscal imbalance has mostly been used interchangeably with fiscal deficit (Gokhale & Smetters, 2003). There are two main types of fiscal imbalance, vertical and horizontal fiscal deficit.

Horizontal fiscal imbalance (HFI) emerges when sub-national governments have different means of raising funds from their tax bases and providing services. This creates differences in 'net fiscal benefits', which are combinations of taxes and public services. On the other hand, vertical fiscal imbalance (VFI) is asymmetry of revenue and expenditure. Sharma (2012) holds the view that vertical fiscal imbalance is strictly revenue-expenditure asymmetry. Therefore, VFI is knownas Vertical fiscal Asymmetry. Sharma identified three types of vertical fiscal asymmetry. First and for most, Fiscal asymmetry with

fiscal imbalance: Vertical Fiscal Imbalance (VFI) means inappropriate allocation of revenue generation and spending responsibilities. A solution to this is by reassignment of revenue raising powers. Also, Fiscal asymmetry without fiscal imbalance but with a fiscal gap: Vertical Fiscal Gap (VFG) means a targeted revenue-expenditure asymmetry yet with a fiscal gap to be closed. This state can be remedied by re-calibration of federal transfers. Lastly, Fiscal asymmetry without fiscal imbalance and without fiscal gap: Vertical Fiscal Difference (VFD) means a desirable revenue-expenditure asymmetry not including fiscal gap (i.e. gap is closed). This is a state of fiscal asymmetry where there is no fiscal imbalance or gap and thus needs no remedial measure.

Most literature explains fiscal deficit (fiscal imbalance) by considering the budget deficit of the country or policy sustainability, however may differ in some context. There are several alternative definitions of budget deficit as used in the literature. The most commonly accepted definition by most governments and international organizations relate to the measure of resources utilized during a fiscal year that need to be financed after computing the difference between revenues and expenditure. This way of measuring budget deficit reflects the financing gap that needs to be closed by way of net lending(Dholakia & Karan, 2005).

In line with this, the World Bank defines budget deficit as the difference between expenditure items including interest on government debt, transfers and subsidies, and revenue items including grants and sale of assets. In support of this line of argument, the IMF gives a functional definition of budget deficit as

follows: Fiscal deficit = [(expenditure on goods and services + transfers) — (revenue + grants) + (lending – repayments)]. In India, fiscal deficit is functionally defined by the government budget document as follows: Gross fiscal deficit = Total Expenditure – Recovery of Loans and Advances – Revenue Receipts – Non Debt Capital Receipts - Repayment of debt.

A budget deficit therefore, measures the extent to which government expenditure exceeds government revenue that needs to be financed (Sowa, 1994). In this case, it measures the overall gap in the expenditure and revenue of government that represents a liability that needs to be covered either by borrowing or through monetization. In essence, it measures the debt-financed and money-financed deficit. This reflects the current cash flow position of the government. Hence, budget deficit provides a measure of government's contribution to aggregate demand in the economy. It also helps measure the crowding out of the private sector in the financial markets [Dholakia & Karan, 2005; Jacobs, Schoeman, & Van Heerden, 2002].

Table 1

Alternative Definitions of Budget Deficit

Budget Deficit	Their Meaning
Conventional budget deficit	Total Expenditure – Total Receipt
Total budget deficit without grants	Conventional deficit – grants
External budget deficit	Government expenditure– receipts (externally financed)

Domestic budget deficit	Domestic budget deficit
Primary budget deficit	Total deficit – interest payments
Operational budget deficit	Primary deficit + real interest payments
Current budget deficit	Current revenue – current expenditure

Source: Jacobs et al. (2002)

Fiscal Imbalance and Macroeconomic Indicators in Ghana

Fiscal imbalance has been at the forefront of macroeconomic policy issues in both developing and industrial countries in recent years. For developing countries, fiscal deficit has been blamed for high indebtedness, inflation and poor investment and growth performances over the years (Sowa, 1994).

Ghana's fiscal stance has long suffered from a structural narrow revenue base due to a large informal sector, as well as a reliance on few primary commodities that are highly susceptible to the vagaries of global economic conditions. In addition, there have been high tendencies for spending in line with the desire to lay a foundation for economic take off by expanding the social-economic development, poverty and inequality reduction, provision of reliable energy supply, improved road networks, quality educational and improve health facilities among others to meet the gaping developmental needs (Amo-Yartey, 2014).

In addition, poor expenditure management processes coupled with weak revenue forecasting capacity, corruption, unaccounted spending, pork barrel spending as well as political business cycle have resulted in a situation where it

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had been almost consistently difficult to synchronize revenue and spending targets for a very long period (Alesina & Tabellini, 1990). These challenges have been compounded by an over-reliance on export of primary raw materials such as gold, cocoa, timber, to mention a few whose prices are highly volatile,donor support for planning budget expenses, lack of flexibility in fiscal management due to significant resource earmarking and statutory payments, corruption and political business cycle. These have led to persistent levels of fiscal deficits compared to the experience of other countries within the ECOWAS sub region and led to increasing levels of inflationary financing and increasing public debt. Unfortunately, the commercial production of oil in Ghana is yet to have significant impact on the fiscal profiles of the country.

Ghana was on the path toward fiscal balance courtesy of the enhanced HIPC relief offered by its donor creditors since 2001 (Amo-Yartey, 2014). The authorities utilized the fiscal account by the introduction of some new taxes to engineer a fiscal consolidation, successfully saw the overall level of fiscal deficit (cash) decreased from 9.81 percent of GDP in 2000 to 2.96 percent of GDP in 2005. The stock of public debt which stood at 187.3 percent of GDP in 2000, declined to the depth of 26.2 percent of GDP in 2006. Total interest payments on debt as a share of total revenue reduced from 42.3 percent in 2000 to 15.3 percent in 2005, moderating the debtservice burden on public finance. Subsequent events from 2006 up till now have however exposed the inherent weaknesses in Ghana's revenue mobilization capacity and poor public financial management systems,

notwithstanding decades of structural reforms in these areas(Aryeetey et al., 2000).

One of the bases of revenue mobilization in Ghana, there has been the existence of a growing informal sector. As such, the country depends a lot on indirect and international trade taxes. Direct taxes as a share of total taxes witnessed some improvement from an average of 31.2 percent over 2000-2008 to almost 37.0 percent and has been difficult to cross the 45 percent mark, even in the presence of oil revenues from 2011.

Another area of much concern is the issue of fallen price of its primary exports. The country either benefits from these export commodities through foreign revenue or taxes on export earnings. Since our major commodities are exported in raw form and their prices highly unstable, targeted revenue from these sector do not ensure significant revenue mobilization for growth of the country (Deaton, 1999).

In 2009, the three tax revenue agencies, the Customs Excise and Preventive Service (CEPS), the Internal Revenue Service (IRS), the Value Added Tax Service (VATS) and the Revenue Agencies Governing Board (RAGB) Secretariat were merged in under the Ghana Revenue Authority Act 2009, Act 791. This was done with the view to bring a number of benefits to taxpayers and tax administration; reduced administrative and tax compliance cost; better service delivery; improved departmental information flow; holistic approach to domestic tax and customs administration; and enhanced revenue mobilization(Addison & Osei, 2001). This notwithstanding, the envisaged benefits from the restructuring

of the revenue agencies are yet to be seen. In particular, this made apparent by adjusting for oil revenues for 2011-2013 that contributed an average of 1.46 percent of GDP, as well as the upward revision in GDP numbers in 2011.

Government's spending since 2006 has been generally high relative to both domestic revenue outturns and annual spending ceilings. The surge in spending in 2006 was to address the energy challenges in 2006, which probably started the new round of fiscal profligacy. In 2007, Ghana celebrated 50 years of nationhood with its associated large spending programs. Then the onset of the global financial crisis, coupled with some domestic activity widened significantly the gap between the end year spending outturn and the annual target. Spending restraint aimed at achieving some consolidation from 2009 was short-lived, as spending ceilings breached consistently from 2010 to 2012. In particular, the implementation of the Single Spine Pay Policy once again stretched the narrowed fiscal space which had placed public finance under severe stress resulting in austere fiscal measures in the 2014 budget statement aimed at some adjustment (Asiama et al., 2014). It is observed that disproportionately significant amount of government's spending has been executed in favour of recurrent expenditure, denying the country the opportunity to invest in critical capital projects to spearhead its growth agenda .

Ghana's fiscal operations are also susceptible to donors (both bilateral and multilateral) honouring their pledges to support the budget. There have been instances where due to perceived lack of domestic efforts and short falls in meeting some required conditions, donors failed to honour their pledges

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thatnormally had a severe toll on the economy. Donor resources since 2006 have generally experienced significant shortfalls, whichhave been replaced with higher levels of domestic financing with its resultant crowding out effects. The country's inability to synchronize its spending programmes with its revenue mobilization capacities has resulted in persistent fiscal deficit levels at variance with programmed limits (Addison & Osei, 2001). With the exception of 2007, the fiscal targets have been consistently breached, a blow to the country's consolidation effort. It makes sense that years of running budget deficits with overshooting annual deficit targets have built some momentum in the evolution of the stock of public debt. The total public debt that amounted to US$5,296.57 million (26.1 percent of GDP) in 2006, increased to US$ 7,988.79 million (36.1 percent of GDP) in 2008 and further surged to US$18,067.45 million (46.5 percent of GDP) and US$23,454.55 million (55.2 percent of GDP) in 2012 and 2013 respectively.

Ghana's access to concessional external borrowing has muted subsequent to completion of the enhanced HIPC initiative and the attainment of lower middle-income status. Currently, the country borrows a lot from domestic sources and the international capital market with relatively higher debt servicing implications. This implies that if this trend should continue, the cost of Ghana's total debt may outstrip the benefits generated from the debt and fiscal imbalance will persist (Asiama et al., 2014).

The Export Commodities of Ghana

Commodities are defined as natural resources used in the manufacturing of finished products or as energy sources (Rosine, 2013).Commodities, both export and import can be classified into five groups, namely crude oil, metals (copper, aluminium, iron ore, tin, nickel, zinc, lead and uranium), agricultural raw materials (timber, cotton, wool, rubber and hides), food (cereals, vegetable oils, meat, seafood, sugar, bananas and oranges) and beverages (coffee, tea and cocoa).

Therefore, the above categories can be summarized as:

Categories of Commodities
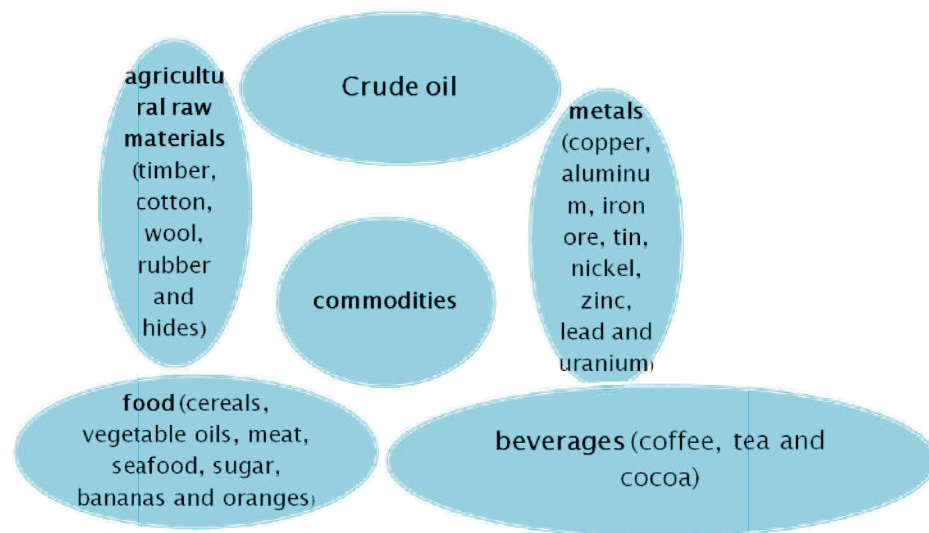
Figure 7: Categories of Commodities

Source:Böwer, Geis& Winkler (2007)

Ghana is indeed blessed with lots of resources namely, precious metals like gold, diamond, silver, bauxite etc, and cocoa, timber, and recently the discovering of black gold (Oil) (Akpalu & Parks, 2007). Ghana is currently the second largest producer of cocoa in the world. It is Africa's second biggest miner of gold after South Africa and the third largest producer of aluminium metal and

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Manganese ore. Between 1990 and 1997, Ghana's total exports have grown by 7.5 percent per year, from USD 897 million to 1.5 billion. While in 1990 exports made up 16.9 percent of GDP, by 2000 its share had grown to about 48.8 percent of GDP. However, there has been a drop to about 38.9 percent in 2014.

Ghana's most important traditional export products; gold, cocoa and timber accounted for 82 percent of Ghana's export in 1997. In recent times, Ghana has been involved in oil production and now exports oil since 2011. Most of the growth in Ghana's export comes from gold production. According to figures released by the Ghana Chamber of Mines, earnings from gold in 2010 were $2.611 billion, leading to an average of 20 percent per the year's mining revenue.

Cocoa is now the nation's major export commodity. Revenue recorded from Cocoa in the first quarter of the year 2010 was $1.7 million. A report of the Timber Industry Development Division (TIDD) states that the export of wood products for August 2010 alone was 12,506,030 Euros. This makes timber exports third most important commodity in the country.

Between 1990 and 1997, Ghana's non-traditional exports have grown by 27 percent and increased their share in total export from 7 percent in 1990 to 22 percent in 1997. The most significant factor is the effort to export semi-processed form of cocoa and timber. There has been growth in horticultural exports such as pineapples and yams, and other cash crops like palm oil, Shea nut, coffee and cashew, canned tuna fish and wood products. However, despite the huge revenue from these resources, we are yet to see significant developments in the towns

where these natural resources come from (Jebuni, Oduro, Asante, & Tsikata, 1992).

Summary and Conclusion.

The chapter discussed a brief overview of the Ghanaian economy. The overview focused on the history, gold and cocoa prices and growth, sector contribution, economic reforms and the modern Ghana. This was followed by explaining the trends in the variables under consideration in this study.The chapter also discussed the concept of fiscal imbalance, fiscal imbalance and macroeconomic indicators. Lastly, the chapter discussed the export commodities of Ghana.

CHAPTER THREE

LITERATURE REVIEW

Introduction

This chapter discusses the phenomenon of the important issues in the literature and doing that the study discussed the review of literature, both theoretical and empirical on the various works of some authorities in the field of export price shocks and its effects on fiscal imbalance.

Theoretical Literature

Some related literatures have employed various economic theories in explaining fiscal deficits. These theories modified with other variables contributing to the fiscal imbalance and explaining the various transmission mechanisms involved. The theories discussed include the Twin Deficit Theory,Source of Financing Government Deficit Approach and Public Sector Budget Constraint.

Twin Deficit Model

One important theory is the one on twin deficit or three (3)-gap model. The three gap model explains the deficit between fiscal and current account deficits (Bernheim, 1988). The current account considers the import and exports made by the country. It is important to note that the discussion on fiscal and current account nexus has mainly centred on four theoretical models.

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The first approachis based on the popular Keynesian twin deficit hypothesis. This hypothesis states that the budget deficit and current account deficit move together i.e. a positive relationship between fiscal deficit and current account deficit.They hold that the causality runs from fiscal deficit to current account deficit at least in the long run, with no feedback effects (i.e. unidirectional causality). The basic transmission mechanism according to the conventional Keynesian income-expenditure approach is that a rise in the government expenditure will increase domestic income and induce import causing a deficit in the current account balance. Thus, an increase in fiscal deficit would induce domestic absorption and hence, domestic income. The increase in domestic income will induce import expansion, resulting in a current account deficit or a reduction in the current account surplus. This is the effect of budget deficit on the external sector deficit causing twin deficits.

Another version of the Keynesian model is the Mundell-Fleming model that assumes capital mobility. The model assumes that capital flow moves faster than trade flows because foreign investors arbitrage differences in interest rates across countries to take advantage of unrealized profit opportunities. In a twin deficits model, Keynes showed that increases in budget deficits in an open economy tend to increase the level of domestic interest rate. If the domestic interest rate is higher than foreign interest rate, there will be capital inflow from abroad, causing a real exchange rate appreciation. The appreciation of the domestic currency leads to deteriorationin the current account balance, and consequently budget deficit causes current account deficits(Obstfeld, 2001).

