

UNIVERSITY OF CAPE COAST

INTERNATIONAL COMMODITY PRICE SHOCK AND ECONOMIC
GROWTH IN GHANA

BY

CHESTER SYLVESTER ONOMAH

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DECLARATION

Candidate's Declaration

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

Candidate's Signature:..... Date:.....

Name: CHESTER SYLVESTER ONOMAH

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: DR. CAMARA K. OBENG

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

Name: DR. ANOKYE M. ADAM

ABSTRACT

The purpose of this study was to examine the effects of international commodity price shocks on economic growth in Ghana from 1990 to 2016. Time series data were collected on oil price, gold price, cocoa price, capital, labour, inflation, exchange rate and trade openness from the Central Bank of Ghana and the World Development Indicators. The study employed Autoregressive Distributed Lag (ARDL) to examine the relationship between the index of commodity price shock on economic growth in Ghana. The study found that there was a positive significant long-run and short-run relationship between the index of commodity price shock and economic growth in Ghana. The study recommends the need for value addition to the commodities that Ghana exports in its raw state by the constructions of manufacturing companies to transform the raw materials into semi-finished and finished goods.

KEY WORDS

Autoregressive Distributed Lag (ARDL)

Economic growth

International commodity price shock

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DEDICATION

To my friends,

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LIST OF ACRONYMS

ADF	Augmented Dickey-Fuller
AIC	Akaike Information Criterion
ARDL	Autoregressive Distributed Lag
CPI	Consumer Price Index
ER	Real Exchange Rate
K	Gross Capital Formation
L	Total Labour Force
LDC	Least Developing Countries
OP	Trade Openness
PP	Philip-Perron
RGDP	Real Gross Domestic Product
SSA	Sub-Saharan African

CHAPTER ONE

INTRODUCTION

International commodity prices are crucial for both importing and exporting nations, as it is a determinant of how much a country can earn from its exports or from its imports (Hummels, 2007). If the country is an exporter of a commodity whose price has gone up, its export earnings will rise to bring its implications on macroeconomic variables. A fall, on the contrary, comes with adverse implications for the economy. In a similar vein, an importing country will benefit from a fall in the price of the commodity been imported but will suffer when the price of the imported commodity increases. The Ghanaian economy is one of the least developing economies in the Sub-Saharan countries, and they mostly depend on the prices of commodities for its survival because it gets more of its revenue from the exportation and importation of such commodities. Therefore, it is vital to look at the shock or the fluctuations in the prices of the commodities to help come out with strategies to help grow the economy.

Background to the study

International commodity price shock is an essential type of external shock and is regularly referred to as a problem for economic growth in Sub-Saharan Africa countries. According to World Bank (2014), commodity prices internationally, in actual fact, have a significant influence on the economic growth of less developed countries (LDCs). International commodity prices have a direct effect on the production structure in LDCs. LDCs have a more highly

concentrated production structure, which leaves them more vulnerable to sectoral shocks, given that they do not diversify their risk across sectors as much as do rich countries (Koren & Tenreyro, 2007). LDCs also specialize in activities (exporting fuels and minerals) which are inherently more volatile. In addition, LDCs industries face more elastic demand curves, while rich country industries face more inelastic demand curves, so that supply shocks (International Commodity Price fluctuation) lead to more quantity adjustment in LDCs. Kraay and Ventura (2007) provide some clarification for the former occurrence: unskilled-labour-abundant countries tend to concentrate on unskilled-labour intensive sectors using out-of-date technologies. To end with, given that modernization in today's world economy largely takes place in rich skill-abundant countries, first-hand technologies tend to be skill using (Acemoglu & Pischke 1998), and hence LDCs end up specializing in industries which use traditional, low-productivity and slow-changing technologies which may be the reason of inability to bear international commodity prices.

International Commodity prices shock affect long-run growth— a recent analysis of modern Third World economies (North, 2003) informs us that price volatility of this sort is bad for long-run growth. Viewers commonly point to commodity price and terms of trade shocks as a crucial cause of macroeconomic instability in commodity-specialized countries, but, until very recently, they paid far less attention to the long run growth effects of such instability (Acemoglu, 2003). Economists stress the investment channel in looking for connections between commodity price volatility and growth. Indeed, the development works

offer ample up-to-date microeconomic evidence linking income volatility to lower investment in physical capital, human capital and even research and development. Households imperfectly protected from risk change their income-generating activities in the face of income volatility, diversifying towards low-risk alternatives with lower average returns, as sound as to lower levels of investment (Roumasset, 1976, 1979; Rosenweig & Wolpin, 1993; Dercon, 2004; Fafchamps, 2003). Additionally, severe cuts in health and education follow negative income shocks to poor households in the LDCs — scratches that unreasonably affect children and hence long-term human capital accrual (Jensen, 2000; Jacoby & Skoufias, 1997; Thomas, Cameron, Bakkenes, Beaumont, Collingham, & Hughes, 2004).

International commodity prices shock affect economic growth by affecting household in LDCs. In the LDCs poor households find it difficult to smooth their expenses in the face of international price shocks because they are rationed in (or even excluded from) credit and insurance markets, so they lower investment and take fewer risks with what remains. Deprived, small family firms find it problematic to smooth net returns on their assets, so they lower investment and take fewer risks with what remains (Aghion, Bacchetta, Rancière, & Rogoff, 2009). Perhaps most importantly, revenue sources geared to taxes on import and export trade will themselves be volatile. Hence, poor governments whose income sources are mainly customs duties find it hard to borrow at cheap rates locally and internationally, cannot, without serious difficulty, smooth public investment on infrastructure and education in the surface of terms of trade shocks (Coatsworth &

Williamson, 2004; Aghion, Bacchetta, Rancière, & Rogoff, 2009). Lower public investment arises, and growth rates fall. To put it short, theory enlightens us that higher instability in international commodity prices and the terms of trade should decrease investment and growth in the existence of risk aversion.

International commodity prices shock affect investment and potential growth. The leading purpose has been the decrease in commodity prices, although drought in eastern and southern Africa also played apart in reducing agricultural production and creating electricity shortages. Decreasing commodity prices have also reduced capital inflows for investment and increased the risk premium on external sovereign borrowing (Casanova & Garcia-Herrero, 2016) to the magnitude that reduced investment inflows were associated with a decline in imports, there was no variation in the overall balance of payments. The slowing of development in China and the rebalancing of the Chinese economy towards higher domestic demand have reduced not merely the prices of commodities but also China's demand for exports from Africa (which Ghana is included). As a result, the traditional trade surplus of the continent vis-à-vis China, which is now its largest trading partner, has turned into a deficit since 2015, thereby also making a negative contribution to growth (Casanova & Garcia-Herrero, 2016).

International commodity price shock has a consequence on monetary and exchange rate. If managed in an elastic way, the exchange rate can be one of the highest major transmission ways for modifying changes in commodity prices. The modification to lower oil prices has been more challenging for most African oil-exporting countries because they are either members of a currency union (eg

CEMAC), have a de facto pegged exchange rate or allow only a limited depreciation (eg Algeria, Angola, and – up to mid-June – Nigeria) (Gurara, & Ncube, 2013).

International commodity prices also have an effect on government revenue. The Ghanaian Government and some state governments collect significant revenues from the production and sale of commodities. Queensland and Western Australia, who have large endowments of commodities and a state government take their revenues in a form of royalties that are tied directly to the market value of production. For the Ghanaian Government, the revenues mostly take the form of company taxes, royalties and the foreign reserves. Movements in the international commodity prices may also influence capital gains and personal income tax receipts through their effect on the share prices of mining firms and employee wages (Gorajek, & Rees, 2015).