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The second theoretical model is based on the Ricardian Equivalence Hypothesis (REH).Under the REH based on the Permanent-Income-Life Cycle Hypothesis; there is indeed no relationship between current account deficit and fiscal account deficit (Seater, 1993). According to this hypothesis, budget deficit financed through tax cut and sale of bonds would incur future tax liabilities to offset the debt. Thus, in order to prevent the effect of the future tax increase, individuals who seek to maximize the welfare of the next generation would increase current savings rather than consumption. In order words, an increase in the public deficits will not affect the private sector lifetime budget constraint and the real wealth of the consumer. Consequently, the equilibrium levels of current account, interest rates, investment and consumption will not be affected by the changes in the level of budget deficits(Barro, 1988).

The third proposition maintains that, a bi-directional causality between the two deficits may also exist. In other words, budget deficit Granger causes current account deficit and current account Granger causes budget deficit. While budget deficit may cause current account deficit, the existence of significant feedback may cause causality between the two variables to run in both directions.

The fourth proposition is that, under certain situations, the causality may be running from current account deficit to fiscal deficit rather than the reverse. A unidirectional causality is one that runs from current account deficit to fiscal deficit, or vice versa. The causality from current account deficit to budget deficit may occur when the deterioration in current account leads to a slower pace of economic growth and hence increases the budget deficit. This is especially true

for a small open developing economy that highly depends on foreign capital inflows (e.g. foreign direct investment, aid, grants etc.) to finance their economic developments. In other words, the budgetary position of a country is affected by large capital inflows or through debt accumulations and with that, a country will eventually run into budget deficit.

Also, another channel through which current account affect budget deficit based on this hypothesis is through the types of exports commodities of the respective country. Low-income countries depend on export of raw primary goods and budget processes prepared based on the earnings from these goods. Export earnings of primary goods are highly volatile due to unstable prices. With such fall in export revenue to the country, total revenue generation falls or estimated revenue in budget process short of the expected income. This fallen revenue with government increasing expenditure in order to sustain development leads to higher deficits and fiscal imbalance. The fiscal imbalance could arise from increasing its borrowing due to fallen revenue or exchange rate depreciation (Bernheim, 1988).

Source of Financing Government Deficit Approach

In Classical economic theory, inflation is induced by money growth from the Quantity Theory of Money. It suggests that the determination of price level is associated with high money growth rates. If money growsand this does not influence output, increase money growth leads to higher inflation. According to famous Friedman dictum "Inflation is always and everywhere a monetary

phenomenon"(Burdekin & Weidenmier, 2001). However, the world is more complexand monetary policy consists of more than just currency exchanges. An important issue that arises is how governments raise money for the country. One way is to print money to finance government deficits.

$$P_t(G_t \quad T_t) = dM_t = M_t \quad M_{t-1} \quad (1a)$$

Where P_t represents prices in period t, $G_t \quad T_t$ is the government resource gap in period t while $M_t \quad M_{t-1}$ represents changes in money stock. Equation (1a) means that each amount of deficit is financed through printing new money dM_t. Literally, the government pays its bills with currency. In another way, the government gets currency into the economy by changing the composition of its balance sheet, which is changing the proportion of interest-bearing debt with non-interest bearing debt(Agha & Khan, 2006).

Most developing countries such as Ghana have accumulated huge debt over the past years. The issue of Ghana's debt arises from payment of wage bill and illicit spending. Some would suggest government-printing money to finance these imbalances in the economy(Amo-Yartey, 2014). An important question that needs answer, if the relation between money growth and inflation is so clear, why do countries with huge debts simply not print less money? The real problem for most of these countries was a large fiscal deficit. If a government is running a deficit, it may issue money or interest-bearing debt. Alternatively, we can rewrite Equation (1a) as:

$$P_t(G_t \quad T_t) = dM_t + dB_t \quad (1b)$$

or

$$G_t \quad T_t = \frac{dM_t}{P_t} + \frac{dB_t}{P_t} \quad (1c)$$

The two terms on the right hand side of Equation (1c) are issues of new money, dM_t and new interest-bearing debt, dB_t. The equations note that what government does not pay with tax revenues, it must finance by issuing some sort of debt. If the government can neither reduce deficit nor issue debt, the only alternative left is to print more money. Whenever a central bank prints " money" it obtains goods and services in exchange for these new pieces of paper, the "seignorage." In real terms, seignorage can be expressed as the ratio of new currency printed to price level during the period(Fischer & Easterly, 1990). Alternatively, it can also be expressed as: $Seignorage_t = dM_t/P_t$.

The monetary aggregate that the central banks control directly is the "monetary base," consisting of currency in the hands of the public and reserves of the commercial banks deposited in the central bank. It gives a twist to Friedman's view that inflation might be a monetary phenomenon, but the money is a reflection of fiscal policy and not of monetary policy. If inflation was purely a monetary phenomenon caused by an exogenous excessive rate of growth of money, economies could have reduced inflation quite fast by printing fewer money and thus reducing the growth rate of the money supply(Agha & Khan, 2006).

Public Sector Budget Constraint

The monetary base of a country is determined by the public sector constraints and how public sector borrowing is financed(Easterly, Rodríguez,

Schmidt-Hebbel, & Mundial, 1994). If public sector borrowing is not financed by government borrowing from non banks or by sales of foreign exchange reserves, it has to be financed by borrowing from banking system(Fischer & Easterly, 1990). Government must finance its deficits by printing money if it has very high inflation, weak financial system, and weak reserves from low price of exports.

The public sector budget constraint is given as

$$G \quad T = C_G + DB + FB + FR + AID \qquad (2)$$

Where $G \quad T$ = public sector deficit, C_G represent central bank credit to government, DB represented domestic private sector borrowing, FB foreign borrowing, FR denote foreign exchange , AID is foreign Aid. This model explains public sector deficit requirement as met by sales of government bonds, sales of foreign reserves (FR), foreign borrowing (FB), Aid and monetary expansion. Changes in government spending and taxation are normally associated with fiscal policy and therefore are important variables in achieving fiscal balance(Buiter, 1985; Fischer & Easterly, 1990; Easterly et al., 1994).

Transmission Channels

The literature devoted to the analysis of the impact of shocks of commodity prices on both growth and fiscal performance is linked in part to the twin deficit theory. Indeed, the twin deficit propositions, which emphasized unidirectional causality from current account deficit to budget imbalance best explains the impact of commodity price shocks to fiscal imbalance. The twin deficit theory traduces the recurrent fluctuations in the prices of export goods in

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the economy, affecting the volume and the earnings from these exports mainly because the commodities are in their raw state. This theory is not sufficient to explain the change of macroeconomic variables.

Many studies in the theoretical analysis of the impact of commodity price shocks on fiscal performance are based on the fiscal balance (Medina, 2010; Kumah & Matovu, 2005), for them, revenue and public spending cannot be separated. Our study will analyze in this same sense i.e. the impact of commodity price fluctuation on fiscal position or fiscal outcome.

Therefore, the literature identifies several channels or mechanisms to explain this link.

Effective Exchange Rate channel

One important mechanism through which price fluctuations affect macroeconomic variables including fiscal imbalance is the exchange rate channel(Gilbert, 1989). The export of commodities largely depends on the exchange rate through the terms of trade from economic theory as shown below

$X = f(T) \ and \ T = eP \ /P$, where X represent exports, T represent terms of trade, P represent foreign price and P domestic price level and e represent exchange rate. If exchange rate rises, export rises because foreign currency can export more export at cheaper rate.

With such effective exchange rate channel,where the change in world commodity price affects the exchange rate in domestic economy leading to change in export earnings, brings about competitiveness in the tradable sectors and in effect affect

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the revenue for budgetary allocation and public spending(Aghion, Bacchetta, Ranciere, & Rogoff, 2009).

The Terms of Trade channel

There is also the channel of the terms of tradepresented by(Bleaney & Greenaway, 2001). These authors showed that volatility in terms of trade resulted in a slight accumulation of physical and human capital and hence a reduction growth. Macroeconomic theory provides the following channel of term of trade and export on the assumption that domestic price level is variable.

$Export = f(T)$ and $T = eP^*/P$, where T is terms of trade, e the exchange rate, P^* the foreign price level and P the domestic price level. Therefore, an increase in the world price of commodity export implyingfavourable terms of trade will increase export earnings and this will translate into increasing revenue of acountry. Hence, fiscal imbalance as well as external and internal deficits will reduce (Blattman, Hwang, & Williamson, 2007).

Channel of Investment channel

Volatile terms of trade leads to income instability that creates uncertainty in investments that could affect the long-term growth. With improve terms of trade from increased world price level, leads to increased output as well as rise in domestic interest rate. The rise in domestic interest rate attracts investment in the capital markets.

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Further, commodity price shocks distort domestic funds available for investment purposes. Funds channelled to other sectors other than profitable investmentare directly affected by price fluctuations. The prudent management of investment fund goes a long way improving our capital account and fiscal balance(Bleaney & Greenaway, 2001; Aidam & Anaman, 2014).

Review of Empirical Literature

The purpose of this review of literature is to identify an appropriate approach for the study. The empirical literature presents many studies that try to analyze the impact of commodity price shocks and fiscal imbalance or growth performance of countries.

An empirical literature by Bjørnland and Thorsrud (2015), examined commodity price fluctuations and fiscal policy design for Norway using time-varying Dynamic Factor Model, in which both the volatility of structural shocks and the systematic fiscal policy responses to change over time. This aimed at adopting a fiscal rule to shelter the Norwegian government against oil price shocks. Contrary, the study found out that fiscal policy has been less effective in sheltering the county from oil market shocks. However, when compared with other resource-rich countries,this was a great success. Commodity price shocks affect the fiscal account balance of most countries.

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The works of Ferraro and Peretto (2013),studied the relationship between commodity prices, long-run Growth and fiscal vulnerability. This paper researched on the short- and long-run effects of how fiscal policy interacts in the presence of external shocks from commodity prices. Long-lasting commodity price declines are often associated with abrupt tax revenue shortfalls in commodity exporting countries. Therefore, reliance on the tax base of the commodity-exporting sector makes the country's fiscal stance vulnerable to exogenous variations in commodity prices hence fiscal vulnerability.

Commodity price shocks increase budget uncertainty and affect the fiscal outcome of LICs. Samaké and Spatafora (2012)analyzed the impact of shocks in commodity prices on the fiscal balance and showed that revenue and expenditure react strongly in response to higher raw material prices. This research considered the commodity export and import prices of 116 countries over the period of 1990-2010. The fiscal balance deteriorates in response to commodity import price increase. Surprisingly, in LIC commodity exporters, an increase in commodity export price led to a deterioration of the fiscal balance.

The issue of commodity price booms in resource-rich countries and the procyclical of fiscal policy was revisited byCéspedes &Velasco (2014).Their empirical results suggest that improvements in institutional quality have led to a more countercyclical fiscal policy stance in a number of countries. In the same vein, Medina (2010)shows a strong reaction of revenue and expenditure to changes in commodity prices in Latin America and the Caribbean with some differences between countries. The distinct behaviour across countries may relate

to institutional arrangements, which in some cases include the efficient application of fiscal rules.

Another important literature by Ilzetzki and Végh (2008),discovered evidence that fiscal policy in developing countries is procyclical and expansionary as well.To settle the issue of causality, they employed quarterly dataset for 49 countries covering the period 1960-2006. The study attributed theprocyclicalbehaviour to international credit constraints and political distortions, but it did not focus on the direct impact of commodity price shocks on fiscal positions. This omission can be a serious one for some commodity-exporting countries, in which the volatility of total fiscal revenue comes mainly from commodity price movements rather than the output cycle.

Commodity price fluctuation affects the growth of a country.Van der Ploeg and Poelhekke (2009) combine the literature on natural resources with an investigation of Ramey and Ramey (1994),the link between the volatility of unanticipated output growth on one hand and growth performanceon the other hand. In a first step, they showed the importance of the variables that reflects the dependence on natural resources in the studies. In a second step, they showed that the fluctuations in commodity prices cause the volatility of the share of natural resource exports in GDP, which ultimately result in unanticipated growth volatility of output and reduces the growth of output per capita in countries that depend heavily on natural resources.Sachs and Warner(2001) also followed similar research. These works were silent on the link between resource price

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volatility and the fiscal stance of a country. However, the effect of commodity price on growth also affects the fiscal performance of a country.

Other researchers such as Kumah and Matovu (2005), examined commodity price shocks and the odd of fiscal performance. The study adopted a structural VAR approach and identified the dynamic effects of commodity price shocks on fiscal performance. In understanding the dynamics of these fiscal movements in the context of transitory commodity price shocks, this study used sample data from four CIS countries- two oil-producing and two non-oil commodity-intensive countries. Stochastic simulations indicate high probabilities of fiscal performance in the short term when commodity prices are high and deteriorate significantly in the long term after the transitory positive commodity price shocks has dissipated.

The impact of commodity price shocks on fiscal imbalance may not be direct. Arezki and Ismail (2013) examined the behaviour of expenditure policy during commodity price cycles and its implication for real exchange rate movements.A panel data for 32 oil-producing countries over the period 1992 to 2009 was used with underlying assumptions. The results obtained shows in periods of commodity booms exchange rate react strongly than capital spending. This brings about rigidities in government spending to revenue shock. Fiscal rules have helped reduce the degree of responsiveness of current spending during booms. This raises concerns about potential adverse consequences of on economic performance in oil-producing countries.

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Fiscal sustainability has eluded many natural resource-rich developing countries including Uganda, Angola and Nigeria. Kazi and Sarker (2012)analyzed a similar research in a case of Uganda.Oil is an opportunity for Uganda to generate funds to finance fiscal deficit. However, obstacles such as limited local participation, capital flight, technical capacity, higher public administration costs, limited local absorptive capacity and capital markets, and political corruption have made the impact of commodity (oil) a resource curse. This research concludes that the "resource curse" is attributable to economic, legal, political and socio-cultural factors.

The literature of commodity price shocks and the fiscal account balance on Ghana is rather limited. A recent article by Kinda et al. (2016) on commodity price shocks and financial fragility reveals commodity price shocks significantly affect the fiscal deficit of a country. The study considered 71 countries covering the period 1997-2013 including Ghana. The results obtained show that negative shocks to commodity prices are associated withhigher financial sector fragility and increases the probability of systemic banking crises.In addition, the study found that negative price shocks affect the financial sector through saving withdrawals, increasing debts and worse fiscal performance (low government revenue). The study added that the adverse effect is more evident in countries that are not under IMF programs and have poor governance and high debt. Ghana has been under IMF programs for a couple of years now, but commodity price shocks continue to be detrimental to its fiscal account. Could this be attributed to the huge debt in the country?

Similarly, Aidam and Anaman (2014) researched on export earning instability and investment in Ghana (1981-2011). Though the research did not consider the prices of these exports, the effect on investment suggests lower revenue for government hence fiscal deficits. The prices of export commodities are important in export earnings and translate to fiscal performance.

Summary and Conclusion

This chapter reviewed some economic theories from which the analysis of fiscal deficits have been drawn from including the three gap model, source of financing fiscal deficit, and public sector budget constraint. Further, the theoretical and empirical works were reviewed andwe realized most empiricalanalysis of commodity price shocks and fiscal outcome had different results. The varying results in the literature was attributedto the type of commodity (primary, value added or capital goods), the size or volume of export share in world commodities and share in exporting countries revenue and more importantly the time varying effect of commodity price. This study intends to consider a country like Ghana whose major exports (gold and cocoa) are primary and forms a significant share in the world output. It is also a major source of revenue to government and their prices are highly volatile in different times. The Ghanaian economy has suffered macroeconomic instability including exchange rate volatility, high inflation rate and unemployment, high debt burden and fiscal deficits. There is therefore a need empirically to analyse the impact of commodity price shocks on its fiscal deficit in achieving macroeconomic stability.

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CHAPTER FOUR

METHODOLOGY

Introduction

This chapter presents the methodological model suitable for conducting the study. It discusses the methods and tools of analysis employed in this study. Specifically, the chapter mainly consists of the research method, a detailed description of theoretical and empirical specification of the model, the justification and measurement of variables, test of variables including unit root, cointegration, lag selection and the estimation procedures.

Research Design

There are quite a number of possible alternative methods for social science research. Numerous studies have employed panel data techniques, and time series examining commodity price shocks and fiscal imbalance. However, the decision to apply any of the possible alternative methods for research depends on the data, more variability and usefulness of research and the objective of the study. Commodity prices shock affects revenue through either tax or foreign exchange resulting in fiscal imbalance. This research employs quarterly time series data for the period 1990-2013 in Ghana. To achieve the objectives of the study, the vector autoregressive (VAR) regression and vector error correction model as well as impulse response was adopted for data estimation and analysis using E-views 9.0 package.

Theoretical Model Specification

Macro economic theory has identified various factors that influences fiscal imbalance of a country from the Keynesians twin deficit, source of financing government deficit and public sector budget constraints. While there is no doubt that fallen price of exports goods will lead to increasing fiscal imbalance, it is also inevitably compatible with other factors. These factors include export and imports of goods and services, public or national debts, interest payment of debts, real exchange rate, inflation, investment and savings of a country, human capital, innovation, technology, economic policies, governmental factors, aid, trade openness, institutional factors, political factors, corruption, socio-cultural factors, bank credits, private sector borrowing or foreign borrowing and many others. In order to examine the empirical evidence of commodity price shocks on fiscal imbalance in Ghana, the study considered some of these control factors including interest payment on external debt, consumer price index, gross fixed capital formation and terms of trade(Rosine, 2013).

The main reason for the expectation that commodity price fluctuations have a detrimental effect on fiscal imbalance in the country is derived directly from the different views on the Keynesian twin deficit approach. The first is that the current account deficit and fiscal deficit move together, with the causality running from budget deficit to current account deficit. Therefore, there is a positive relationship between budget deficit and current account deficit. However, this research follows the unidirectional school of thought, which believes the causal effect runs from current account deficit to budget imbalance. The causality

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from current account deficit to budget deficit may occur when the deterioration in current account leads to a slower pace of economic growth and hence increases the budget deficit. This is especially true for a small open developing economy that highly depends on exports on primary commodities whose prices are unstable compared to their import based. The current account includes the export versus import of a country. We export primary commodities such as gold and cocoa and import capital goods at a high cost to the country. It is important to emphasize that not only prices of commodities in small open economies volatile but other factors also contribute to poor export performance. Some of these factors include protection for export vis-a-vis production for the domestic market mostly seen as export bias (Balassa, 1982). Such protections negatively affect competiveness of exports to other countries.

To analyze the relationship between fiscal deficits and the export price, there has been a surprising and impressive resumption of fiscal imbalance literature, which has led to various models in sustaining economic balance. These models have focused on different approach and have considered some of the following variables, such as interest payment on external debt, terms of trade, gross fixed capital formation (investment), consumer price index (inflation), etc to explain how fiscal imbalance persist.

Based on theoretical considerations, it is helpful adopt the national income accounting identities. The national income account identity provides the basis for the relationship between budget deficit and current account deficit that includes

export commodities. The model starts with the national income identity for an open economy that is represented as follows:

$$Y = C + I + G + X - M \qquad (3a)$$

Where Y is real GDP, C is private consumption, I denote investment, G is government expenditure, and (X-M) is net exports (called current account balance) which is the difference between exports (X) and imports (M). This model is important since it includes export commodities, however, this study focus on the prices rather than volume or earnings.

Alternatively, we can identify the national income by consumption (C), saving (S) and tax payments (T):

$$Y = C + S + T \qquad (3b)$$

Combining equations (3a) and (3b), we obtain:

$$C + S + T = C + I + G + X - M \qquad (3c)$$

This simplifies to the following

$$(X - M) = (T - G) + (S - I) \qquad (4a)$$

Or

$$CAB = BD + SI \qquad (4b)$$

Where CAB is current account balance, BD is budget deficit and SI is the savings-investment gap.

Equation (4a) shows that the current account balance (X-M) is related to private saving-investment balance (S-I) and the budget balance (T-G). Under the assumption that the private saving-investment balance is constant, a deficit in the budget will cause current account deficit that according to the Keynesian doctrine, is the rationale behind the twin deficits hypothesis or the three (3)-gap model. This identity provides the basis for an expected positive long-run relationship between budget deficit and current account balances. Based on this identity, the Keynesian twin deficit hypothesis is explained as follows: an increase in the government expenditures will have a deteriorating effect on the budget balance and thereby cause a decline in national savings. However, by offering higher interest rates to finance the budget deficit, the government will attract foreign investors and this will cause an appreciation of the domestic currency. Hence, import expenditures will increase and inversely, export revenues will decline through the loss of competitiveness in the international arena. Consequently, the budget deficit, formed by expenditures, will cause current account deficit through exchange rate and interest rate mechanisms.

For the purpose of this study, the causality will be running from current account deficit to budget deficit rather than the reverse (Bernheim, 1988). The causality from current account deficit to budget deficit implies deterioration in current account leads to poor revenue generation and increases the budget (fiscal) deficit. The export component in the current account is mostly dependent on the price of the commodity. In other words, the fiscal position of a country affected by large fluctuations in prices of exports or through low prices associated withraw

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commodities and with that, a country will eventually run into fiscal deficit or fiscal imbalance.

Hence, equation $4a$ can be re-written as follows,

$$T - G = (X - M) + (I - S) \quad (5a)$$

OR

$$FD = Xn + f \quad (5b)$$

Where FD is budget or fiscal account/imbalance, Xn represent net export and f savings – investment gap. Under the assumption that the saving-investment gap and imports are constant and this research only focuses on export commodities including our major exports cocoa and gold. It is useful to trace the economic links between budget deficits and export commodity price in some detail.

From equation (5b), the relationship between commodity price and fiscal imbalance model is specified as:

$$FD = A_t EXP\_INDEX_t^{\propto} K_t^{\beta} \quad (6)$$

Where *EXP_INDEX* represents commodity price index and *K* represents gross fixed capital formation. *A* denotes other factors accounting for the fiscal imbalance not captured in the model. The theoretical models reviewed focused on different variables influencing fiscal deficit in a country.(Rosine, 2013)); Samaké and Spatafora(2012); Medina, (2010) identified important economic variables including terms of trade, consumer price index and interest payment to relate the fiscal outcome of a country. Therefore, the *A* function is expressed as:

$$A = (CPI_t, TOT_t, INT\_PER_t) \qquad\qquad (7)$$

The study examined the following set of variables of interest in

$$FD = f(EXP\_INDEX_t, CPI_t, TOT_t, K_t, INT\_PER_t) \dots \dots \dots \dots (8)$$

Where FD is fiscal account/imbalance, EXP_INDEX represents commodity price index (cocoa and gold price), CPI is consumer price index, K is gross fixed capital formation (INVESTMENT), TOT is terms of trade and INT_PER is interest payment on external debt.

EmpiricalModel Specification

Equation (4a) is a fundamental THREE gap model or twin deficit explaining fiscal deficit and net exports and savings –investment identity. Based on economic theory, equation 1 in the interest of this studywas modified to accommodate the various variables based on literature to influence fiscal imbalance. The study applied natural log transformation on some variables derived in equation (8).

Equation (8) in a transform model can be written mathematically as:

$$lnFD_t = a_0 + a_1 EXP\_INDEX_t + a_2 lnCPI_t + + a_3 lnTOT_t + a_4 K_t$$
$$+ a_5 INT\_PER_t + e_t \dots \dots \dots \dots \dots (9)$$

Where ln denotes natural log to bring about linearity in the values. FD represents fiscal imbalance proxy by Overall surplus/deficit, excluding all grants (current LCU). EXP_INDEX_t represents commodity price index. This

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research considered major export prices of Ghana's cocoa and gold.$CPI$is consumer price index proxy by consumer price index (overall goods),TOT is terms of trade proxy by net bilateral terms of trade, K is investment proxy by gross fixed capital formation (percentage of GDP), INT_PER is interest payment on debt proxy by interest payment on debt on external debt (percentage of GNI) and "e" is error term assumed to be normally and independently distributed at zero mean and constant variance.In addition,the error term captures other explanatory variables that influence fiscal imbalance yetnot included in the model.

Justification and Measurement of the Variables

Fiscal Imbalance (FD)

Ghana's record of accomplishment of high fiscal deficits has resulted in elevated levels of public debt to GDP ratio since 1990 until the HIPC relief. Fiscal management in Ghana has not been consistently strong and this is because it has not been able to keep the government budget under control. Poor revenue collection built upon an inadequate tax base and low tax compliance have combined with expenditure pressures particularly in election years leading to large and continuous public sector borrowing. This high expenditure in election years are mostly unproductive and mainly to secure position in governance.

Poor revenue mobilization also stems from the fact that Ghana has weak external position partly reflecting lower commodity prices particularly gold and

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cocoa. With weaker gold and cocoa exports, the estimated earnings from contributing to revenue decline and current account deficits worsen. Despite the country's involvements in oil export fiscal deficits continue to be on the increase leading to poor fiscal performance (Amo-Yartey, 2014). This is because revenue performance has improved and at the same time primary spending including capital spending as well as wages and salary has increased. Wages and salary has become major problem and largest share of government spending due to the implementation of single spine salary structure the composition of tax revenue has shifted from heavy international taxes to high domestic taxes of goods and services. Historically, this unsatisfactory fiscal performance has been at the centre of a vicious cycle in which the public sector's appetite for debt financing has contributed to high interest rates, put pressure on the exchange rate as economic agents are unsure about the sustainability of public debt, raised and distorted the cost of capital and crowded out private sector investments. Government, concerned about securing the support of public service labour unions, granted substantial wage increases in election years and embarked on ambitious capital projects, many of them unproductive. The result has been an inconsistent and poor fiscal performance and high debt levels. The consequences of accumulating high fiscal deficits have become major concerns to the country.

We used the overall surplus/deficit account as proxy for fiscalimbalance. Overall budget surplus/deficit is current and capital revenue and official grants received, less total expenditure and lending minus repayments. This simply means revenue less expenditure.

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This study follows public deficit or fiscal deficit measures, which consider government expenditure less revenue. This was obtained by multiplying the overall account by negative one since it is captured as revenue component less expenditure patterns. Log transformation was applied to allow easy interpretation of results and normalize data (Wicklin, 2011).Values obtained from African Development Indicators.

Commodity Price Index (EXP_INDEX)

Ghana is highly dependent on export of raw materials such as cocoa, timber and minerals such as gold, etc. These major export prices are highly volatile and affect the fiscal balance of the country. According to Foxley (2009), a country's exposure to external shocks generally depends on its reliance on export earnings, finance import and also contribution to revenue and economic growth. Production structures primarily oriented towards export led growth, countries face external shocks more than production structures and this disrupt the reliance on domestic demand(Krznar & Kunovac, 2010). Therefore, the impact of external economic shocks typically manifest itself through losses in export earnings, however the size of impact depends on a country's mix exports and trading partners and the degree of export concentration. This study will consider our major export (gold and cocoa) prices and see the effect of the shocks on fiscal performance.

Cocoais the chief agricultural export of Ghana. Early years of independence, Ghana implemented many infrastructural developments

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mainlyfrom cocoa export, which she was the leading producer in the world. Cocoa plantations have dropped due to aging trees, widespread disease, bad weather and low prices. Some have attributed the low price of cocoa due to export of these commodities in its raw states. Others believe that with value addition the country could earn three times more than the raw export(Abdulai & Rieder, 1995).

Gold accounts for 90 percent of total mineral output in Ghana and the slump in gold prices on the world stage affects total mineral earnings for the country that is the second largest producer of gold in Africa, after South Africa. Ghana became the eighth world biggest gold producer in 2013. This sector has experienced sharp drop in earnings from gold production and exports. The drop in revenue was due to the fall in gold prices on the world stage that caused mining firms to restructure their operations and even lay off some workers. Also, gold production in Ghana has suffered more due to illegal mining (galamsey)(Akpalu& Parks, 2007).

Major studies have emphasized export earnings affecting revenue to the country. However, the prices of these exports have significant effect and hence are major determinants of these export earnings, what we produce and export as well as volume of export production goes a long way to induce fiscal performance. In addition, the volume of export could be increased with some appropriate measures such as technology and this will make the price effect less significant on revenue but this is not so in Ghana.

Commodity price index used in this study is the main dependent variable. The variables used in creating the index were gold and cocoa prices obtained from Bank of Ghana (BoG) quarterly time series. The study adopts the standard normalization approach combined with a moving average method. The merits of this method are that it distinguishes between rise and fall, temporary and permanent, and stochastic and predictable changes of export price for both cocoa and gold.Akpokodje (2000) and Aidam and Anaman (2014) used a similar approach to estimate export earnings fluctuation for Nigeria and Ghana respectively.

The commodity price index (EXP_INDEX) obtained by applying the formula below

$$EXP\_INDEX = \frac{(XP_t \quad XP4_t)}{\sigma 4_j} \qquad (10)$$

But, $XP4_j = \frac{1}{4}\sum_{j-t-3}^{1} XP_t$

Where XP_t = average price of gold and cocoa

$\sigma 4j$ = standard deviation of the gold and cocoa prices of a four-quarterly period

$XP4j$ = moving average over the same four-quarterly period, EXP_INDEX represents commodity price index.

After obtaining this commodity price index from average prices of gold and cocoa, the values not transformed into logarithms. A prior expectation between commodity price and fiscal account balance is positive.

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Consumer Price Index (CPI)

Consumer price index used in the model as an explanatory variable that explains changes in the growth of fiscal imbalance in the economy. Consumer price index and inflation mostly used interchangeably, or most importantly, changes in consumer price index used as measure of inflation. Most economists have criticized the use of CPI as a measure of inflation. Consumer price index defined as a measure of the average change overtime in the prices paid by consumers for a market basket of goods and services, inflation on the other hand, defined as the persistent and appreciable increase in the general price level. This affects several macroeconomic variables such as the interest rates, balance of payment position among others, all of which affect the revenue and expenditure patterns of a country, hence fiscal deficit in the economy. Most researchers have different views on the directional relationship between inflation and fiscal deficit. Some believe fiscal deficit influences inflation of a country than vice versa. However, majority support that inflation affects fiscal imbalance.

An empirical research carried out by Catão and Terrones (2003) shows that there is a strong positive relationship between fiscal deficits and inflation among high-inflation and developing country groups, but not among low-inflation advanced economies. If the general price level increases, expenditure increases including government expenditure and this distort government budget leading to fiscal imbalance. High consumer price index that increases the cost of borrowing (interest rate) and making more money chasing fewer goods reduces revenue mobilization, increasing the level of fiscal imbalance in the economy. This is

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because of the positive relationship between inflation and budget deficit. High prices of goods and services including high inputs cost and infrastructure resources, government borrowfrom the public or print more money (siegnorage) to meet the increased prices and that leads to further inflation. Other means include government borrowing from external sources. Government ability to control these debts created by means of high price of inputs and resources as well as interest payment on these debt leads to fiscal deficit. However, under stabilized inflation or low level of average price of basket of goods and services, there is significant control of expenditures by government.Therefore, not only is inflation an increasing function of budget deficit but also can be a leading indicator for fiscal imbalance. Under high inflation, growth of an economy is obscured but favourable under stabilize inflation or controlled inflation. It is interesting to note that inflation a significant component or variable in planning budget or implementing fiscal policies to achieve growth of a country.

Consumer price index (CPI) should hence be included in estimating the relationship with fiscal balance. CPI used in the model as a control variable was obtained from Bank of Ghana (BoG) quarterly time series. In addition, the natural log transformation applied for the values used in estimation. Consequently, we expect the coefficient of consumer price index to be negative.

Terms of Trade (TOT)

The impact of terms of trade on fiscal deficits is very important. Net barter terms of trade used as proxy for terms of trade and obtained from world

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development indicator. Further, the Gandolfo approach was used to quarterlies data from annual time series from 1990 to 2013. In addition, natural logarithm applied to bring about linearity among values.

Fiscal imbalance and current account analysis is made possible through terms of trade. Favourable terms of trade encourage domestic export that leads to current account surplus, hence enough revenue mobilization leading to fiscal account surplus. On the other hand, a fall in terms of trade affect exports leading to current account deficit and this translates to fiscal deficit (Bernheim, 1988). Since 1990, there has been some trade improvement which we would expect a favourable impact of the fiscal account. This is far from what we observe and fiscal imbalance continues to be a challenge in Ghana despite major commodities for export that fetch the country significant revenue.

A positive correlation between budget surpluses and trade surpluses does not necessarily indicate causality through favourable terms of trade. It is therefore necessary to explore the variations in fiscal balance and trade balance through the terms of trade. In conclusion, a prior expectation is therefore positive.