The links to the value of resource production mean that government revenues were boosted as international commodity prices were high and rising, while more recently falling prices have been weighing on government revenues. In 2015, the finance minister of the Republic of Ghana has to go to parliament for approval of supplementary budget because of the drastic fall in commodity prices (oil) which leads to the fall of government revenue according to Gorajek and Rees (2015).

International commodity prices affect Debt. Debt levels are on the rise in Sub-Saharan Africa and, in some cases, rapidly. Consequently, public debt in the region has continued to rise amid large/widened fiscal deficits and weak growth, however, there is wide variation across countries. For the bottom quartile of

countries in the region, general government gross debt is less than 40% of GDP; for the top quartile, it exceeds 60% of GDP (Gilbert & Tabova, 2004). Debt ratios among oil exporters have increased by about 15 percentage points of GDP over the past three years (2014–16), to a median value of 50%. Substantial reliance on primary commodities and difficulties related to low economic growth and foreign debt were stated as a challenge to the Millennium Development goal. The declining trends in “prices and high volatility” of “traditional” export commodities have worsened the poverty in LDCs over the last two decades. An assessment by the IMF and World Bank records the “lower export earnings owing essentially to declining commodity prices” as a primary “causes worsening of the debt indicators in Heavily Indebted Poor Countries” (Gilbert & Tabova, 2004).

International commodity prices also affect infrastructure development of LDCs of which Ghana is a part. Countries that are more dependent on exporting commodities tend to face problems when the price changed. A satisfactory supply of infrastructure services has long been seen as a crucial element for economic development but virtually taken all dimensions of infrastructure performance, Sub-Saharan Africa ranks at the lowest of all developing regions. Also, there are varying trends in the region’s infrastructure performance across key sectors. Countries that highly depend on revenue from the exportation of commodities face a major problem in terms of infrastructure development like good roads, safe water, health facilities, good education etc. In a situation where the international prices fall, revenues that such country will get also fall which makes it difficult to

finance such projects which involves a huge investment. In telecommunications, Sub-Saharan Africa has seen a vivid development in the size and quality of infrastructure, and the advantages are broad-based. In 2015, 77 percent of the population had access to safe water as against 51 percent in 1990. Access to safe water has ascended but inequalities amid rural and urban access rates persist (Calderón, & Servén, 2014).

Nevertheless, the region's electricity-generating capacity has changed little in more than 20 years. Approximately, the Sub-Saharan region has 0.04 megawatts per 1,000 people, a capacity which is less than one-tenth of Latin America and the Caribbean and less than a third of that of South Asia. There is some discrepancy by country, with a slight advancement in electricity-generating capacity per capita in the region's low-income countries (LICs) and lower-middle-income countries (LMCs), but more than a doubling of capacity among upper-middle-income countries (UMCs). Access to electricity is low, at 35 percent of the population, with urban access rates at high, more than that of the rural area by one-third. In addition, transport infrastructure is likewise lagging, with the region registering the lowest road and railroad densities among developing regions. The only region where road compactness has deteriorated over the past 20 years is Sub-Saharan Africa, thus from 1990 to 2011 (Calderón, & Servén, 2014).

International commodity price shock can affect inflation. Commodity prices are argued to be leading indicators of inflation through two basic channels. One is that they respond more quickly to general economic shocks, such as an

increase in demand. Some fluctuations in commodity prices reflect idiosyncratic shocks which are the second channel, such as a flood that reduces the supply of certain agricultural crops, which are consequently passed through to the overall prices. Depending on the type of shock, the perceived linkage between commodity prices and inflation would be anticipated to be different. Moreover, fluctuations over time in the combination of shocks in the economy could disturb the steadiness of a bivariate link between commodity prices and inflation. The toughest situation for commodity prices shock as a determinant of future inflation is that they are rapid to respond to economy-wide shocks to demand. Generally, commodity prices are set in extremely competitive sale markets and subsequently tend to be more elastic than prices overall. As a result, actions in commodity prices would be anticipated to lead and be positively related to changes in aggregate price inflation in response to aggregate demand shocks. In addition, to the extent that demand shocks are not sector- specific, the levels of commodity prices and overall prices also would be linked.

A study by Adamand Tweneboah (2008) used a vector error correction model to found out the long run and short-run relationships between world crude oil price and monetary policy in Ghana for the period 1970:1 to 2006:4. The results of the study indicated that there is a long run relationship between oil price, domestic price level, GDP, exchange rate and interest rate in Ghana in which oil price positively influence the price level while negatively influencing output. The study also revealed that an unanticipated oil price shock is tailed by an increase in inflation rate and a drop in output in Ghana. On the response of

interest rate to a rise in the price of oil, they argued that monetary policy has in the past been with the purpose of reducing any growth significances of oil price shocks but at the cost of higher inflation. However, it failed to control for the effect of the fiscal policy response to changes in the price of crude oil in Ghana.

The economy of Ghana is very vulnerable to rise and fall or the shock in the worldwide commodity prices like crude oil, gold and cocoa. For instance, one of the fundamental challenges in managing an oil economy is how to achieve economic stability in the face of uncertainty and widely fluctuating oil revenues and how to avoid boom-bust cycles. High volatility in world market prices may be transmitted to the economy as external shocks, causing considerable volatility in public revenues and expenditures. If public expenditure policies are pro-cyclical they may result in booms and busts. Increased world market prices with the corresponding increase in government revenues may lead to unsustainable levels of public expenditure that will require a drastic and painful reduction in expenditures when world market prices fall (Center for Policy Analysis, 2010).

Volatility has a negative effect on growth and the positive effects of resource booms can be short-lived with negative long-run effects. Volatility can be detrimental to growth in several ways. Volatility in world market prices and government revenues impact macroeconomic instability in the economy, raising risks and reducing the risk-adjusted profitability of investment. This will discourage both domestic and foreign investment and encourage speculative activities. Also as in Collier (2007), booms may give crisis, with public spending decisions becoming compromised with grandiose projects during booms that

require drastic cuts in expenditures during troughs. Indeed, the slower than average growth of commodity-exporting less developed countries may be due to their higher incidence of economic crashes (Takizawa, Gardner, & Ueda, 2004).

Some other studies have also examined the effects of oil price changes on the macroeconomy of developing countries. Raguindin and Reyes (2005) studied the effects of oil price shocks from the year 1981 to the year 2003 on the Philippine economy. Their result showed that oil price shock leads to a prolonged reduction in the real GDP of the Philippines using impulse response functions for the symmetric transformation of oil price shocks. Conversely, oil price decreases play a greater role in each variable's fluctuations than oil price increases in their asymmetric VAR model. El-Anashasy (2006) investigated the effects of oil price shocks on Venezuela's economic performance from 1950 to 2001 by employing a general to specific modelling (VAR and VECM). He found two long-run relations consistent with economic growth and fiscal balance. Furthermore, he found that this relationship is important not only for the long run performance but also for short-term fluctuations. Olomola and Adejumo (2006) used VAR to examine the effects of oil price shocks on output, inflation, real exchange rate and money supply in Nigeria. Using the VAR methodology they found that oil price shocks do not have any substantial effect on output and inflation. Oil price shocks significantly determine the real exchange rate and significantly affect the money supply in the long run.

The Ghanaian economy suffered its worst growth performance for about a decade in 2000 when real GDP growth slumped to 3.7 per cent. The 2000

performance continued four successive years of economic decline. The poor performance in 2000 was attributed to terms of trade deterioration as the prices of the country's main export earners — gold and cocoa — fell, while the price of crude oil — the nation's main import commodity rose rapidly. These developments led to a severe drop in foreign exchange earnings. Poor domestic economic performance that created fiscal imbalances and excessive monetary growth compounded the external problems led to substantial reductions in production and consumption. Real GDP growth was projected at 5.8 percent in 2001 and 5.3 per cent in 2002 as the impact of the external shock was lessened with improvements in export performance, and political changes brought about some positive changes in economic policy. The recent growth performance has been led by the services sector, while the growth performance of the dominant sector — agriculture — has stagnated with telling effect on total income growth. The agricultural sector contributed about 36 per cent of total GDP and grew at a lower rate of 2.1 per cent in 2000 compared with 3.9 per cent in 1999 and 5.1 per cent in 1998. The growth performance in 2000 was the lowest since 1995. The poor performance of agriculture in 2000 was caused by the crops and livestock sub-sectors, which grew at only 1.1 per cent compared with 4.7 per cent in the previous year. The performance of all the other sub-sectors — forestry, logging and fisheries — was better in 2000 than in the previous year.