Gross Fixed Capital Formation (K)

Investment is one of the macroeconomic variables that affect economic growth on theoretical and empirical growth as well as revenue that translates to fiscal deficits in a country. Investment (capital stock) is the asset including machinery, buildings, and vehicles used in production. Investment examined using different indicators including, gross fixed capital formation (physical

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capital), stock market, foreign direct investment etc. However, this research used gross fixed capital formation, which includes improvement in land, plant, machinery and equipment purchase and the construction of roads, etc. in the domestic economy. Physical capital in other words refers to any non-human asset made by humans and then used in production. Summers and Heston (1991) has shown support for the prediction that high investment role is associated with high income per person. More capital means more production and more production means more output and hence more domestic revenue. Further, investment in capital market is an important channel to raise income in domestic country and this affect the budget profile of the country. Therefore, interest rate in the domestic economy is an important macro indicator for attracting investors to raise profitable funds for physical development to reduce the imbalance in a country.

Investment is included in the model because the accumulation of capital remains one key variable in traditional and modern growth model. Bulk of theoretical and empirical evidence indicates that the relationship between economic growth and capital stock is positive. (Lucas, 1988; Rebelo, 1990; Hoover & Perez, 2004). The positive relationship between investment and growth implies higher revenue mobilization through investment. Investment proxy by Gross Fixed capital Formation (percentage of GDP) and were quarterlies using the Gandolfo approach. Consistently, we expect an increase in gross fixed capital formation to increase fiscal surplus.

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Interest Payment on External Debt (INT_PER)

      Despite the deterioration in Ghana's economic growth, there are sensitive areas such as interest payment that needs to be considered. Large public debt could have deterioration impact on fiscal conditions, institutional set up as well as financial markets. At the time governments experience a sharp long-term debt accumulating fiscal deficits, there are mainly heavy repayment obligations through interest payment of the debts. In the absence of a substantive fiscal adjustment to avoid undue pressures in the economy domestic agents, borrow freely from international capital markets. Interest payments on these borrowed funds are part of government obligations. Small economies such as Ghana pay high interest rate due to uncertainty about repayments. Such high rate of demands and repayments conditions has place most low-income countries such as Ghana in serious financial problems. Interest payment on debt is a significant component of government statutory payment and this result in fiscal imbalance. High interest on debt or borrowed funds would lead to high fiscal imbalance and distort a growing economy.

      Interest payment on debt is therefore significant in the fiscal stance of a country. This research proxy interest payment by interest payment on external debt (percentage of GNI) and was obtained from World Development Indicators. Further, the Gandolfo approach was used to quarterlies the yearly time series data.Therefore, we expect a negative a prior expectation between interest payment and fiscal imbalance.

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Based on the empirical literature and justification above, the expected signs of thecoefficients are:$a_1 > 0, a_2 < 0, a_3 > 0, a_4 > 0, a_5 < 0.$

Sources of Data

This research employed secondary data and quarterly time series data were generated from the annual time series collected from 1990 to 2013 using(Gandolfo, Martinengo, & Padoan, 1981) algorithm. The series were drawn from World Development Indicators (terms of trade, gross fixed capital formation and interest payment on external debt), African development indicators (fiscal imbalance) and Bank of Ghana (gold and cocoa price and consumer price index).

Estimation Procedure

To investigate the relationships as well as the dynamics interaction between commodity price shocks and fiscal imbalance the vector error correction model (VECM) and Impulse Response Function (IRF) derived from Bayesian VARwas applied. The testing procedure involves the following steps. The study first investigated the time series properties of our data by using the Augmented Dickey-Fuller (ADF) and the Phillips-Perron tests. The unit root test was done to check the stationary position of our series. In the second step, we tested for cointegration using the Johansen co integration framework. In the presence of cointegration among variables, we used the Vector Error Correction Model to

estimate the long run and short run parameters. In the final step, Impulse Response was done to analyse the response by fiscal imbalance to shocks.

Unit Root Test.

The study employed a variety of unit root tests and this was done to ensure reliable results of the test for stationary due to the inherent weaknesses specific to the various tests. Time series data are rarely stationary in level forms. Regression involving nonstationary variables often lead to spurious regression (Tang, 2006). The results may be statistically significant but no meaningful relationship among variables. The null hypothesis to be tested is that the variable under investigation has unit root against the stationary alternative hypothesis.

A time series data is said to be stationary if its moments that is mean, variance and autocovariance are independent of time. Stock and Watson, (1988) have also shown that the usual test statistics including the t, F, DW, and R^2 will not possess standard distributions if some of the variables in the model have unit roots.

The study used a variety of unit root test to ensure reliable results for stationarity test. The study employed both Augmented Dickey Fuller (ADF) and the Phillips-Perron (PP) tests. Theyare considered reliable and as such accepted by 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 was chosen using the Akaike Information Criterion (AIC) and Schwarz 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

$$X_t = a + \delta t + \rho X_{t-1} + \sum_{i=1}^{p} \beta_i \ X_{t-1} + v_t \quad (11)$$

Where X_t denotes the time series at time t, Δ is the difference operator, $a\delta\rho$, β, are parameters to be estimated and v is the stochastic random disturbance term.

The PP test is superior to ADF and this includes the following reasons. First, ADF test do not consider cases of heteroskedasticity 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

H_0: Series contain unit root

H_1: 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. In addition, 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 that are non-stationary and contains unit root is by taking first difference. Nevertheless, first differencing results eliminate all the long-run information that 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 and Juselius Approach to Cointegration

Johansen (1988) andJuselius and Johansen (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)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 use of two test statistics namely, the trace statistic and the maximum Eigen value statistics in order to make references about the number of cointegrating variables.

VECMFramework

In order to develop strong, robust and reliable model that captures the relationship between commodity price shocks and fiscal imbalance, and following after Sims (1980), the Vector Autoregression (VAR) approach was applied as an estimation technique.

VARs have the desirable property of focusing on 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 commodity price shocks as sources of fiscal fluctuations. Another advantage of using VARs over cross-sectional regressions is the ability they provide to look at

the dynamic effects of commodity price shocks on fiscal revenues and expenditures; 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. The use of VARs permits commodity prices' direct and indirect effect on fiscal positions (through their effect on expenditure and revenue) to be disentangled. A VAR model is expressed as follows:

$$X_t = \mu + \Theta_1 X_{t-1} + \quad + \Theta_k X_{t-k} + V_t \qquad t = 1,2 \ldots n \quad (12)$$

Where X_t is a 1×7 vector of intregated series of order one (fiscal account balance, commodity price index, consumer price index, exchange rate, terms of trade, capital formation and interest payment), μ is a vector of intercepts while V_t is a vector error terms and k represents the lag length of the series.

In essence, the presence of cointegration relationship among variables informs the use of Vector Error correction Model (VECM) to examine the long and short run relationships among the variables. The ECM is expected to be negative and statistically significant. The ECM measure the speed of adjustment from disequilibrium to equilibrium.Equation (12) transformed into an equilibrium error correction modelcan be expressed as:

$$X_t = \delta + \sum_{i=1}^{k-1} \Phi_i \ X_{t-1} + \Pi X_{t-k} + \varepsilon_t \qquad\qquad (13)$$

$$\Phi_i = \quad (\varphi_{i+1} + \quad + \varphi_k) i = 1, \ldots k \quad 1 and \quad \Pi_{i_i} = \quad (I \quad \varphi_1 \qquad \varphi_k)$$

Where   is the first difference operator and Φ_i represents a 7×7 matrix of coefficients of the first difference that capture the short run dynamics. Π is the coefficient matrix which contains information about the long run relationships among variables used in the model. Given that the rank of Π is 0<r<n, then Π can be decomposed into $\Pi = \theta\beta'$.

The error correction representation in equation (13) is further expressed as:

$$X_t = \delta + \Phi_1 X_{t-1} + \Phi_2 X_{t-2} + \quad + \Phi_{p-1}\Delta X_{t-p+1} + \theta\left(B'X_{t-p}\right) + \varepsilon_t \qquad (14)$$

Where the columns of β are interpreted as distinct cointegration vectors providing the long-run relationships $(B'X_t)$ among the variables, and $\theta's$ are the adjustment or error correction coefficients, indicating the adjustment to long-run equilibrium.

Bayesian VAR

Bayesian analysis requires knowledge of the distributional properties of the *prior*, *likelihood*, and *posterior*. In Bayesian statistics and econometrics, anything uncertain, including the true value of a parameter, can be thought of as being a random variable to which can assign a probability distribution.

The prior is the external distributional information based on researchers' belief on parameters of interest. The likelihood is the data information which contains a sample probability distribution function (PDF). Combining the prior distribution via Bayes' theorem with the likelihood data results in the posterior distribution.

In particular, the parameters of interest in a given model by $\theta = (\beta, \Sigma)$ and the data by y. We consider prior distribution $\pi(\theta)$ and the likelihood $l(y|\theta)$, then

the posterior distribution $\pi(\theta|y)$ as the distribution of θ given the data y and may be derived by

$$\pi(\theta|y) = \frac{\pi(\theta)l(y|\theta)}{\int \pi(\theta)l(y|\theta)d\theta} \qquad (15)$$

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

$$\pi(\theta|y) \propto \pi(\theta)l(y|\theta) \qquad (16)$$

The main target of Bayesian estimation is to find the posterior moments of the parameter of interest. For instance, location and dispersion are the general estimates which are comparable to those obtained in classical estimation (namely the classical coefficient estimate and coefficient standard error). These point estimates can be easily derived from the posterior because the posterior distribution contains all the information available on the parameter θ.

To relate this general framework to Bayesian VAR (BVAR) models, suppose that we have the

VAR *(p)* model:

$$y_t = a_0 + \sum_{j=1}^{p} A_j y_{t-j} + \epsilon_t \qquad (17)$$

Where y_t for $t = 1,.. T$ 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 $N(0, \Sigma_\epsilon)$. For compactness we may rewrite the model as:

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$$Y = XA + E \qquad (18)$$

or

$$y = (I_m \quad X)\theta + e \qquad (19)$$

Where Y and E are $T \times m$ matrices and $X = (x_1, \dots x_t)'$ is a $T \times (mp + 1)$ matrix

for $x_t = (1y'_{t-1,\dots}, y'_{t-q})$, I_m is the identify matrix of dimension m, $\theta = vec(A)$, and $e \sim N(0, \Sigma_\epsilon \quad I_T)$.

Using Equation (19) the likelihood function is

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

$$\left. (I_m \quad X)\theta) \right\} \qquad (20)$$

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

$$\Pi(\theta) \propto |V_o|^{-\frac{1}{2}} \exp\left\{ \frac{1}{2}(\theta \quad \theta_o)' V_0^{-1}(\theta \quad \theta_0) \right\} \qquad (21)$$

where θ_0 is the prior mean and V_0 is the prior covariance. When we combine this prior with the likelihood function in Equation (20), the posterior density can be written as

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

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

$$\left. \left. \left. \left(\Sigma_\epsilon^{-\frac{1}{2}} \quad X \right)\theta \right\} \right) \right\} \qquad (22)$$

which is a multivariate normal PDF. For simplicity, define

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

$$W = \begin{bmatrix} V_0^{-\frac{1}{2}} \\ \left(\Sigma_\epsilon^{-\frac{1}{2}} \quad X\right) \end{bmatrix} \qquad (23)$$

Then the exponent in Equation (22) can be written as

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

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

$$\left. + (w \quad W\bar{\theta})'(w \quad W\bar{\theta})\right\} \qquad (24)$$

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

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

Since is known, the second term of Equation (24) has no randomness about $\bar{\theta}$.

The posterior therefore may be summarized as:

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

$$= \exp\left\{ \frac{1}{2}(\theta \quad \bar{\theta})'\bar{V}_0^{-1}(\theta \quad \bar{\theta})\right\} \qquad (25)$$

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

$$\bar{V} = [\,V_0^{-1} + \left(\Sigma_\epsilon^{-1} \quad X'X\right)]^{-1} \qquad (26)$$

Impulse Response Function

Impulse response analysis is used to study the behaviour of the endogenous variables in response to shocks in one or more variables used the

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model. A shock to the variable not only directly affects the variable but alsotransmits to all the other endogenous variables through the dynamic (lag) structure of the VAR. An impulse response function traces the effect of a onetime shock to one of the innovations on current and future values of the endogenous variables. Plotting the impulse response functions (i.e., plotting the coefficients of the innovations against the time horizon) is a practical way visually to represent the behaviour of the series in response to the various shocks. Hence, impulse response analysis from the Bayesian VAR was done to trace the effect of commodity price shocks on fiscal imbalance(H. H. Pesaran & Shin, 1998).

Stability Tests

This study uses cumulative sum (CUSUM) and cumulative sum of squared (CUSUMSQ) tests developed by Brown, Durbin, and Evans (1975) to test for the stability of parameters on fiscal imbalance. The null hypothesis tested is that there is no structural break against the alternative hypothesis that there is structural break. This test becomes necessary because in Ghana, there have been changes in fiscal policy as a result of changes in government programmes aimed at reducing fiscal deficits. Ghana in 2001 opted for High Indebted Poor Countries initiative in order to claim debt forgiveness and reduce fiscal imbalance.

Data Analysis

The study employed both descriptive and quantitative analysis. Charts such as graph and tables were employed to aid in the descriptive analysis. Unit

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root test were carried out on the variables to ascertain their order of integration in order to avoid the problem of spurious regression. The study also tests for cointegration among variables to ascertain their long run relationship. Further, the study adopted the Vector Autoregressive model (VAR) econometric model. In addition, impulse response function was doneto explain how price shocks translate to other variables involved with particular interest on fiscal imbalance. The variance decomposition was done to assess the importance of different shocks by determining the relative share of variance that each structural shock contributes to the total fiscal imbalance variable. All estimations were carried out using E-views 9.0 package.

Summary and Conclusion.

This chapter developed and presented the methodology framework suitable for conducting the study. The model was developed from the theoretical formulations of the twin deficit approach. Quarterly time series data of fiscal imbalance, export commodities prices including Gold and Cocoa prices, consumer price index, terms of trade, gross fixed capital formation and interest payment on external debt, from 1990-2013 using Gandolfo approach was employed for the study. Stationary test was conducted using ADF and PP tests to ensure that the variables are not integrated in higher order than one to avoid spurious regression.Cointegration test was done to established long run relationship among variables. VAR model was employed as estimation technique

and impulse response function was used to analyze how shocks translate to other variables.

The systematic framework of this chapter now establishes the relationship between commodity prices and fiscal imbalance that guides us in our estimation, this has a link with our models as well as guiding us to interpret our estimation results in the subsequent chapters and make policy recommendations based on the outcome of findings.

CHAPTER FIVE

RESULTS AND DISCUSSION

Introduction

This chapter presents the empirical findings and discussions of the results of the study. The aim is to unearth the relationship between commodity price and fiscal imbalance and provide empirical findings to how commodity price shocks affect fiscal imbalance. In addition, the study examine the time series properties of the data to determine stationary status of the variables using the Augmented Dickey Fuller and Phillips-Perron (PP) tests and further tested for co integration using the Johansen cointegration test; exploratory data analysis, in graphical and descriptive presentation; unit root and co integration test; the VECM results and analysis. It also employed Impulse Response Function (IRF) to ascertain how shocks transmit to affect fiscal imbalance.

Descriptive Statistics

The study conducted descriptive statistics of all the variables employed. The descriptive statistics include the mean, median, maximum, minimum, standard deviation, skewness, kurtosis, sum, sum squared deviation and number of observations. These statistics are illustratedextensively in Table 2. From Table 2, it can be seen that all the variables have positive average values (mean and median). In addition, thedeviation of the variables from their means as shown by

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the standard deviation gives indication of a relatively high fluctuation among these variables over the period under consideration.

With reference to skewness, commodity price index, terms of trade and interest payment on external debts were positively skewed while fiscalimbalance, consumer price index and gross fixed capital formation are negatively skewed.

Table 2

Summary Statistics of the Variables

	LNDEF	EXP_INDEX	LNCPI	LNTOT	K	INT_PER
Mean	15.63	16.41	4.26	3.67	7.00	0.43
Median	15.92	13.48	4.54	3.66	6.92	0.47
Max	14.13	30.83	6.12	4.08	9.77	0.90
Min	16.62	8.462	1.77	3.32	3.64	0.08
Std.Dev	0.79	6.94	1.34	0.23	1.39	0.22
Skew	-0.68	1.01	-0.41	0.44	-0.21	0.02
Kurt	1.98	2.53	1.88	1.96	2.87	1.93
J-Bera	11.59	17.19	7.79	7.28	0.77	4.60
Prob	0.00	0.00	0.02	0.03	0.68	0.10
Sum	1500.74	1575.15	409.29	352.37	672.38	41.00
Sum Sq.Dev.	59.60	4577.05	171.70	5.10	182.93	4.41
Observ	96	96	96	96	96	96

Note: Max is maximum; Min is minimum Std. Dev. represents Standard Deviation; skew is skewness; kurt is kurtosis; J-Bera is Jarque-Bera; prob is Probability while Sum Sq. Dev. represents Sum of Squared Deviation; observ is Observation.
Source: Computed using Eviews 9.0 Package.