Growth in the mining and quarrying sub-sector at 1.5 per cent in 2000 was dismal compared with 2.9 percent in 1999. The poor performance was attributed to declines in gold production of about 9 per cent in 2000 compared with a 9 per

cent gain in 1999. The production shortfall reflected the labour and financial troubles at Ashanti Goldfield that were played out from 1999. The industry sources at home indicated also that the legal and investment framework with respect to mineral rights was a limiting factor to increased production. In addition the failure of the gold price on the international market to recover translated into shrinking profitability.

Statement of the Problem

International commodity price shock is a current phenomenon that affects economies especially the economies of the Less Developed Countries—which Ghana is included (World Bank, 2014). In Ghana for instance, when there is an increase or decrease in international commodity price, sectors like the mining sector, agricultural sector, and energy sector are affected either positively or negatively (Hummels, 2007).

From January to September 2014, Ghana made \$2.9 billion from oil revenues. However, for the same period in 2015, the oil revenue drop almost halved to \$1.5 as made between January to September 2015. Ghana's cocoa export revenues for the period from January to September 2015 was \$1.9 billion – a repetition of what the country made the same period a year earlier in 2014. Ghana made \$3.4 billion from gold exports from January to September 2014. The gains made within the same period in 2015 fell short by \$1 billion to \$2.4 billion and is expected to plummet further. Total export revenues for these three major commodities amounted to \$8.2 billion for the period between January and

September 2014. This reduced by \$2.4 billion to \$5.8 billion for the same period in 2015 and it is expected to fall further this year. (Matthews, 2016).

For example, when there is a decrease in the international price of cocoa, the foreign reserves of the government reduces.

Also, In Ghana, revenue from oil accounted for 22% of the total export revenue, but cocoa, gold and oil together accounted for about 80% of the export revenue (Institute of Fiscal Policy, 2015). There has been also an extensive debate over the implications of developing countries dependence on commodity exports for growth, with recent arguments about the implications of commodity price changes on macroeconomic variables. It is worth stating that Ghana started commercial drilling of crude oil from the Jubilee field in December 2010 with an oil reserve estimated to be around one billion barrels (Institute Fiscal Studies, 2015). With this, the study constructed an index for the commodities. This is because, in Ghana cocoa, gold and oil are the major important exporting commodities that give more revenue to develop the economy in terms of foreign exchange earnings hence the topic, “International commodity price shock and economic growth in Ghana.”

Purpose of the Study

The main purpose of this study is to examine the effects of an international commodity price shock on economic growth in Ghana.

Research Objectives

The researcher intends to achieve the following research objectives at the end of the whole process:

1. To carry out trend analysis of commodity prices shock and economic growth in Ghana.
2. To examine the short-run effect of commodity price shocks on economic growth in Ghana.
3. To examine the long-run effect of commodity price shocks on economic growth in Ghana.

Research Question

1. Is there any trend between commodity price shock and economic growth?

Research Hypotheses

1. **H₁**. There is a significant long-run relationship between commodity price shock and economic growth.
2. **H₂**. There is a significant short-run relationship between commodity price shock and economic growth.

Significance of the Study

This research area was chosen due to the restricted amount of work done in recent times on the Ghanaian economy. In Ghana almost every year the budget

suffers from deficits because of the revenue the economy gets from exporting commodities suffer from price shock or changes and also about 80% of export revenue comes from oil, gold and cocoa. So, this study would help policymakers to formulate the appropriate strategies towards the future preparation of the budget.

For the professionals and academia, the study would serve as a strong foundation or a reference material for further research into how international commodity price shocks affect the economy or similar work on this area and also contribute enormously in building up academic and professional knowledge in the economy of Ghana.

Also, Investors can use the results of this study to spread their portfolio by capitalizing on international commodities price shocks. A study found that a portfolio of stocks and commodities can yield greater returns and lesser risk than stock only (Erb & Harvey, 2006). More specifically, Arouri and Nguyen (2010), show that adding oil asset into a diversified portfolio of stocks significantly improve its risk-return feature.

Delimitations

This study deals with the effect of international commodity price shocks on economic growth. The research is to find the possible effect of this problem and try or attempt to suggest possible solutions. Although there are many international commodity price shocks in Ghana, this study will restrict itself to

only three (3) international commodity price shock namely; oil price shock, gold price shock and cocoa price shock.

Limitation of the Study

The study used the changes in prices of cocoa, oil, and gold to find the index of international commodity price shock. The study did not consider other changes in the prices of other commodities.

Definition of Terms

International commodity price shock is defined as the fluctuations or the changes in commodity prices at a given point in time.

Economic growth is “a gradual and steady change in the long run which comes by a gradual increase in the rate of saving and population” (Schumpeter, 1932). Economic growth is how much more the economy produces than it did in the prior period. It is also defined as the change in the capacity of an economy to produce goods and services, compared from one period of time to another.

Organization of the Study

This study is organized into five (5) chapters:

Chapter one contains the introduction which consists of the background to the study, statement of the problem, the purpose of the study, research objectives, research hypotheses, significance of the study, delimitations, limitations, definition of terms and the organization of the study.

Chapter two examines among other things, relevant literature from works that have been done already on this topic. The literature review was organized in the following ways: introduction, an overview of the economy of Ghana, a theoretical framework or review and then an empirical review of related literature.

Chapter three presents the research methods which comprises an introduction, the research design used, theoretical model, and empirical model, description of the variables, data and sources of data, estimation protocol and the chapter summary.

Chapter four constitutes results and discussion based on the research question and the hypotheses and finally, chapter five gives a general overview of the research study, the research method used, summary of the key findings, conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This study seeks to examine the effect of international commodity price shock on economic growth using oil, cocoa and gold prices to measure international commodity price shock. This chapter presents theories that are related to commodity price shock and economic growth. This section addresses the overview of the Ghanaian economy. The chapter also reviews a number of issues in the literature that pertains to oil price shock, gold price shock and cocoa price shock and their effects on economic growth.

Overview of the Economy of Ghana

In the year 2007, Ghana discovered crude oil in commercial quantities but its actual production started in December 2010, with production per day of 55,000 barrels. In 2011, which was a year later after the production; the structure of the economy improved vividly as the commercial production of oil led to significant GDP growth of 14.0 percent, making Ghana the highest growing economy in sub-Saharan Africa (Aryeetey, & Asmah, 2011). Overall real GDP grew at an estimated 7.8 percent in the first half of 2017 (6.6% in quarter one and 9.0% in quarter two) against 2.7 percent in the same period in 2016. Overall GDP growth is provisionally estimated at 7.9 percent at the end of 2017, up from the original forecast of 6.3 percent; Non-Oil real GDP grew at an estimated 4.0 percent in the

first half year of 2017 (4.0% in quarter one and 3.9% in quarter two) compared to 5.9 percent in the same period in 2016. The non-oil GDP growth is provisionally estimated at 4.8 percent at the end of 2017 (Ghana Budget, 2018).

Before long, about 103,000 barrels were produced in Ghana per day, and production is expected to more than double to 250,000 barrels per day by the year 2021 as output rises at the Jubilee field and other sites start production. Ghana as a nation also imports both crude oil and refined ones for domestic consumption since its own crude oil cannot be refined locally at the moment due to some technical reasons. Oil is therefore not only an export commodity for the country but also a major import commodity, which requires a careful look at the price swings of such commodity. Since 2011, Ghana has been getting oil revenues which may endure for the next 20 years and beyond.