The kurtosis of all the variables deviates from the normal distribution value of 3. The study then uses the Bayesian VAR that assumes normal distribution for impulse response analysis.

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Unit Root Test Results

In order to examine the impact of commodity price shocks on fiscal imbalance in Ghana , the stationarity status of all variables including fiscal imbalance , commodity price index, consumer price index, gross capital fixed formation, terms of trade and interest payment on external debts in the model specified for the study were determined. This was done to ensure that the variables were not integrated of order zero or two (That is I (0) or I (2) stationary), and to avoid spurious results. The order of integration of the variables tested using Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) units root tests.

Table 3

Unit Root Test (ADF) for Order of Integration: At Levels and First Difference with Intercept Only

Var	ADF-statistic	lags	Var	ADF-statistics	lags	O1
LNFD	-0.747198 (0.8286)	5	DLNFD	-3.454073 (0.0116)**	4	I(1)
EXP_INDEX	-0.100370 (0.9456)	0	DEXP_ INDEX	-9.566869 (0.0000)***	0	I(1)
LNCPI	-2.079239 (0.2535)	0	DLNCPI	-9.486359 (0.0000)***	0	I(1)
LNTOT	-0.508502 (0.8835)	9	DLNTOT	-3.344909 (0.0158)**	8	I(1)
K	-3.139136 (0.0274)**	9	D K	-5.953036 (0.0000)***	11	I(0)
INT_PER	-1.003899 (0.7491)	5	DINT_PER	-3.930010 (0.0028)***	4	I(1)

Table 4

Unit Root Test (ADF) for Order of Integration: At Levels and First Difference with Intercept and Trend

Var	ADF-statistic	lags	Var	ADF-statistics	lags	O1
LNFD	-1.816887 (0.6884)	5	DLNFD	-3.532639 (0.0419)**	4	I(1)
EXP_INDEX	-1.494435 (0.8249)	0	DEXP_INDEX	-9.663675 (0.0000)***	0	I(1)
LNCPI	-1.071831 (0.9999)	0	DLNCPI	-10.00135 (0.0000)***	0	I(1)
LNTOT	-3.978614 (0.0126)**	2	DLNTOT	-3.272145 (0.0778)*	8	I(0)
K	-3.709430 (0.0269)**	9	D K	-5.855394 (0.0000)***	11	I(0)
INT_PER	-2.304103 (0.4272)	5	DINT_PER	-3.921380 (0.0150)**	4	I(1)

Note: D denotes first difference. ***, ** and * represent significance at1%, 5% and 10% levels respectively. Numbers in brackets are P-Values. OI represents the order of integration.
Source: Computed using Eviews 9.0 Package

Table 3 and 4 reports the ADF test for intercept only and intercept with trend respectively, at levels and first difference. Most variables are non stationary at levels considering ADF in Table 3 and 4 except gross fixed capital formation (K_t) which is stationary at 5 percent that is ADF test intercept only and with both intercept and trend; gross fixed capital formation (K_t) and terms of trade $(lnTOT_t)$ were stationary at 5percent, implying they are $I(0)$.

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Table 5

Unit Root Test (PP) for Order of Integration: At Levels and First Difference with Intercept Only

Var	PP-statistic	Bwd	Var	PP-statistics	Bwd	O1
LNFD	-1.832206 (0.6813)	4	DLNFD	-5.536772 (0.0001)***	4	I(1)
EXP_INDEX	-1.511493 (0.8190)	2	DEXP_INDEX	-9.666275 (0.0000)***	3	I(1)
LNCPI	1.891715 (1.0000)	3	DLNCPI	-10.00135 (0.0000)***	0	I(1)
LNTOT	-2.659661 (0.2557)	6	DLNTOT	-4.270414 (0.0053)***	5	I(1)
K	-3.062167 (0.1275)	4	D K	-5.650023 (0.0000)***	4	I(1)
INT_PER	-2.148292 (0.5123)	4	DINT_PER	-5.814670 (0.0000)***	4	I(1)

Table 6

Unit Root Test (PP) for Order of Integration: At Levels and First Difference with Intercept and Trend

Var	PP-statistic	Bwd	Var	PP-statistics	Bwd	O1
LNFD	-0.522621 (0.8810)	5	DLNFD	-5.450588 (0.0000)***	4	I(1)
EXP_INDEX	-0.115077 (0.9439)	2	DEXP_INDEX	-9.567412 (0.0000)***	2	I(1)
LNCPI	-2.079239 (0.2535)	0	DLNCPI	-9.486408 (0.0000)***	1	I(1)
LNTOT	-0.626492 (0.8586)	6	DLNTOT	-4.283361 (0.0008)***	5	1(1)
K	-2.677039 (0.0818)	4	DK	-5.669433 (0.0000)***	4	1(1)
INT_PER	-1.282877 (0.6350)	4	DINT_PER	-5.848329 (0.0000)***	4	I(1)

Note: D denotes first difference. ***, ** and * represent significance at1%, 5% and 10% levels respectively. Numbers in brackets are P-Values. OI represents the order of integration. Bwd represents bandwidth.
Source: Computed using Eviews 9.0 Package

Table 5and 6 report the results of the unit root tests with intercept only and intercepts with trend at levels and first differences respectively.From Table 5 and 6, all variables were stationary at 1st difference under PP test but not at levels. It suffices to state that the ADF and PP tests are all consistent confirming the stationarity of each variable at first difference. The ADF and the PP statistics are higher than their respective critical (in absolute terms) values implying stationarity after first differences, implying all variables are $I(1)$.

Lag Selection Criteria

It is essential, before estimating a VAR model, to determine the optimal lag length of the model. Table 7, reports on the optimal lag selection criteria based on the sequential modified LR test statistic (LR), Final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ) and where * indicates lag order selected by the criterion.

Table 7

VAR lag selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-356.2257	NA	0.000152	8.232403	8.401312	8.300452
1	278.5441	1168.554	1.87e-10	-5.376002	-4.193637	-4.899657
2	359.5084	138.0074	6.80e-11	-6.397919	-4.202097*	-5.513277
3	388.8597	46.02821	8.13e-11	-6.246812	-3.037535	-4.953875

4	416.2988	39.28769	1.04e-10	-6.052245	-1.829511	-4.351011
5	524.8541	140.6285	2.20e-11	-7.701230	-2.465040	-5.591700
6	587.6136	72.74394*	1.38e-11*	-8.309399	-2.059754	-5.791574*
7	625.8297	39.08467	1.63e-11	-8.359766	-1.096665	-5.433645
8	667.3435	36.79631	1.96e-11	-8.485079*	-0.208522	-5.150662

Source: Computed using Eviews version 9.0 Package

* indicates lag order selected by the criterion

LR: sequential modified LR test statistics (each at 5%level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

From Table 7 results, the optimal lag selection is 6. This was based on the Schwarz information criterion (SC) andHannan-Quinn information criterion (HQ).

Cointegration Analysis

To establish the relationship between commodity price shocks and fiscal imbalance, it is imperative to test for the existence of long run equilibrium among these variables by testing forcointegration. In determining the number of cointegrating vectors, Trace test and Maximum Eigen value test using the more recent critical values of MacKinnon, Haug, & Michelis (1999)were performed. The assumption of no deterministic trend and restricted constant was used for all the variables. Given that the study employs quarterly data and a lag length of

6,Table 8 and 9 reports on the Johansen Trace and Maximum Eigen test. After the stationarity was determined, the lag length tests statistics andcointegration tests within the framework of the model conducted. The Null Hypothesis (H_0), which says that there are no cointegrating vectors is therefore rejected while the alternative hypothesis of the presence of cointegrating vectors conveniently accepted. Thus, it has concluded that a long run relationship exists among the variables.

Table 8

Johansen's Cointegration Test (Trace) Results

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.406165	141.9278	95.75366	0.0000
At most 1 *	0.314484	95.54515	69.81889	0.0001
At most 2 *	0.256517	61.94024	47.85613	0.0014
At most 3 *	0.206221	35.55983	29.79707	0.0097
At most 4	0.098491	15.00528	15.49471	0.0591
At most 5 *	0.062852	5.777316	3.841466	0.0162

Trace test indicates 4 cointegratingeqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

From Table 8,it can be seen from the trace statistics indicates the presence of at most fourcointegrating relationships. The null hypothesis is rejected given

the trace statistics of 35.56 is greater than the critical value of 29.80, hence existence of cointegration among variables.

Table 9

Johansen's Cointegration Test (Maximum Eigenvalue) Results

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.406165	46.38263	40.07757	0.0086
At most 1	0.314484	33.60490	33.87687	0.0538
At most 2	0.256517	26.38042	27.58434	0.0707
At most 3	0.206221	20.55455	21.13162	0.0600
At most 4	0.098491	9.227964	14.26460	0.2677
At most 5 *	0.062852	5.777316	3.841466	0.0162

Max-eigenvalue test indicates 1 cointegratingeqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Again, it can be seen from Table 9 that the maximum-Eigen value statistics indicate one cointegrating relationship among the variables. The maximum-Eigen value statistics of 46.40 is greater than the critical value of 40.08 accepting the alternative hypothesis of cointegration among variables.

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The Long Run Effect on Fiscal Imbalance

There is existence of long run relationship among variables as reported from the cointegration test. The study then proceeds to estimate the long run Vector Autoregressive model (VECM).

The long run relationship was derived by normalizing LNFD and dividing each of the cointegrating coefficients by the coefficient of fiscal account imbalance.

Normalized cointegrating coefficients (standard error in parentheses)

LNFD	EXP_INDEX	LNCPI	LNTOT	K	INT_PER
1.000000	0.297502	1.194103	-10.02192	-0.453303	0.721832
	(0.01936)	(0.10905)	(1.07763)	(0.03708)	(0.23549)

Table 10 reports the long run results and test statistics of the estimated VECM model. From the long run estimates, any disequilibrium as a shock in the short run can be correctedby the error correction term. Hence, the error correction term measure the speed of adjustment from disequilibrium to equilibrium.

The error correction term (ECM)of the normalized equation can be expressed as:

$$ECM = LNFD + 13.99C + 0.30EXP\_INDEX + 1.19LNCPI \quad 10.02LNTOT$$
$$0.45K + 0.72INT\_PER$$

Where C is constant trend, EXP_INDEX is commodity price index, $LNCPI$ is consumer price index, $LNTOT$ is terms of trade, K is gross fixed capital formation and INT_PER is interest payment on external debt.

The VECM estimate from Table 10 reveals that commodity price index has a negative impact on fiscal account (negative fiscal imbalance) given the test statistics is compared with the rule of thumb (2). Specifically, 1 percent increase in commodity price index negatively affects fiscal account implying fiscal imbalance increase by about 30percent. $lnCPI_t$, Log of consumer price index has a negative relationship with fiscal account (negative fiscal imbalance). A percentage change that is a 1 percent increase in consumer prices negatively affects fiscal account implying increase in fiscal imbalance by 1.19percent. $lnTOT$, positively affect fiscal account balance implying a positive fiscal imbalance (surplus account). A percentage increase in terms of trade will positively affect fiscal account by about 10percent given the test statistics is compared with the rule of thumb (2). Gross fixed capital formation$(K_t)$is positively related to fiscal account also reducing negative fiscal imbalance (surplus fiscal account). A percentage increase in gross fixed capital formation will positively affect fiscal account by about 0.45percent given the test statistics is compared with the rule of thumb (2). Interest payment on external debt negatively affects fiscal account balance that is high fiscal deficit. A 1 percent increase in interest payment on external debt will increase negative fiscal imbalance by 0.72percent average given the test statistics is compared with the rule of thumb (2).

Table 10

VECM long run estimates – Dependent variable is LNFD

Variable	coefficient	Standard error	T-ratio
EXP_INDEX	-0.297502	0.01936	-15.3657*
LNCPI	-1.194103	0.10905	-10.9502*
LNTOT	10.02192	1.07763	9.29996*
K	0.453303	0.03708	12.2260*
INT_PER	-0.721832	0.03708	-3.06519*
C	-13.99429		

Note: * indicate significant level compared with rule of thumb [2]

Source: Computed using Eviews 9.0 Package

Short Run Dynamic Results (*lnFD* is Dependent Variable)

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 (Engle & Granger, 1991). The existence of long run relationship among fiscal imbalance and its explanatory variables necessitates the estimation of its long-run coefficients and short run dynamic parameters.

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Table11 reports the short run results of the estimated Vector Autoregressive Model (VECM) and shows that there is significant impact on fiscal imbalance from commodity price index. Fiscal imbalanceis affected by its own lags from the results reported in Table 11. It is significant in the first, fourth and fifth previous quarters with coefficient of about 0.72, 0.69 and 0.50 respectively, all at 1 percent significant level. The first and fifth lags show positive relationship but the fourth lag shows a negative relationship. Hence, fiscal imbalance in the previous level affects current fiscal imbalance. Commodity price index is significant and affectsfiscal imbalance both positively and negatively in the second, third, fifth and sixth lags with coefficients of (1.1), (2.3), (3.3) and (1.4)percent respectively. The third and fifth lags are about 1 percent significance level; the sixth lag is significant at 5 percent alpha level and the second lag at 10percent significance level.

Consumer price index shows a significant positive relationship in the third and fifth lags with coefficients about 1.25 and 0.65 respectively. The third lag is significant at 1percent significance level whiles the fifth previous quarter significant at 5percent significance level. In addition, negative significant relationship was recorded in the fourth and sixth lags with coefficient of about 1.2 and 0.98percent respectively both at 1 percent significance level. The coefficient of terms of trade is positive about 2.69percent and at 1 percent significance level. Gross fixed capital formation reported a positive significant relationship in the fourth lag with 0.04 percent coefficients at 5 percent significance level. Interest payment on external debt was positively related with fiscal account balance in the

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first and fifth lags. The coefficients were 0.59 and 0.53 for the first and fifth previous quarters respectively. The first lagwas significant at 1 percent and in the fifth quarter 5 percent significance level.

Table 11

Short run results (Dependent Variable isLNFD)

	Coefficient	Std. Error	t-Statistic	Prob.
ECM(-1)	-0.043704	0.019852	-2.201530	0.0309**
D(LNFD(-1))	0.719368	0.063105	11.39952	0.0000***
D(LNFD(-4))	-0.689268	0.067640	-10.19028	0.0000***
D(LNFD(-5))	0.508917	0.069826	7.288364	0.0000***
D(EXP_INDEX(-2))	0.011607	0.006885	1.685670	0.0961*
D(EXP_INDEX(-3))	-0.022569	0.006872	-3.284372	0.0016***
D(EXP_INDEX(-5))	-0.033498	0.006421	-5.217204	0.0000***
D(EXP_INDEX(-6))	-0.013674	0.006447	-2.121095	0.0373**
D(LNCPI(-3))	1.253443	0.231678	5.410276	0.0000***
D(LNCPI(-4))	-1.202743	0.262401	-4.583600	0.0000***
D(LNCPI(-5))	0.646593	0.251413	2.571841	0.0122**
D(LNCPI(-6))	-0.979229	0.220168	-4.447652	0.0000***
D(LNTOT(-4))	2.689810	0.434341	6.192858	0.0000***
D(K(-4))	0.043193	0.018953	2.278914	0.0256**
D(INT_PER(-1))	0.593196	0.210547	2.817403	0.0062***
D(INT_PER(-5))	0.526908	0.212232	2.482704	0.0153**

***, **,* indicates 1%, 5% and 10% respectively.

R-squared= 0.8032   DW=1.9926

Adjusted R-Squared= 0.7628

Source: Computed Using Eviews version 9.0

Discussions

This section gives a detailed discussion on the results of the study. It tries to relate the findings of the study to previous works as provided in the literature in order to justify the different results of the different models and provide interpretation of the results.

Long Run Estimates (VECM)

From Table 10, it can be seen that commodity price index, consumer price index and interest payment on external debt showed a negative relationship with fiscal imbalance. The negative impact on fiscal account implies negative fiscal imbalance. These variables have the expected sign on fiscal imbalance and significant expect commodity price index. It thus follows that a 1 percent increase in price of major export gold and cocoa prices will negatively increase fiscal imbalance in Ghana by 30percent in Ghana according to our findings. The sign of the commodity price index is rather ambiguous from the theoretical expectation that as country's major commodity prices rises fiscal account balance improves. However, it is consistent with the results obtained by Samaké & Spatafora (2012).

Commodity price has a significant impact on export growth, which affect the revenue generation of a country through either foreign exchange earnings or tax on exports. It also affects the volume of export.As export price increases,it encourages countries to export more, increasing their volume of exports, government revenue increases through taxes or foreign earnings and that more

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revenue for government expenditures and economic growth. This is the traditional view of the role of export price in increasing revenue and reducing deficit. On the other hand, if commodity price declines in a resource-rich nation like Ghana, government revenue declines if no reduction in non-essential expenditures fiscal imbalance increases. This is also consistent with the other empirical studies by Kinda et al. (2016) and Deaton & Miller (1995).

The results obtained suggest that increase in gold and cocoa prices negatively affect the fiscal account implying increase in the fiscal imbalance in Ghana. An important reason to these results stems from the fact that the relationship between commodity price index and fiscal imbalance may not be direct.

Commodity price affects the volume of export commodities. An increase in gold and cocoa price with increased volume of export commodities would fetch the country higher earnings, which would reduce both current and fiscal imbalance. Gold and cocoa productions have suffered some challenges for quite some time now. Gold mining for commercial export has dropped due to low extract from overused site and most importantly the presence of illegal mining (galamsey). The presence of illegal mining activities has reduced the level of gold production and benefits there off. Cocoa producers have also suffered some setbacks including dry weather condition, insects and crop diseases, land tenure problem, use of land for commercial activities or settlement, inadequate motivation for cocoa producers, low-level education among cocoa farmers, lack of funds for hired inputs and exploitation by banks and microfinance institutions.

These problems among others in the gold and cocoa sectors have reduced the volume available for exports. Therefore,increase in prices with fall in the volume of export will reduce the revenue of government increasing fiscal imbalance.

Another important reason for the negative relationship with fiscal imbalance is the type of commodity in question. Gold and cocoa are exported in their raw state in Ghana. Prices of raw commodities are mostly less than is its true value or value added commodities and highly volatile. Cocoa production has a longer gestation period hence takes time to increase output as price increase. The raw nature of export of gold and cocoa makes positive price less significant in reducing fiscal deficit, hence fiscal imbalance.

The attitude of government in terms of expenditure patterns and expectations induce fiscal imbalance as price of commodities rises. Fiscal imbalance has been attributed to excessive government expenditure over expected revenue. Expectations of high prices for commodity exports leading to significant revenue induce government to increase expenditure patterns.Gold and cocoa price rise below expected price and with high expenditure budget increases deficits. In addition, most expenditure's are non-essential such as rebranding of buses. The emphasis is on the use of revenue, if itis used for ill project or non-essential expenditure. This reason confirms Samaké and Spatafora (2012) results that increase in commodity export prices leads to a deterioration of the fiscal balance because expenditure rises faster than revenue.

The coefficient of consumer price index is negative and averaging about 1.19. Given the t statistics of 10.9502compared with the rule of thumb (2), it is significant. A coefficient of 1.19 for consumer price index means that all things being equal, a1 percent increase in consumer price index raises fiscal deficit by about 1.2percent average. The negative relationship between consumer price index and fiscal imbalance is consistent with the expectation of classical economic theory and source of financing deficit approach. It's also consistent with the results obtained byAgha & Khan (2006) andCatão & Terrones (2003). Asiedu (2006) had a negative relationship between consumer price index and economic growth implying reduction in income hence rising fiscal deficits.

Changes in consumer price index have been mostly used as measure of inflation. Sowa (1994) reported that changes in consumer price index (inflation) alter the expenditures of household and government. Cost of raw materials increase and already budgeted projects must have their revenue allocation increased. The increase in prices of input for government's projects increases expenditure and distorts achieving a balance budget, hence increasing negative fiscal imbalance. Increase in consumer price index reduces real income and that government, firms, household and individuals must increase income to maintain their expenditure patterns. One-way firms or government tend to increase their revenue is to borrow from other sources, hence more deficits. We can therefore conclude that increase in consumer price index will negatively affect fiscal account and increase fiscal imbalance(Sowa, 1994).

Interest payment on external debt is negative and statistically significant using the rule of thumb (2). The coefficient of interest payment on debt is 0.721832,meaning a 1 percentincreasein interest payment on external debt, all things being equal, will negatively increase fiscal imbalance by 0.7percent on the average. This is consistent with the resultBruckner and Arezki (2010)that increase in interest payment on external debt increases domestic countries fiscal imbalance. Ghana over the years has borrowed from external sources with the aim of undertaking economic projects and infrastructure development. Most of these borrowed funds are misplaced, end up for non-essential project, or mismanaged. Since most developing countries are highly indebted including Ghana, international agencies have to lend at a higher interest rate to reduce the risk of indebtedness. Such high interest payment on external debt is part of government statutory expenditure. Therefore, at high interest payment on external debt government revenue is diverted from essential expenditures increasing its fiscal deficit.Dornbusch (1984) and Alesina and Tabellini (1990) all confirmed that rising payment of debt negatively affects fiscal performance of countries.

Gross fixed capital formation as percentage of GDP shows a positive and significant relationship on fiscalimbalance. Investment proxy by gross fixed capital formation is statistically significant using the rule of thumb (2) and the sign is consistent with basic economic theory. The coefficient of gross fixed capital is 0.453302 implying a 1 percent increase in gross fixed capital formation increases fiscal imbalance by 0.5percent averagely. Ahmad (1970) and Aidam and Anaman (2014) confirmed investment in physical capital and stocks

ensuresgrowth of national income which increases revenue mobilization and with prudent expenditure management reduce the budget deficits and imbalance.

Terms of trade is significant and has positive relationship with fiscalimbalance. The coefficient of net bilateral terms of trade is 10.02192 and significant using the rule of thumb (2). Hence, 1 percent increase terms of trade positively increase fiscal imbalance by an average of 10.02 percent. This implies favourable terms of trade will have a positive impact on fiscal account and increase fiscal imbalance.This is also consistent with basic economic theory. Blattman et al. (2007) reported that favourable terms of trade increase earnings from trade and this increase revenue and trade balance. Countries openness to trade is highly dependent on the terms of trade with its trading partners. Kaminsky (2010) confirmed that if terms of trade are unfavourable, developing countries tend to suffer and experience high trade imbalance. This affects the revenue in domestic countries leading to high fiscal imbalance (deficits).Favourable terms of trade reduce the external shocks from trade imbalance and help reduce Ghana's negative fiscal imbalance.

Short Run Dynamics of Fiscalimbalance.

From Table 11, it is evident of the parsimonious results of the short run dynamics coefficients of the lags of fiscal imbalance, commodity price index, consumer price index, gross fixed capital formation, terms of trade and interest payment on external debt on fiscal imbalance.

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Fiscal imbalance is affected by its own lags in the first, fourth and fifth quarter periods. The coefficients for the first and fifth lags recorded positive values of 0.719368 and 0.508917 respectively, whiles the fourth lag recorded a negative coefficient of 0.689268and all were significant at 1 percent significance level. The positive effect on fiscal account by its own lags implies that a 1 percent increase in previous fiscal accountpositively increase current fiscalimbalance in the first and fifth quarter period by 0.7 and 0.5 averagely. With appropriate fiscal management past fiscal deficit will reduce current imbalance and improve fiscal balance. On the other hand, in the fourth quarter a 1 percent increase in fiscalimbalance negatively increases current fiscal imbalance that is increasing fiscal deficitby about 0.6 percent. This is true because Ghana's past budget deficits also enter in its current expenditure by way of defraying some deferred payment.

The coefficient of commodity price index was negative and significant in the third, fifth and sixth lags and the coefficients were 2.3, 1.4 and 3.3percent respectively. This implies that an increase in commodity prices will increase fiscal imbalance since it negatively affect the fiscal account. Samaké and Spatafora (2012) confirmed an increase in commodity export prices increase fiscal deficit. This is because over reliance on export of primary commodity which are mostly more elastic to prices changes, increase fiscal deficits of a country. Increase in gold and cocoa price should fetch more revenue and that managing government spending should lead to reduction in fiscal imbalance. If commodity price increases and the volume of exports fall, foreign earnings are affected and this

increases fiscal imbalance without expenditure cuts. However, the previous second quarter recorded a positive and about 1.2 percent average on fiscal imbalance. This implies increase in commodity price (gold and cocoa) would positively affect fiscal account as expected by the traditional view.

Consumer price index reports significant results in the third, fourth, fifth and sixth previous periods and were both positive and negative. The positive coefficients were recorded in the third and fifth lags and were 1.253443 and 0.646593 respectively. Hence a 1 percent increase in consumer price index increase fiscal account surplus (positive imbalance) by 1.3 average in the third lag at 1percent significant level and 0.6 percent average in the fifth lag at 5percentsignificant level. The fourth and sixth lags coefficients are 1.202743 and 0.979229 both significant at 1 percent and have negative relationship to fiscal imbalance. A 1 percent increase in consumer price index negatively affects fiscal imbalance by 1.2 and 1.0percent on the average in the fourth and sixth quarter lag series. The positive and negative relationships derived stem from the reasons as expected in the prior expectation. Catão and Terrones (2003)confirmed changes consumer price index (inflation) exertfluctuationson fiscal imbalance across different periods.

Terms of trade was significant in the fourth lag period and its relationship with fiscal imbalance was positive. The coefficient was 2.689810, implying a 1 percent increase in terms of trade positively affects fiscal imbalance by 2.7 averages in the fourth lag at 1 percent significance level. The positive relationship implies favourable terms of trade will encourage exports and this increase

domestic income and with managed budget will help reduce negative fiscal imbalance(Kaminsky, 2010). This relationship of favourable terms of trade to increase fiscal surplus will require fiscal discipline and prudent management of resources in other to reduce negative fiscal imbalance and achieve surplus fiscal account(Bleaney & Greenaway, 2001).

Investment or gross fixed capital formation tends to be significant and positively related to fiscal account imbalance in the fourth quarterly lag period. The coefficient of gross fixed capital formation is 0.043193, implying a 1 percentincrease in fixed capital stock increase fiscal surplus by 0.04 percent at 5 percent significant level. Increase in gross fixed capital formation increase gross domestic income (GNI) of the country and this increase government income for its expenditure. Capital investment sparks growth and reduces the reliance on donor agencies and ensuresa surplus government fiscal account(Aidam & Anaman, 2014;Chimoba, O.P., 2010). Thisconfirms the direct relationship between gross fixed capital formation and fiscal account in the short run.

The relationship between fiscal imbalance and interest payment on external debt is significant in the first and fifth quarterly lag series. The coefficients in the first and fifth quarters are 0.593196, 0.526908 respectively, and positive. Hence, a 1 percent increase in interest payment on external debt positively affects fiscal imbalance by 0.59 and 0.53 percent in the first and fifth lags accordingly. The first lag is at 1percent significant level and the fifth coefficient is at 5 percent significant level. The positive relationship in the short run time lags mean interest payment of external debt will have a fluctuating

impact on fiscal imbalance (Dornbusch, 1984). External borrowing used for significant development programmes and project generate revenue for a country and interest payment on such loans in different time lag will not increase fiscal deficit and vice versa.

The coefficient of the error correction term is negative and statistically significant as expected at 5percent significance level, suggesting the speed of adjustment that would take the system to return to its equilibrium once is out of equilibrium. This negative and significant coefficient is an indication that the cointegrating relationships exists among the variables; fiscal imbalance,commodity price index, consumer price index, terms of trade, gross fixed capital formation and interest payment of debt. The size of the vector error correction term denotes that about 4.4percent of disequilibrium caused in the previous quarterly shocks converges back to equilibrium in the current quarter period. Thus, the study discerns that the variables in the model will slowly response to equilibrium when shocked in the short run

Diagnostics

The regression for the VECM also had significant post estimation test results. From the results in Table 11, the first order serial correlation problem is eliminated as seen from the DW statistic of 1.992599 that is 2 approximately, which is an indication of the acceptance of null hypothesis of no serial correlation in the residuals.

The model also recorded a high R-squared of 0.803220 and adjusted R-squared 0.762786 implying a high predictive power of the determinants. The high R-squared shows a tight fit for the model, implying the independent variables accounting for the explanations in the dependent variable.

Table 12

Post Estimation test for VECM

Test	Statistic	Conclusion
ARCH Test	F-statistic=1.305730 (0.1919) Obs*R-squared 33.69784(0.2110)	There is no ARCH element in the residual
Breusch-Godfrey Serial Correlation LM Test	F-statistic 0.060110(0.9417) Obs*R-squared 0.142009 (0.9315)	No serial correlation
Multivariate Normality	Jarque-Bera=1.699925 p-value=0.427431	Residuals are normal

Source: Computed Using Eviews 9.0Package

The ARCH test also revealed that there is no ARCH element in the residual specified while the normality test indicates that the residuals are normally distributed. Hence, heteroskedasticity is also not a problem since the probability value lead to the acceptance of the null hypothesis.Breusch-Godfrey Serial Correlation LM Test confirms that there is no serial correlation.

Stability Tests

Hansen (1992)warned that estimated parameters of a time series data might vary over time. As a result, it is imperative to conduct parameters test since the model misspecification may arise because of unstable parameters and thus has the tendency of biasing the results. Therefore, Pesaran and Pesaran (1997) advise that we employ cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) tests to assess the parameter constancy. These tests check the stability of the parameters in the model for the study period and makes results more reliable for policy suggestions. This option plots the cumulative sum and the cumulative sum of squares together with the 5 percent critical lines. The test finds parameter unstable if the cumulative sum and cumulative sum of squares goes beyond the area between the two critical lines. These tests were proposed by Brown et al. (1975).

Appendix D shows the plots of the CUSUM and CUSUMSQ for the estimated VAR model. The graphs indicate the absence of any instability of the coefficient because the plots of these graphs are confined within the 5 percent critical bounds of parameters stability suggesting that the coefficients' of the estimated model are stable over the study period.

Impulse Responses Analysis

To buttress the information adduced from the above results, a confirmation and direction was sought by looking at the impulse responses for the

commodity price shocks and other transmission channels such as terms of trade and gross fixed capital formation on fiscal imbalance over ten periods. The impulse response function is obtained from a Bayesian VAR methodology.
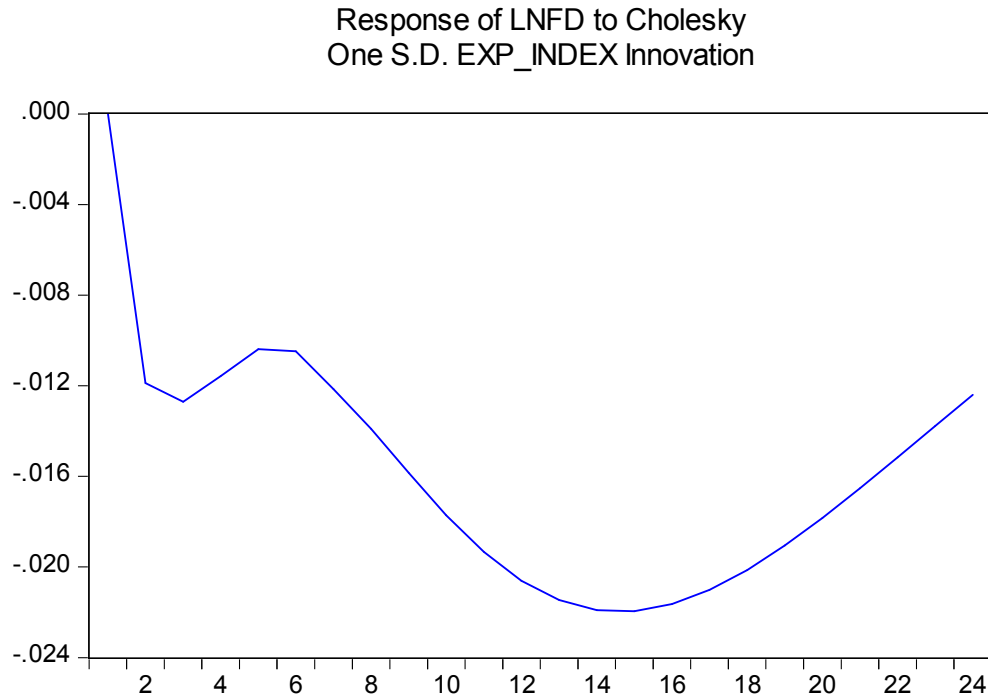
Response of LNFD to Cholesky
One S.D. EXP_INDEX Innovation

Figure 8: Response of LNFD of commodity price shocks

Source: Computed Using Eviews 9.0 Package

The impulse response function, as indicated in figure 8 shows that for a positive commodity price shock, fiscal account negatively response sharply from first period to the fourth period were it begins to rise. It risesfrom the fourth period; stabilize in sixth period then continuous to fall to the fourteenthperiod. The trend takes a turn from the sixteenth period and shows an upward responds

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though negative. The possible explanation for this trend is that with continues positive commodity price shocks from gold and cocoa, expenditure rises faster than revenue fiscal imbalance worsens(Samaké & Spatafora, 2012).This trend supports the long run results were price worsensthe fiscal account hence negative fiscal imbalance. Therefore, a continuous price booms or shocks lead to negative fiscal response.