According to IFS (2015), crude oil exportation in Ghana increased from US\$2.8 billion in 2011 to US\$3.9 billion in 2013 but fell to US\$3.7 billion in 2014. Similarly, total revenue from oil to the government which (include carried and participating interest, royalties, surface rentals and taxes) increased from US\$444.1 million (16.0 percent of total oil exports receipts) to US\$978.8 million (26.3 percent of total oil exports receipts) over the period. When crude oil began to be exported in 2011, it added to cocoa and gold as a major export commodity of Ghana, which coming together accounted for more than 80 percent of the country's total export revenue. Having lagged behind gold and cocoa in 2011, oil became the second biggest export revenue earner from 2012, it contributed 22 percent of the country's total export revenue (Institute of Fiscal Policy, 2015).

However, in 2013, Ghana became a net exporter of oil, exporting US\$3.9 billion worth of crude oil and importing US\$3.4 billion of crude and refined oil products. It is imperative to point out that this came in spite of the fact that the country has gradually relied on imports of refined oil products which cost a lot more than crude oil because of value addition. Not only that but also the country has been importing crude oil at significantly higher prices than it exports in each year since 2011. For the government to ensure that the country was well placed and effectively ready to succeed the new oil boom, prepared and placed before Parliament, a Petroleum Revenue Management Bill, a month before the first oil production in commercial quantities came on stream in December 2010. On April 11, 2011, the Bill was passed into law giving birth to the Petroleum Revenue Management Act (PRMA), 2011 (Act 815). The Act provides for a portion of the oil revenue to be used for budget support, designated the Annual Budget Funding Amount (ABFA) and portions for Petroleum Funds (comprising the Stabilization Fund and a Heritage Fund). The main objective of the Ghana Stabilization Fund (GSF) is to sustain public spending capacity during periods of unexpected oil revenue shortfalls while the Ghana Heritage Fund (GHF) is an endowment for the benefit of future generation (Kopiński, Polus, & Tycholiz, 2013).

Oil prices have declined significantly, after experiencing large swings in the second quarter of 2015. The decline is on account of strong supply from members of the Organization of Petroleum Exporting Countries (OPEC) and the Islamic Republic of Iran's nuclear deal. In June 2015, crude oil prices reached US\$59.82 a barrel and in September 2015, it fell further to US\$42.46 a barrel

compared to Ghana's annual benchmark revenue projection of US\$99.38 a barrel for 2015, which was revised to US\$57.00 per barrel in the mid-year review of the 2015 Budget (Ghana Budget, 2015).

The mineral potential in Ghana and the country's contribution to worldwide minerals output, particularly gold is well recognized. The mining sector is an important section of the Ghanaian economy and has played a substantial role in the country's socio-economic growth since the colonial period. The country was at one stage, a primary producer of gold in the world and accounted for about 35.5 % of total world gold output between 1493 and 1600(Akabzaa & Darimani, 2001). However, the country's share of world gold output has since declined over the subsequent years. Ghana is currently ranked around tenth in the global association of major gold producers but in Africa, it still ranks second largest gold producer after South Africa.

The country is knowingly endowed with varied other mineral resources including manganese, diamond and bauxite that are presently under commercial exploitation. Silver is produced as a by-product from gold mines while aluminium is produced from an imported alumina. Ghana also has large portfolios of iron, limestone, salt, and numerous other industrial minerals. Gold, however, is by far one of the most important minerals currently being exploited. Gold accounted for, on the average, 90% of the total value of minerals won (Akabzaa, 2009).

The mining industry, on the whole, accounts for over 50% of foreign direct investment flows into the national economy since the commencement of reforms under the Economic Recovery Programme (ERP) in 1983. Statistics on

the mining sector's contribution to the national economy vary from year to year because of the shocks in their prices. On average, it accounts for about a third of gross foreign exchange and about 5 percent of the gross domestic product. Its contribution to government tax revenue is around 4%, while its contribution to labour employment is about 0.7% of the working-age population (UNCTAD, 2005).

Records available revealed that Dutch missionaries implanted cocoa in the coastline areas of Ghana as early as 1815, and in 1857 Basel missionaries also implanted cocoa at Aburi. However, this did not end in the spread of cocoa farming until Tetteh Quarshie, who journeyed to Fernando Po and worked there as a blacksmith, returned in 1879 with Amelonado cocoa pods and started a farm at Mampong (Akwapim). Farmers bought pods from his farm to plant and farming spread from the Akwapim zone to other portions of the Eastern Region. Sir William Brandford Griffith, the Governor in 1886, also organized for cocoa pods to be transported in from Sao Tome, from which seedlings were raised at Aburi Botanical Garden and distributed to farmers. Cocoa is one of the backbone of Ghana's economy which accounted for 36% of GDP in 2001. Cocoa is considered to be the highest export crop earner for Ghana accounting for 8.2 percent of the country's GDP and 30 percent of total export earnings in 2010. Throughout the world, the standards against which all cocoa is measured are those of Ghana cocoa. This makes Ghana an important player in the cocoa sector in the world (Okyere, & Mensah, 2016).

The utmost vital variables in explaining cocoa exports are the producer price of cocoa and the level of economic activity in the country or the farming sector-cocoa for that matter. Between the year 1970-71 and 1980-81, the cocoa sector experienced a divergence in the growth rates of output. This was mainly due to the differences in the movements of real producer prices. Real producer prices affected the profitability of production and are the main determinant of output growth. As formerly integrated monopolies for the production and exportation of commodities such as cotton, cocoa, and coffee are being privatized in many Sub-Saharan African countries, the question of the mechanism used to set producer prices is on the agenda has become very crucial. Additionally, structural rigidities in agriculture remain intractable largely because of the predominance of subsistence farming. Cash crops are subject to prohibitively high transaction costs, as evidenced by large differentials between producer and consumer prices, arising from monopolistic and inadequate distribution systems.

Economic growth is mostly defined as an increase in the production of goods and services in an economy at a given period, particularly over a long period. Again, it can also be defined as “a gradual and steady change in the long run which comes by a gradual increase in the rate of saving and population”. Sub-Saharan Africa has experienced some significant level of real GDP per capita growth of 5.7 percent on average within the period of 1998 to 2008 whilst from the period of 1988 to 1998 recorded an average of 3.7 percent. Also, WEO (2009) recorded that Sub-Saharan Africa’s real GDP growth declined by almost 1.7 percentage from 2007 to 2008 thus 6.21% to 5.17%. However, the evidence has

shown that Sub-Saharan Africa's growth performance in the past has been predominated by tremendous growth performance of commodity-exporting countries in the region who took advantage of the increasing global demand and prices.

Ghana's real GDP growth is set to drop significantly as a fiscal adjustment in response to the oil shock which dampens economic activity. The projection is that real GDP growth will drop to 3.5 percent in 2015 from 4.0 percent in 2014 and 7.3 percent in 2013 before recovering over the medium term. The lowered prospects for real GDP growth will act as a disincentive for private investment and weaken the country's capacity to diversify away from oil-related sectors. This will reinforce the direct effect of lower investment in the oil sector stemming from the continuously depressed oil prices as well as the impact of the exchange rate depreciation on private sector balance sheets, and hence on investment.

There has been considerable debate over the implications of developing countries dependence on commodity exports for growth, with recent arguments about the implications of commodity price changes on macroeconomic variables. Despite growing concerns, little attention has been paid to the effects of international commodity price shocks and their dynamics in developing economies, particularly, given that middle-income economies may be prone to instability in international commodity prices due to the nature of their exports (Addison & Ghoshray, 2013). One of the key fears facing developing economies is the implications of their dependence on commodities and the implications of price changes.