The reasons for the negative imbalance could be attributed to some factors discussed earlier including the nature of commodities, volume of exports as well as expenditure patterns of government. Ghana's major commodities (gold and cocoa) are exported in raw or it primary form. this findings confirms the conclusion from Samaké and Spatafora (2012) that developing countries relying of primary exports goods positive commodity price shocks leads to high fiscal deficits. The international prices of primary goods tends to fluctuate more compared to processed or value added commodities.Dependence on commodities often fails to generate significant revenue because volatile internationalprices lead to losses in export revenue (UNDP, 2015).

The loss in export revenue could be curtailed by increasing the volume of export to supplement the shortfalls. The volume of Ghana's export has been on decline due to some factors including illegal mining, rain fed farming, pest control, inadequate subsidies among others. commodity price shocks relates the volume of export, therefore, for positive price shocks to have significant impact of revenue mobilization the volume of export needs to be considered to match price changes.

Positive commodity price shocks will continue to be detrimental to achieving fiscal balance so far as government expenditure rises faster than revenue. Expenditure from government should be controlled especially non essential patterns to absorb shocks in commodity export price.
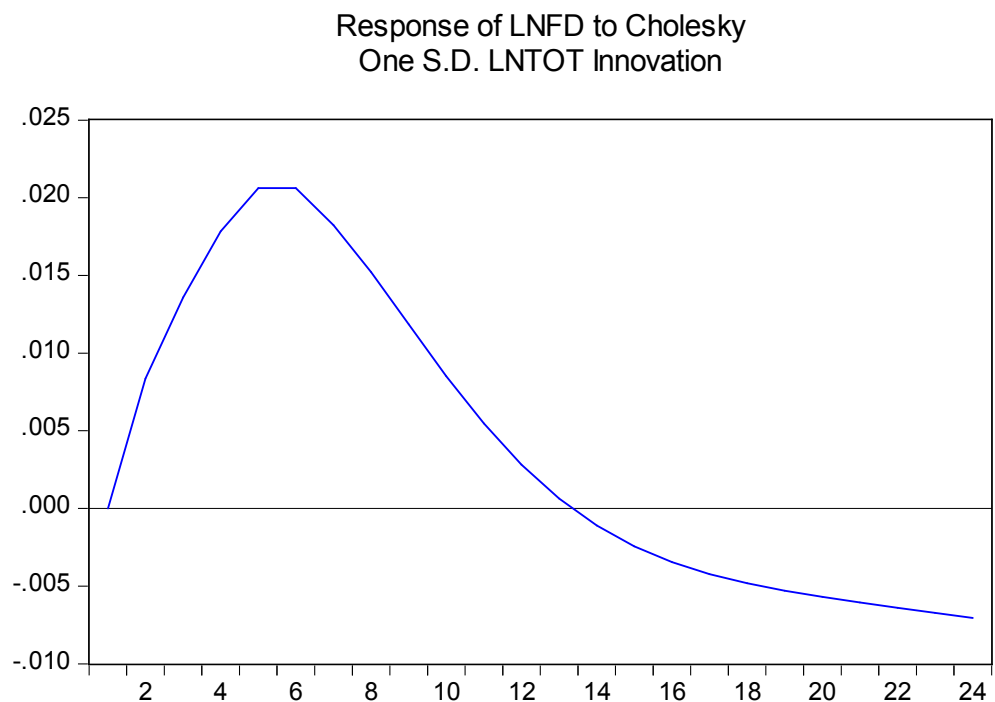
Transmission channels

Response of LNFD to Cholesky
One S.D. LNTOT Innovation

Figure 9: Response of LNFD of Terms of Trade Shock

Source: Computed Using Eviews 9.0 Package

As positive shocks of terms of trade are introduced, fiscal account responds both positively and negatively. It rises faster to the sixth period then falls to the fourteenth period where it balances; it then becomes negative through the

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period. Favourable terms of trade shock increase trade surplus and fiscal account surplus. The falling trend from the sixth period through to the twenty-fourth period implies that rising terms of trade do not guarantee stable fiscal balance for a longer period and could then to be negative fiscal imbalance.
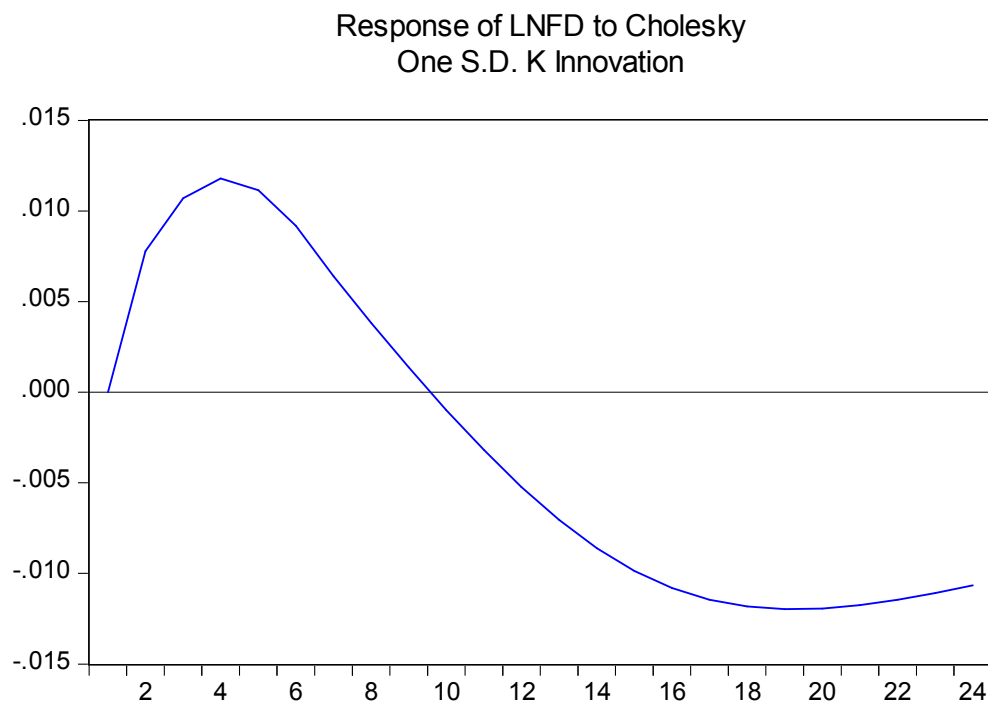
Response of LNFD to Cholesky
One S.D. K Innovation

Figure 10: Response of LNFD of Fixed Capital Formation Shock

Source: Computed Using Eviews 9.0 Package

As positive shocks of investment or gross fixed capitalare introduced, fiscal accounts response positively and negatively. The response by fiscal account is not stable, it rises faster to the fourth period and falls to the tenth period were it balances. The negatively response begins from the period of tenth after the balance through to the latter period. The impact of a positive capital formation shock on fiscal account seems to fluctuate across different periods.

Summary and Conclusion

This chapter targets itself empirically to test the relationship between commodity price shocks and fiscal imbalance in Ghana using the Vector Autoregressive Model (VECM) to explore the long and short run relationship among variables and Bayesian VAR to analyse impulse response. The results disclosed and discussed long run cointegration relationship as well as the short run estimates. The impulse response function was done to explain the impact of shocks in commodity price, terms of trade, investment and the response by fiscal imbalance.

The short run estimates reveal negative and statistically significant in the third and fifth lags of commodity price index on fiscal imbalance in Ghana. Consumer price index, terms of trade, gross fixed capital formation and interest payment of external debt were significant moving from general to specific to obtain the parsimonious relationship.

The long run estimates reveal that commodity price has negative relation with fiscal imbalance. This suggests that the increase in gold and cocoa prices negatively affects fiscal imbalance since government expenditure rise faster than revenue. Consumer price index, gross fixed capital formation, terms of trade and interest payment was significant on fiscal imbalance. The error correction term (-1) for the model was negative (4.4) and significant, indicating a fairly slow recovery statistics.

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The diagnostic and parameter stability tests reveal that the model passes the test of serial correlation,errors are not normal and heteroskedasticity. The graph of CUSUM and CUSUMSQ show the absence of any instability of the coefficient because the plots of these graphs are confined within the 5 percent critical bounds parameter stability suggesting that all coefficients in the estimated VECM model are stable over the study period.

The impulse response function also reveals a positive shock of commodity price on fiscal imbalanceincrease the deficit hence negative fiscal imbalance. With a positive shock of terms of trade and capital stock, it positively affects fiscal imbalance for a while then become negatively. shocks of terms of trade balance in the fourteenth period whiles shocks of capital stock balance in the tenth period by the fiscal imbalance.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter summarizes, concludes and gives policy recommendations derived from the study for the Ghanaian government. The aim is to elaborate on the major findings in the study and thereafter suggest policy recommendations to be considered.

The chapter first summarizes brief overview of the research problem, objective, methodology and findings whereas the conclusions capture the overall outcomes regarding the findings of the study in light of the hypotheses. The chapter then concludes on the major findings of the study before prescribing policy recommendations. The target of the research was to investigate empirically the impact of commodity price shocks on fiscal imbalance in Ghana. The empirical results show that the objectives of the research were met within the period.

Summary

The main objective of this study was to examine the effect of commodity price shocks on fiscal imbalance in Ghana using quarterly time series data from 1990 to 2013. The study investigated the short-run, long-run and causal relationship between commodity price index (gold and cocoa price) with other control variables including consumer price index, terms of trade, gross fixed

capital formation and interest payment on external debt on fiscal imbalance in Ghana.The Johansen cointegration, Vector Error Correction Model (VECM), Bayesian Vector Autoregressive and Impulse Response analysiswere used as estimation techniques.

A brief overview on Ghana was discussed including trends in the variables used and issues of fiscal imbalance and macroeconomic indicators. This section discussed the export commodities of Ghana with focus on gold and cocoa prices and production.

An empirical model was specified based on an extensive review of the literature on the impact of commodity price shocks on fiscal imbalance. The variables included in the model are fiscal imbalance (Overall surplus/deficit, excluding all grants), commodity price index (gold and cocoa price), consumer price index (Overall Index), Net barter terms of trade index (2000 = 100), gross fixed capital formation percentage of GDP, interest payment on external debt percentage of GNI. In order to determine the long and short run effect of commodity price index on fiscal imbalance, the Johansen cointegration and error correction methodology was preferred to other techniques, because of its several advantages over those alternative techniques.

About the methodology, the time series properties of the data were analyzed by employing both informal and formal tests for stationarity. The stationarity properties of the variables were tested using the Augmented-Dickey Fuller (ADF) and Phillips-Perron test statistics. The unit roots results suggest that all the variables were stationary after taking first difference. The study employed

Johansen (1988) approach to cointegration and the Vector Error Correction Model to examine the long-run and short-run dynamics among the variables used in the estimation. The cointegration analysis showed the presence of economically interpretable long-run relationship among fiscal imbalance, commodity price index, consumer price index, terms of trade, gross fixed capital formation and interest payment on external debts.

In the long run, the regression indicates that there is a significant negative effect between commodity price index and fiscal account imbalance. Also in the short run, the result depicts a significant negative relationship for the third, fifth and sixth but was positive in the second lag. Commodity price index is related with the volume of export and Ghana's export volume has decreased due to some challenges facing these sectors, therefore less benefit leading to rising fiscal deficit. In addition, Ghana's major commodities are exportedin raw states and gets price less below its true value. These do not fetch enough foreign revenue to reduce fiscal imbalance. Furthermore, unproductive spending on the part of government spending as well as anticipation of high price of these exports increase fiscal imbalance. It further brings to light the crowding-out effect associated with the increasing trends in government expenditures(Samaké & Spatafora, 2012).

Consumer price index also has negative relationship with fiscal imbalance in the long run. Increase in consumer price index implies inflationary pressures through rising prices of goods and services consumed by household and government. This increases inputs cost, budgeted projects and distorts

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behaviourof economic agent leading to rising deficit. This is consistent with Asiedu (2006) between consumer price index and economic growth which was negative implying reduction in income and rising fiscal imbalance (negative). The short run relationship was significant in the third, fourth, fifth and sixth period lags but showed positive and negative relationship with fiscal imbalance. This is because changes in consumer price index are unstable and exerts fluctuation impact on fiscal imbalance.

The regression also points out a positive and significant relationship between terms of trade and fiscal imbalance both long and short runs. This outcome supports the economic theory that increase in terms of trade increases export earnings and this increases the revenue of a country and reduces negative fiscal imbalance. Further, favourable terms of trade increases trade surplus and with the positive relationship between current account and fiscal account as explained by twin deficit approach fiscal surplus increases.

In the short and the long run, gross fixed capital formation had a positive effect on fiscal imbalance. This was attributed to increase in gross fixed capital formation complementary role to private investment and directly increase domestic income. This implies that if more resources are directed towards domestic investment expenditure, Ghana's economy will experience considerable reduction in fiscal imbalance that is a surplus fiscal balance.

The results again showed that interest payment on external debt has a negative and significant effect on fiscal account balance in the long run and positive relationship in the short run at different time lags. The negative

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relationship is consistent with economic theory that increase in interest payment on debt increases fiscal imbalance. Interest payment distorts government revenue from productive investment to debts servicing. On the other hand, if borrowed funds are used for productive investment, this could raise domestic income and reduce negative fiscal imbalance.

Impulse response was done to ascertain the asymmetric relationship of commodity price shocks on fiscal imbalance. The trend shows that a positive commodity price shock will have negative response by fiscal imbalance in the entire periods. This implies a positive shock in commodity price of primary goods in Ghana negatively affect fiscal account/imbalance. Meanwhile, shocks of terms of trade and capital investment positively affect fiscal outcome in early period, and turns negative.

Conclusion

From the study, commodity price index has negative significant long run on fiscal account in Ghana implying fiscal imbalance. The impulse response also showed positive price shocks negatively affect fiscal imbalance. Thus, the study found out that the research works which argued that increase in commodity price or positive commodity shocks reduce negative fiscal imbalance have to consider the type of commodity in question, the volume of exportsand the expenditure patterns of government. This reemphasizes the significant role of raw major commodities for export, and responsiveness of these raw exports to price, volume available for export and expenditures patterns of government.

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Consumer price index and interest payment exerted a negative relationship on fiscal imbalance in the long run and both positive and negative in the short run at different time lags. This is an indication that these variables are critical in worsening fiscal imbalance because of its distortionary impact on revenue mobilization.

The study also found a positive relationship for terms of trade and gross fixed capital formation on fiscal imbalance in both long run and short run. This was in line with the findings of Aidam and Anaman (2014) that rising fixed capital stock increase domestic income. In addition, favourable terms of trade increase export earnings as well as domestic revenue and hence reduce fiscal imbalance.

Impulse response analysis shows positive shocks in commodity price and response by fiscal imbalance. Positive commodity price shocks negativelyincrease fiscal imbalance. Terms of trade and capital formation shocks positive increase fiscal balance in the short period. However, terms of trade and capital formation shocks could sometimes lead to negative impact on fiscal account.

Recommendations

First, the negative relationship between positive commodity price shocks and fiscal imbalance implies government needs to put in more effort in revenue mobilization since our major commodities such as gold and cocoa, which serve as a source of funding through foreign earning and tax revenue, have lower price to generate significant revenue in undertaking infrastructural development. More

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revenue can be generated by adding value to our major export commodities which fetch higher price and also controlling challenges facing these sectors including illegal mining (galamsey), disease control (cocoa spraying),etc. to increase the volume of exports. This measure is because with an increase in commodity price and the volume of export desired continue to fall,targeted revenue would be less and fiscal imbalance would persist.