Theoretical Review

The study uses the later theories; Linear/ symmetric relationship theory of growth, Asymmetry - in - effect theory of economic growth, and Renaissance growth theory as the theoretical framework.

Linear / symmetric relationship theory of growth

This theory attempts to explain the link through which commodity price shocks have on economic growth. Contributors to this theory are Hamilton (1983) and Gisser and Goodwin (1985). This theory posits that fluctuation in GNP is occasioned by frequent fluctuation in commodity prices. Hooker (as cited in Oriakhi, & Osaze 2013) after rigorous empirical studies demonstrated that between 1948 and 1972, the change in oil price exerted an immense impact on the GDP growth rate. Based on Hooker (2002), this study uses linear relationship theory to find how commodity price shocks affect economic growth.

Similar to the Linear / symmetric relationship theory of growth is the Asymmetry-in-effects theory of economic growth. This theory used the U.S economy as a case study. The theory posits that the correlation between crude oil price decreases and economic activities in the U.S economy is significantly different and perhaps zero. Mark, Olsen and Mysisen (1994), in a study of some African countries, established the asymmetry in the effect of oil price volatility on economic growth. Ferderer (1996) described the asymmetric mechanism between the influence of oil price volatility and economic growth by concentrating on three possible ways: Counter-inflationary monetary policy, sectoral shocks and

uncertainty. He concludes that there is a significant relationship between oil price increases and counter-inflationary policy responses. Balke (1996) supports Federer's position/submission. He posited that monetary policy alone cannot sufficiently explain real effects of oil price volatility on real GDP. So, therefore, this study will use this theory to study the effect of commodity price shocks on economic growth since oil is a commodity.

Renaissance growth theory

The Renaissance growth theory/model was an off-shoot of the symmetric and asymmetry in effect schools. Lee, Ni and Ratti (1995) who was a prominent advocate of this school concentrated her theoretical work on trying to distinguish between oil price changes and oil price levels. Lee et al (1995) defined volatility as the standard deviation in a given period. She succumbed that both variables have a negative impact on economic growth, but in diverse ways: Volatility has a negative and significant impact on economic growth immediately, while the impact of oil price changes delays until after a year. She concludes by testifying that, it is volatility/change in crude oil prices rather than the oil price level that has a significant effect on economic growth.

Champions of the aforementioned theories agreed to the fact that a relationship exists between crude oil prices and economic growth in both the developed and developing economies. Although, the effects have been proven with empirical evidence to be different even among these nations. In a similar way, both the exporting and importing countries experience the effect of changes in oil prices in diverse ways, subject to the internal mechanism for stabilization.

This research is hence based on the Renaissance growth model of economic growth. The choice of this theory is informed by the close relationship it bears with the subject matter of this study. For it specifies a link between changes in commodity prices and its impact on economic growth which this study seeks to investigate. In addition, the theory was advanced from symmetric and asymmetry in effect theories and this approves its supremacy over the two theories. Base on this, the study will use this theory to help investigate the problem under study.

Empirical Review

Commodity price shock and economic growth

Commodity price shock tends to destabilize economic performance. From the pivotal work of Deaton and Miller (1995), and Deaton (1999) show that a decline in commodity prices led to lower economic growth in 35 Sub-Saharan African commodity exporters. This was also confirmed by a study conducted by Dehn (2000) which found that per capita growth rates were significantly reduced by large negative commodity price shocks in 113 developing countries over the period 1957-1997. The author also hinted that ex-ante price uncertainty does not affect growth, but what matters most for growth is the actual understanding of negative shocks, not the view of volatile world prices. Also, Bruckner and Ciccone (2010) in their study found that there is a negative association between commodity price shock and GDP growth in 39 Sub-Saharan African countries during the period 1980-2006.

According to Arezki and Gylfason (2001) in their work titled the impact of commodity price volatility on economic growth using a panel data from 158 countries during the period 1970-2007 using a new data set on non-resource GDP which dodge the “noise” presented by the resource sector’s impact to overall GDP. The authors found that increased commodity price volatility leads to a significant increase in non-resource GDP growth in democracies, but has no significant effect on growth in autocracies. This was consistent with the work of Azizi (2004) who analyzed the relationship between rising prices, come back and Inventory cost catalogue in Iran, using econometric methods. The researcher's results indicate that rising prices describes money come back catalogue and complete come back (price and cash) but it does not describe the stock cost catalogue. On the other hand, money profits, complete profits (price and cash) and stock cost catalogue do not describe rising prices. Similar work by Collier and Goderis (2007) also examined the relationship between commodity prices and growth in selected African countries using VAR. The basic result of their work depicted that increases in commodity prices significantly raises the growth of primary commodity exporters.

Again, Lopez-Murphy and Villafuerte (2010) show that countries’ responses to the 2009 drop in commodity prices demonstrated pro-cyclical fiscal policies, with many of the fiscal adjustment coming from a fall in current expenditures. Deaton and Miller (1995) also constructed for each sub-Saharan African country, a country-specific index of commodity prices that weighted together with the world prices of the commodities that each country exports, using

common prices but fixed individual country weights, deflated by a (common) index of prices of manufactured imports to examine the relationship between commodity prices and growth in Africa. The authors used vector auto regressions augmented by the price indexes to examine the relationship between GDP, its components and commodity price fluctuations. This statistic used national income information from the Penn World Tables and covered the era from 1981 to 1986. An essential feature of their analysis is the modifying of the price indexes to each country. Furthermore, Deaton and Miller (1996) found that in the short run, when commodity prices increase they have a positive impact on economic growth in African countries in comparison to a commodity price decreases. However, Collier and Gunning (1999) also revealed that payouts from commodity price shocks do not describe the sustainable increases in income. Evidence for Sub-Saharan African (Dehn, 2000) points to possible asymmetry; where price booms are less likely to have a lasting effect on economic growth than price slumps because windfall profits associated with booms tend to be consumed rather than invested; whereas slumps may force farmers to disinvest.

Many studies allow for multiplier effects through forward and backward linkages but typically neglect that these effects may be confined to specific regions due to limited spatial integration. Varangis, Varma, delay, and Nehru (2004) echo the importance of distinguishing positive and negative shocks. They argue that the effect of external shocks on economic growth is asymmetric and the reason that positive shocks do not offset negative ones partly because negative shocks have irreversible effects. In a related study, Collier and Goderis (2012)

find that in the short run, commodity booms have positive effects on output; however, in the long run, the effect on output largely depends on the type of commodity and the quality of governance in such country.

Empirically, countries have shown to respond differently to the same shocks because of the differences in their economic, structural and political set up (Akinleye & Ekpo, 2013). For instance, countries that export purely agricultural commodities may respond differently to those that export non-agricultural crops when faced with the same type of shock because the supply of factors of production for countries that rely on imported intermediate inputs such as agricultural commodities can be greatly affected by natural disasters because unlike oil, these commodities are perishable. A bad harvest which reduces the supply of agricultural products would lead to a rise in prices which may persist to clear the market. Since African economies export a large percentage of primary commodities, fluctuations in prices of primary commodities entail the vulnerability of their fragile economies, which can only be captured by carrying out case studies in those countries.

Oil price shock

Following the oil price shocks of 1973, most macro researchers focused their attention on the economy's response to sudden and permanent decreases in the price of oil and the subsequent adjustment to the shock in developed economies; (Peersman & Van Robays; 2009; Kilian & Park; 2009).