In addition, government should promote export diversification for goods and services, which fetch more revenue than few primary commodities. This measure would help the country focus on more commodities for export as well as favourable terms of trade and not rely on few primary goods for export whose prices are highly volatile

Furthermore, despite the significant role of government expenditure in welfare advancements, it has been detrimental to achieving fiscal balance. The analysis indicated that uncontrolled government expenditure would negatively affect fiscal imbalance even if commodity price increase. To enhance fiscal balance there is the need for policy makers to examine its composition. Measures should be tailored towards reducing government's non-essential or unproductive expenditures.

Moreover, the positive relationship between capital stock and fiscal imbalance implies government needs to invest more in productive sectors and introduce policies that would protect and enhance private investments (gross fixed

capital formation). Thus, government needs to create conducive business environment for the private sector to ensure easy access to funds for investment.

Lastly,the study found a positive relationship for consumer price index and interest payment on external debt. This implies government should cut down excessive borrowing with high interest payment and control the rise of inflation (inflation targeting) which distorts achieving a balance budget.

Limitations of the study

Various limitations were encountered in the course of the study. The Johansen approach to cointegration adopted by the study has a major limitation thatis based on Vector Autoregressive methodology. It is inherently over parameterized and sensitive to both model specification and lag length selection. The selected lag length has implications for the outcome of the cointegration, VECM coefficient estimatesand impulse response function. Nonetheless, the cointegration, VECM estimates and impulse response produced consistent results.

Most developing nations including Ghana, has a problem of quality and limited availability of annual data on some key variables used in the study. To produce highly reliable estimates especially with cointegration analysis, long span annual time series data of all the variables were needed. Because of the inadequate annual series, quarterly series were generated through Gandolfo approach for the purpose of estimation. The use of Gandolfo (1981) quarterly series did not pose danger to the reliability of the results because such a general

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model could be disaggregated to sub periods of any desired length without being restricted by any arbitrary assumptions or variable-type.

Lastly, the study could not examine the impact of individual commodity price shocks on fiscal imbalance and disaggregate the effect on revenue and expenditure patterns in Ghana.

Direction for future research

The areas for further research that emerge from this study include covering the gap that has been left by this study by analyzing the individual effects of the various major export commodities and disaggregating the fiscal imbalance into revenue and expenditure patterns data in other to analyze the individual shocks on government revenue and expenditure patterns.

In addition, future research should consider price elasticities of these exports and analyze the effects of value addition of commodity price on fiscal imbalance.

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APPENDIX A

Plots of the Variables (Series) at Levels
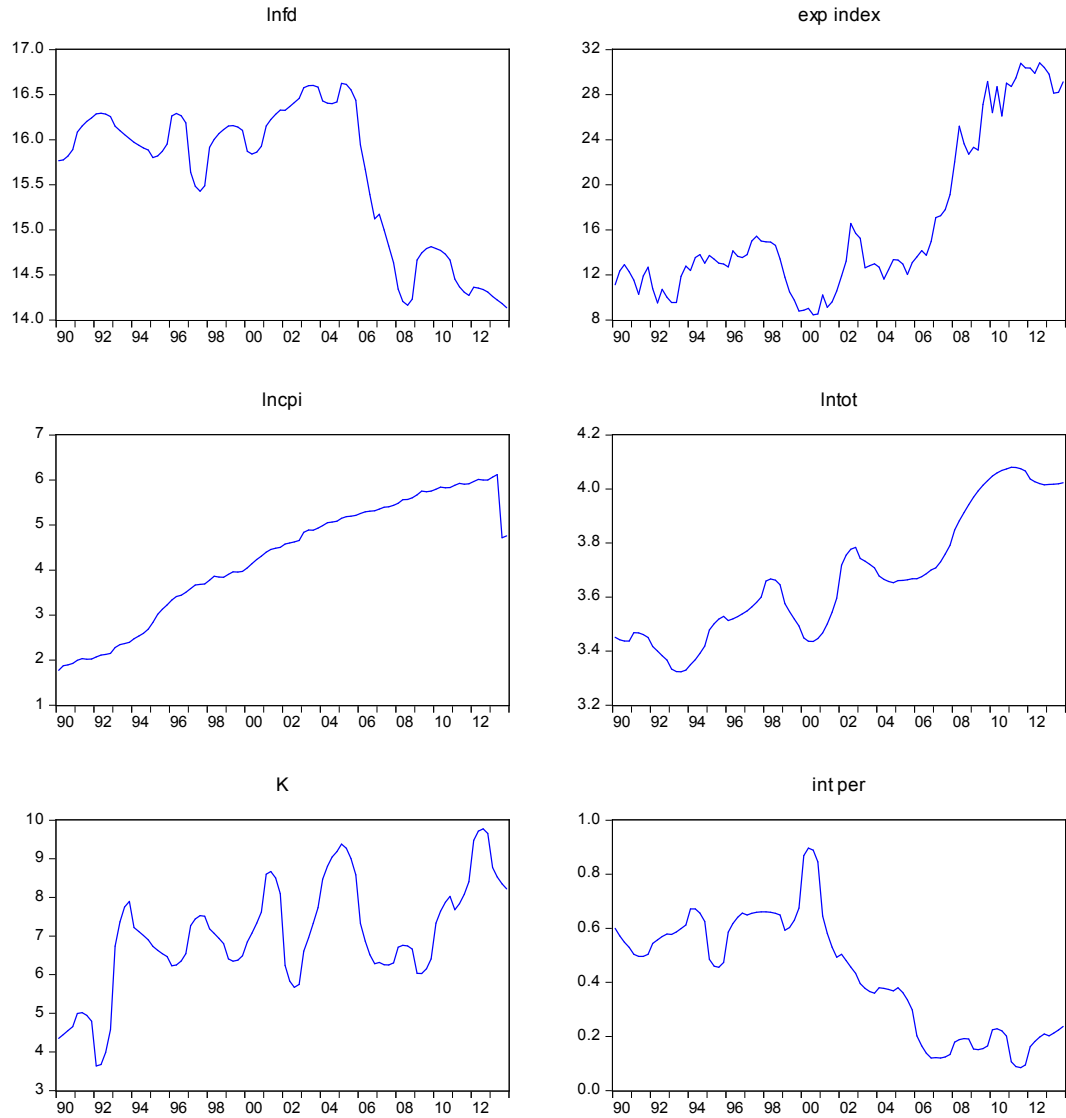
Source: computed using Eviews 9.0 Package

APPENDIX B

Plots of the Variables (Series) at First Difference

Source: computed using Eviews 9.0 Package

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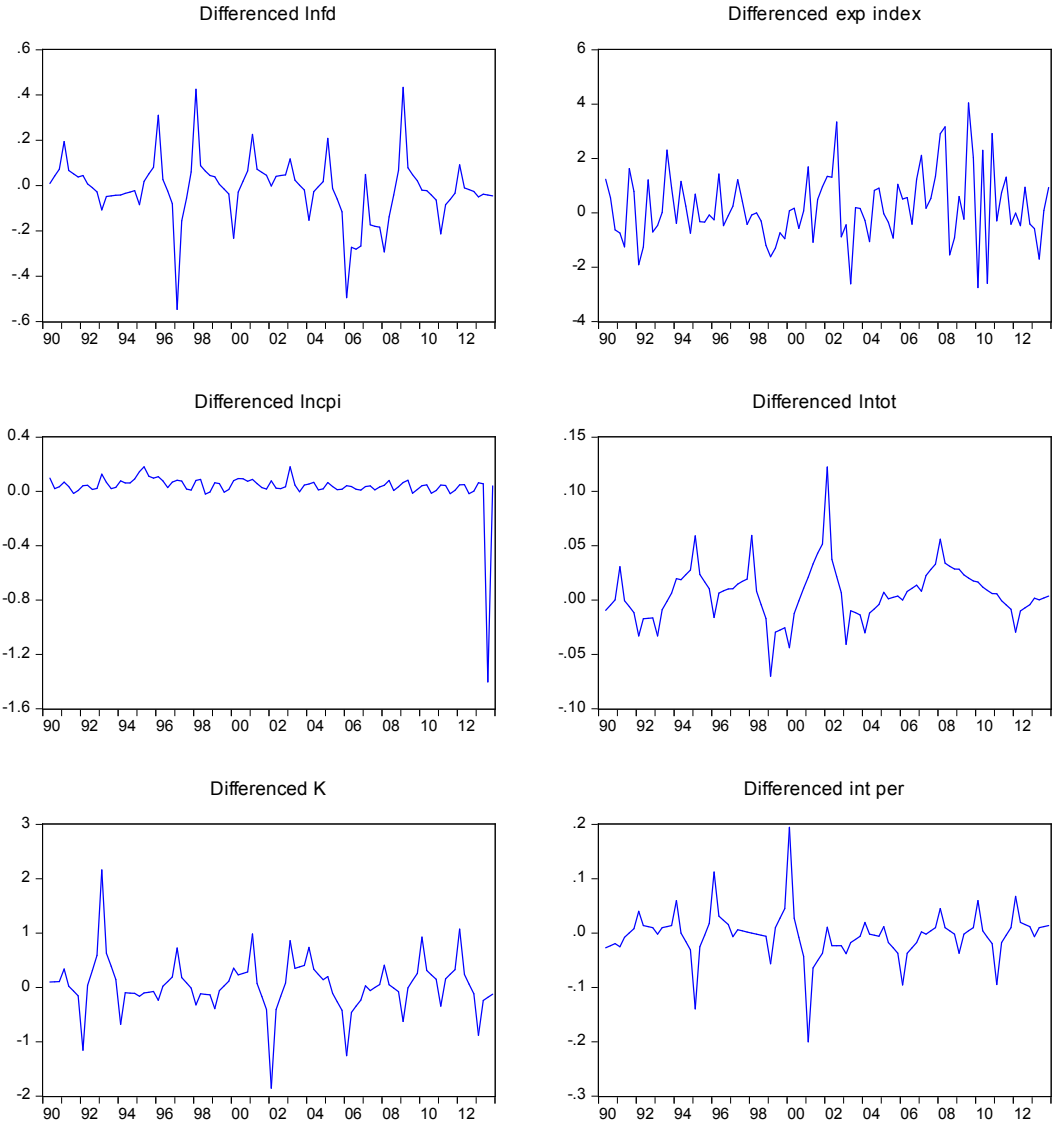
APPENDIX C

Un-Normalized Cointegrating Coefficients

LNFD	EXP_INDEX	LNCPI	LNTOT	K	INT_PER
10.57703	3.146684	12.63006	-106.0022	-4.794603	7.634842
-2.466156	0.326576	3.040330	-41.44736	0.877152	-5.820279
-4.683246	-0.891274	-2.107478	21.54360	-0.173542	-2.235380
1.804685	0.490873	2.345713	-16.61375	-0.902684	10.13851
-4.384510	-1.319956	-2.567012	36.67402	1.019257	-1.311291
2.485246	0.166986	0.748370	-11.42018	-0.130010	-9.094002

Source: computed using Eviews 9.0 Package

Plot of Cumulative Sum (CUSUM) and Cumulative Sum of Squares

Recursive Residuals (CUSUMSQ)
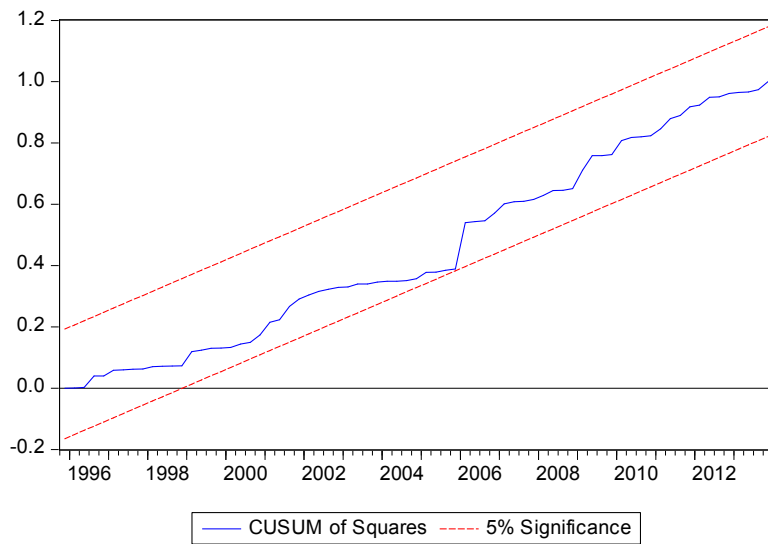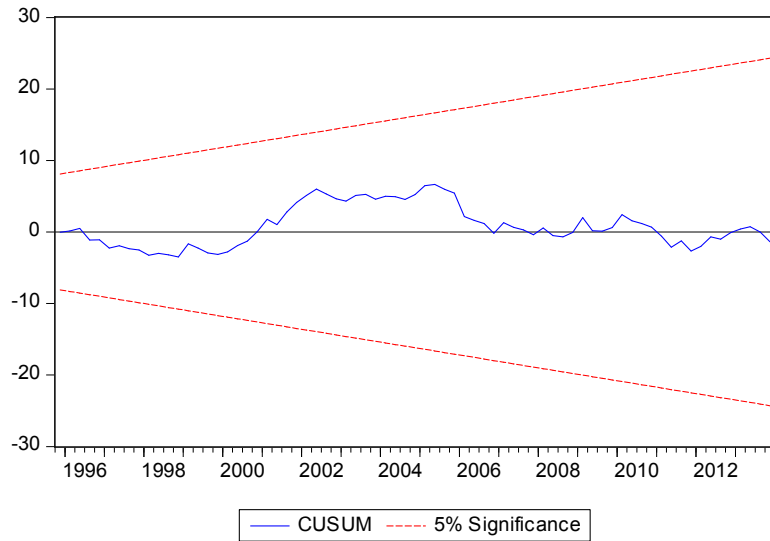
The straight lines represent critical bounds at 5% significance level.
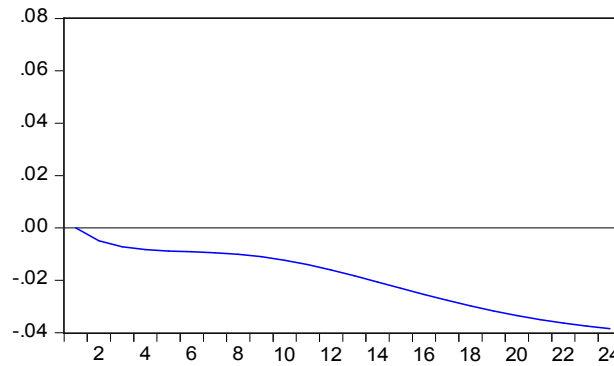
Source: computed using Eviews 9.0 Package

APPENDIX E

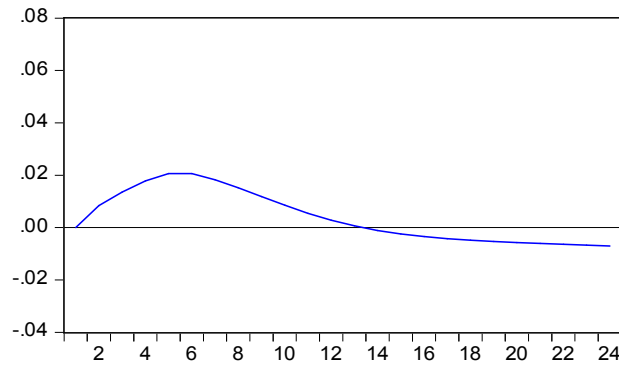## Impulse Response Function: Response of LNFD to Cholesky one S.D

Innovation

Response to Cholesky One S.D. Innovations

Response of LNFD to LNCPI

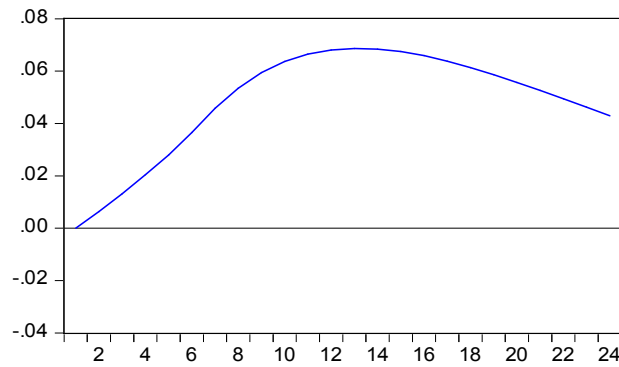### Response of LNFD to LNTOT

Response of LNFD to INT_PER

Source: computed using Eviews 9.0 Package

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