A work done by Boheman and Maxén (2015) using vector autoregressive models (VARs),” reported that a 1% increase in the oil price will increase the GDP growth rate the following year by 0.145% (OPEC) versus 0.141% (non-OPEC). They again reported that there is a positive relationship between oil price shocks and economic growth. Also, they found that 2.82% of the variation in the OPEC countries’ growth rate is explained by oil price shocks, while the responding ratio for the non-OPEC countries is 2.81%. They further reported that OPEC and non-OPEC oil exporting countries’ economic growth showed nearly identical responses to oil price shocks. Therefore, they concluded that the price setters, OPEC, appear to be just as sensitive to oil price shocks as non-OPEC countries. Again, El-Sharif, Brown, Burton, Nixon and Russell (2005) sought to investigate the relationship between the price of crude oil and equity values in the oil and gas sector using data relating to the United Kingdom. The findings show that the relationship is always positive. They found that the relationship is often highly significant and it connotes a direct impact of volatility in the price of crude oil on shared values.

Papapetrou (2001) also employed a multivariate vector-autoregression (VAR) method to examine the dynamic relationship between oil prices and real stock prices for Greece. The results suggest that oil prices are important in explaining stock price movements. Miller and Ratti (2009) analyzed the long-run relationship between the world price of crude oil and international stock markets. They established that stock market indices respond negatively to increases in oil price in the long run in six (6) OECD countries. Some works showed positive

relationships while others showed a negative relationship. This means that there is no specific consensus on the relationship between oil price shocks and economic growth.

As for developing countries, fewer empirical studies exist. Olomola and Adejumo (2006) using quarterly data from 1970 to 2003 examined the effects of oil price shocks on output, inflation, real exchange rate and money supply in Nigeria. They used the VAR method and found that oil price shocks do not have any substantial effect on output and inflation. Oil price shocks only significantly determine the real exchange rate and in the long run money supply. Olomola and Adejumo conclude that this may crowd the tradable sector, giving rise to the "Dutch Disease". Also, Iwayemi and Fowowe (2011) found that shocks to oil prices result in volatile macroeconomic variables in Nigeria and a rise in oil prices provide more foreign exchange earnings and lead to increased government revenue.

Raguindin and Reyes (2005) used data from the period of 1981 to 2003 to examine the effects of oil price shocks on the Philippine economy. Their impulse response functions for the linear transformation of oil prices show that an oil price shock leads to a continued reduction in the real GDP of the Philippines. Equally, in the non-linear VAR model, oil price falls play a bigger role in each variable's fluctuations than oil price increases. Berument, Ceylan and Dogan (2010) use GDP figures ranging from 1952-2005 to examine how oil price shocks affect the output growth in some net-exporting and net-importing countries in the Middle Eastern and North African (MENA) region. The study suggests that oil price

shocks have a considerably positive effect on the outputs of Algeria, Iran, Iraq, Kuwait, Libya, Oman, Qatar, Syria and the United Arab Emirates, of which many are OPEC countries, except Oman and Syria. Meanwhile, oil-price shocks showed no impact on the outputs of Bahrain, Djibouti, Egypt, Israel, Jordan, Morocco and Tunisia, all of which are net-importers. They also acknowledged the existence of an asymmetrical relationship between GDP and oil price. Similar results were also presented by Déés, Karadeloglou, Kaufmann and Sánchez (2007).

Furthermore, Mehrara and Oskoui (as cited in Boheman & Maxén, 2015) examined output fluctuations in Iran, Kuwait, Indonesia and Saudi Arabia (all OPEC members at the time), and aimed to conclude about the driving forces behind output fluctuations. Four structural shocks were identified by imposing long-run restrictions on a VAR-model. Thus, nominal demand, real demand, supply, and, oil price shock. The oil price shock was recognized as the main driving force behind fluctuations in GDP in Saudi Arabia and Iran, while supply shocks had the biggest impact in Kuwait and Indonesia. The authors believe Kuwait's well-managed savings fund and Indonesia's limited resource-based production to be the reasons for these results.

In a similar study, Park and Ratti (2008) concluded that Norway exhibits a positive response in real stock returns to an oil price increase. They also found that for many European countries, increased volatility of oil prices depresses real stock returns. Using a bivariate GARCH method, Malik and Ewing (2009) examined the volatility dynamics between five different US sector indexes and oil prices. They revealed proof of transmission of shocks and volatility between oil

prices and some of the observed market sectors. Arouri and Nguyen (2010) studied the short-term linkages in the aggregate and the sector by sector levels in Europe. They found that the reactions of stock returns to oil price changes vary greatly depending on the activity sector. Another study by Malik and Ewing (2009) examined the relationship between the stock market and oil prices in Greece using Cointegration, VECM and a multivariate VAR method. They found that oil prices exercise a significant negative influence on the stock market. Eryigit (2012) used VAR model to examine the significance of oil price volatility in a number of countries, including developed, developing, importing and exporting countries (include Germany, India, Japan, the Republic of Korea, Malaysia, and the United States). He concludes that an increase in oil price volatility can have negative consequences for the economies of both oil exporting and importing countries. He also reported that an economy that greatly depends on oil trade is more likely to be affected by price shocks.

Aloui and Jammazi (2009) examined the relationship between crude oil shocks and stock markets in the UK, France and Japan. The findings show that rises in oil price have a significant role in determining the volatility of stock returns. Jawadi, Arouri and Bellalah (2010) found evidence of considerable linkages between stock and oil markets and significant long-run relationships exists between these markets. They studied the USA, France, Mexico and Philippines market using a nonlinear approach. Chen and Lv (2015) examined the asymptotic dependence between the Chinese stock market and the world crude oil market employing the Extreme Value Theory (EVT). They found a positive

extremal dependence. They concluded that the oil and stock move together especially during the crisis period hence the contagious effect. Using a VAR model Cong, Wei, Jiao and Fan, (2008) investigated the relationships between oil price shocks and Chinese stock market. They found that oil price shocks transmit significantly to manufacturing indices. Kapusuzoglu (2011) studied the long-term and short-term dynamics between the Istanbul Stock Exchange (ISE) market and international Brent oil price. They found a long-term relationship between the stock and oil markets. They also observed that there was a one-way causality relationship from the stock exchange market to oil price.

Maghyereh and Al-Kandari (2007) used a nonlinear Cointegration model to examine the linkages between oil prices and the stock market in the Gulf Cooperation Council (GCC). They found that in GCC countries, oil price influences the stock price indices in a nonlinear fashion. Using a VAR-GARCH model, Arouri, Lahiani and Nguyen (2011) studied the linkages between the oil and stock markets in the Gulf Cooperation Council (GCC) countries. They found evidence of substantial return and volatility spillovers between world oil prices and GCC stock markets. Using bootstrap panel Cointegration techniques and seemingly unrelated regression (SUR) methods, Arouri and Rault (2012) studied the GCC stock and oil market. They found that with the exception of Saudi Arabia, it was noted that oil price increases have a positive impact on stock prices. Narayan and Narayan (2010) established that oil prices have a positive and statistically significant impact on stock prices in their study on the impact of oil prices on Vietnam's stock prices.

Adjasi (2009) used the EGARCH model to study the relationship between macroeconomic variables including oil price and the stock market of Ghana. The results showed that higher volatility in oil prices reduces the volatility of stock prices. Hodo, Akpan and Offiong as cited in Ahuru and James (2015) used annual time series data ranging from (1970-2010) and used VAR model to examine the asymmetric effect of oil price shocks on exchange rate volatility and domestic investment in Nigeria. The study reported that government expenditure showed an immediate positive response to oil price shock, but public investment, private investment and industrial production showed a negative response to oil price shock. They further came out with the evidence of a “Dutch disease” in Nigeria. They again reported that in the short-run, exchange rate, government expenditure and domestic investment are mainly affected by oil price shock using the variance decomposition analysis.

However, evidence from other studies has not been as straightforward as those just reviewed. Akide (2007) investigated the impact of oil price volatility on economic growth indicators in Nigeria using quarterly data from 1970 to 2000. He reported that oil price shocks did not affect output and inflation in Nigeria, but significantly influenced the real exchange rate. Also, Jimenez and Sanchez (2005) examined the effect of oil price volatility on the real economic activity of the main industrialized countries using both linear and non-linear models. They established that there is the non-linear impact of oil price volatility on real GDP.

Cocoa price shock

Anderson and Bruckner (2012) show that increases in distortions to relative agricultural prices have a significant negative effect on economic growth in Sub-Saharan African countries. Also, Collier (2007) shows that price changes in agricultural commodities have very different effects from those of non-agricultural commodities. For example, agricultural commodity booms had been badly managed in Sub-Sahara African due to excessive taxation. Collier and Goderis (2009) highlight the importance of positive and negative price shocks when considering whether aid can mitigate the effects of such shocks. The effect is that agricultural prices can have a significant impact on economic growth in SSA countries and that one may expect the response to a positive shock in commodity prices to be different from a negative price shock.

In addition, Cavalcanti, Raissi and Mohaddes (2012) recognize that energy price shocks have the worst effect on low-income economies and they argued that these countries' macroeconomic conditions are worsened by fluctuations in international prices of commodities. They also argued that agricultural commodity prices have serious implications for macroeconomic variables of LIEs. Moreover, recent studies tend to find evidence that commodity price fluctuations lead to an increase in the volatility of macroeconomic variables in LIEs. Precisely, Regardless of the differences in their findings, we can draw the conclusion that a key feature in most of the results is that commodity price shocks affect significantly the implementation of macroeconomic policies in developed

economies, particularly that commodity price shocks determine most of the macroeconomic fluctuations globally.

Bleaney and Greenaway (2001) estimate a panel data model for a sample of 14 SSA countries over the period 1980–1995 and show that growth is negatively affected by terms of trade volatility, and investment by real exchange rate instability. Again, Blattman, Hwang and Williamson (2007) use a panel data of 35 commodity-dependent countries between 1870 and 1939 to investigate the impact of terms of trade volatility, arising from excessive commodity price fluctuations, on the growth performance. They provide evidence of the adverse effects of volatility on foreign investment and, through that, on economic growth in what they call ‘periphery’ nations. In another study by Blattman et al., (2007) using historical data find that countries experiencing more volatile commodity prices tend to grow more slowly than countries experiencing relatively stable price movements. In addition, when commodity prices show a favourable trend, the core countries tend to perform better than their peripheral counterparts. Aghion, Bacchetta, Ranciere and Rogoff (2009), using GMM dynamic panel data method for 83 countries from the year 1960 to 2000, revealed that higher levels of exchange rate volatility can stunt growth, especially in countries where capital markets are thin and where financial shocks are the main source of macroeconomic volatility.

Bourguignon, Lambert and Suwa-Eisenmann (2004) showed that international agricultural trade uncertainty indicates different adjustments of domestic incomes for different groups of income earners, but did not, however,

investigate the impact of increased exposure to international markets. Nevertheless, partly because of low tradability of many farming products and partly because of lack of transmission of world prices to domestic markets, the domestic farming product markets in many developing countries (DCs) are very unbalanced, not only from year to year but also within each crop year. Also, a study by Amoro and Shen (2012) evaluated the impact of the fluctuation of international prices of raw materials on the variability of the gross domestic product (GDP) in Côte d'Ivoire. The study used the vector autoregressive model on an international dataset of primary products and export earnings; inflation and GDP were selected variables analysed in relation to this variability. From 1960 to 2005, fluctuations in coffee prices explained about 15% of the variability of the GDP, while export earnings in total explained approximately 20% of this variability. The exchange rate of the dollar and fluctuation of the petroleum price, which are external factors, also had a significant impact on the dynamics of the growth of Côte d'Ivoire. These results confirm the dependence of the Ivorian economy on raw materials. Kose and Reizman (2001) in their paper trade shocks and macroeconomic fluctuations in Africa demonstrated that in Sub-Saharan Africa, trade shocks linked to fluctuations of international prices accounted for almost 45% of GDP fluctuations, 87% of investment variations and 80% fluctuation of labour supply.

Gold price shock

Sharma and Mahendru (2010) analyzed the impact of Macro-Economic factors on inventory values in India and used the macroeconomic factors like change in return amount, forex trading supplies, inflation rates and gold costs. This study covers the period of Jan 2008 to Jan 2009 and results inrevels that return amount and gold costs highly affect the inventory values. Again, Wang, Wang and Huang (2010) used daily data and time sequence method to discover the effects of variations in raw oil cost, gold cost. The results showed that there exist co integrations among variations in oil cost, gold cost and forex prices of the money vs. various foreign returns, and the inventory marketplaces in Malaysia, Asia, Taiwan and Chinese suppliers.

Furthermore, Arezki, Dumitrescu and Quintyn (as cited in Omar, Bashar & Sarkar, 2013) in their work the Relationship between Commodity Prices and Exchange Rate in Light of Global Financial Crisis: Evidence from Australia used cointegration tests and vector error correction models to established causality running from South African Rand to gold price volatility before the capital account was liberalized; the direction of causality reverses after capital account liberalization. Capie, Mills and Wood (2005) in their paper investigated the relationship between gold prices and the US dollar using the monthly data from Jan 2000 to Dec 2011 and used the GARCH model. Their results showed that there is a positive relationship between gold prices and the US dollar. Yahyazadehfar and Babaie (2012) the main objective of their study was to investigate the impact of gold and oil prices on the stock market of Iran. The

study used the VAR model and concluded that there is a negative relationship between them.

Commodity prices are known to be volatile and it has been suggested that natural resource prices, in particular, have been largely detrimental to growth (Hausmann & Rigobon, 2003; Blattman et al., 2007). Auty (1994) described the phenomenon of the 'natural resource curse' where countries endowed with natural resources experience low economic growth in comparison to countries who achieve high economic growth with little or no natural resources. However, the empirical evidence regarding the impact of natural resource prices on economic growth is mixed, with some confirming Sachs and Warner's (1999) results of a negative effect on growth (Rodriguez & Sachs, 1999; Gylfason, Herbertsson & Zoega 1999; and Bulte, Damania, & Deacon, 2005). On the other hand, a growing number of papers provide evidence against the resource curse hypothesis (Brunnschweiler & Bulte, 2008; Alexeev & Conrad, 2009).

Also, Easterly, Kremer, Pritchett and Summers (1993) showed using growth regressions, that variation in the growth of terms of trade could explain a large part of the variation in the economic growth of a selection of countries. Mendoza (1995) and Kose and Riezman (2001) adopt calibrated general equilibrium models and find that almost half of the output fluctuations in LICs can be accounted for in terms of trade shocks. However, using a different methodological approach (Vector Autoregressive or VAR models) Deaton and Miller (1996) and Hoffmaister, Roldós and Wickham (1998) found that terms of trade shocks account for a small fraction of output volatility. To add to this study,

Broda (2004) employed a panel VAR approach and found that terms of trade shocks have a larger output impact in countries with fixed exchange rates. Raddatz (2007) also employed a panel VAR model to find that external shocks play a small but significant role in explaining output volatility. Collier and Goderis (2012) study the effect of commodity prices on output per capita, separating the long-term and short-term effects adopting a panel error correction model. The results revealed that commodity price increases have an impact on per capita GDP in the short term; however, for countries that have poor governance, the long-term effects of commodity price booms are negative (reflecting mismanagement of the export revenues when governance is weak). A study by Seemuang and Romprsert (2013) explored the relationship between the movement of gold value and dynamic macroeconomic variables (Inflation rate, US real GDP, the value of Dollar, US money supply level 2 and inflation rate) in the United States. The authors used correlation analysis to explore the correlation between each of the variables and used Ordinary Least Square (OLS) regression equation to explore the factors contributing to the movement of gold. They reported that the percentage of change of the US dollar index (Dollar supply and inflation) is a factor of movement of gold value and has mirror effects to each other. They further reported that there is a negative relationship between the value of Dollar and gold price. The US Real GDP is positively correlated to the gold price and the inflation rate significantly affects the gold price and

Bapna, Sood, Kumar Totala and Saluja (2012) stated that the demand for gold is allied and sensitive to macroeconomic conditions in the world. Gold price

is difficult to anticipate, predict, and explain. So, their study aimed to analyze the impact of macroeconomic variables (Gross Domestic Product, Growth Rate, Exchange Rate, Interest Rate, Inflation, BSE Sensex Index and Forex Reserves) on gold prices. The authors used unit root test, regression method and Granger causality test to analyze the data. Macroeconomic variables were also analyzed using trend analysis. All the data were collected for a 10-year period, starting from the year 2002 until the year 2011 on a quarterly basis; March, June, September and December. They reported that an exchange rate, fiscal deficit, and forex reserve inflation rate independently affect the gold price on a large scale but the growth rate, Gross Domestic Product, BSE Sensex and NSE Index have a very low impact on gold price independently. They further reported that gold does not cause and affect the exchange rate, BSE Sensex, NSE Index, forex reserves and fiscal deficit but gold does affect interest rate and inflation and vice versa.

Simakova (2011) stated that gold plays an important role in shaping the economy. Gold, oil and also other commodities are mostly quoted in U.S. Dollars. The study was to analyze the relationship between gold and oil price. The author used a traditional time series model to analyze the data while using the Johansen cointegration test and Vector Error correction model to investigate asymmetric cointegration relation. Moreover, the author also analyzed the trend of movement of gold price and oil price on a 40-year period from the year 1970 to the year 2010 on a monthly basis. Then, the author calculated the ratio for both variables to determine their relationships. The result shows that the correlation between oil price and the gold price are strongly positive and there are causal

links between gold and oil price levels, which were recognized using the Granger causality test.

Chapter Summary

This chapter presented the theories that underpin the study. The chapter again addressed the overview of the Ghanaian economy and the empirical literature relevant to the study.

CHAPTER THREE

RESEARCH METHODS

Introduction

The purpose of this study is to examine the effect of an international commodity price shock on economic growth. This chapter talks about the procedures and techniques that were used to obtain and analyze the data for the study. Basically, it captures issues such as research design, theoretical model, empirical model, description of variables, data and source of the data and the estimation protocol. Also, a summary of this chapter is provided to hold the chapter in perspective.

Research Design

Research design refers to the plan or proposal for conducting the research. It involves the interaction of philosophy, strategies for inquiry, and specific methods. Thus, the plans and the procedures for research that span the decisions from broad assumptions to detailed methods of data collection and analysis (Creswell, 2009).

There are different research paradigms and design alternatives depending on the type of data available and the analysis procedures required for the study. Creswell (2009) states that in research there is no single research design that best fits all. There are three (3) different types of research paradigms and design alternatives and these are quantitative research design, qualitative research design and mixed research design.

The qualitative research design is a means for exploring and understanding the meaning of individuals or groups ascribe to a social or human problem. The process of research involves emerging questions and procedures, data analysis, inductively building from particulars to general themes, and the researcher making interpretations of the meaning of the data (Creswell, 2007). The quantitative research design is a means for testing objective theories by examining the relationship among variables. These variables, in turn, can be measured, typically on instruments, so that numbered data can be analyzed using statistical procedures (Creswell, 2008). And mixed research design is the inquiry that combines or associates both qualitative and quantitative form.

For the purpose of this study, the research design used for the study was quantitative. Leedy and Ormrod (2010) and Wahyuni (2012) also states that quantitative design is more suitable and appropriate if the purpose of the study is to explain, confirm and validate, or to test the theory. They also state that for the use of a quantitative approach, the data must be numeric and require standardized instruments for data collection. The quantitative approach is used if data analysis requires deductive and objective reasoning (Creswell, 2009). This study seeks to collect numeric data on gold prices, oil prices and cocoa prices, exchange rate, inflation rate and economic growth rates of Ghana.

Some key strengths of quantitative research design are that the findings of the study can be generalized to the population about which information is required, it is also relatively easy to analyze, data can be very consistent, precise and reliable, it is a standardized approach that permits a study to be replicated in

different areas or overtime with the production of comparable findings and it is also possible to control for the effects of extraneous variables that might result in misleading interpretations of causality.

On the other hand, quantitative research design may yield some weaknesses - data may not be robust enough to explain complex issues, and studies that use these approach are expensive and time-consuming and even the preliminary results are usually not available for a long period of time.

Theoretical Model

The purpose of this is to estimate the effect of international commodity prices on economic growth in Ghana. Economic growth is one of the most essential concepts in the global economy. Notwithstanding the criticism that the level and rate of growth does not always reflect the real level of a population's living standards, it remains the primary measure of prosperity. However, as a measure describing the dynamics of economic processes in the country, it has some drawbacks. Since the process of economic growth is based on a great variety of factors that change over time, models of economic growth necessarily apply some simplifications. These generalizations comprise in grouping and combination of the causes of economic growth. Mostly, in models of economic growth, a depreciation rate for capital and growth of population are exogenous. Theoretically, in order to study the relationship between international commodity price shock and economic growth, it is natural to start or the study to adapt the

analysis with the Solow growth model in a form of a Cobb-Douglas production function.

$$RGDP = f(K_t, L_t, A_t) \quad (1)$$

Where RGDP is the output, K_t is the capital stock formation, and L_t is the labour force. The variable A_t is the total factor productivity, and it changes with different production functions based on the factors being studied.

This model is modified to include other variables to analyse the effect of an international commodity price shock and economic growth using time series annual data from 1990 to 2016 in Ghana. This is due to the fact that the study is a macro study and involves trend analysis. For the purpose of this work and following Carlin and Mayer (2003) commodity price shock, real exchange rate, trade openness and inflation (CPI) will be represented by the A_t .

$$A_t = f(\text{INDEX}, \text{ER}, \text{CPI}, \text{OP}) \quad (2)$$

Empirical Model

The study uses Real GDP as a measure of economic growth, and then find the index of oil price, gold price and cocoa price shock which was used as the independent variable. The study controlled for the exchange rate, inflation rate, labour, capital, and openness. The dependent variable is Real GDP. The functional form of the model is:

$$RGDP_t = f(K_t, L_t, \text{INDEX}_t, \text{ER}_t, \text{CPI}_t, \text{OP}_t) \quad (3)$$

Where

$RGDP_t$ refers to Real Gross Domestic Product,

K_t is Capital and it is measured by Gross fixed capital formation,

L_t is Labour and will use the total labour force as a measurement,

$INDEX_t$ also the index of the three commodity price shock namely gold, oil and cocoa,

ER_t represent Real exchange rate,

CPI_t represent Inflation Rate and

OP_t is Trade Openness

The study uses the standard normalization combined with a moving average approach to calculating the commodity price shock index as used by Akpokodje (2000) in his work effect of export earning fluctuation on capital formation in Nigeria.

Commodity price shock index ($INDEX$) is derived by applying the following formula:

$$INDEX_t = \frac{X_t - \bar{X}_4}{\sigma_4} \quad (4)$$

Where $\bar{X}_4 = 1/4 \sum_{j=1}^4 X_{ij}$

Thus, the average of the first four- year prices of the commodities used, where X_t is the average commodity prices of the three products used and σ_4 is the standard deviation of the commodity prices of a four-year period. The advantage of this method (the standard normalization combined with a moving average approach) is that it distinguishes between rising and fall, temporary and permanent, and stochastic and predictable changes, all relative to the most recent experience in the indexes obtained.

A positive INDEX means that the shock in the international commodity prices is upwards. Thus there is an upwards or rise in the prices of the commodity. Negative INDEX means there is a downwards or decrease in the prices of the commodities under the study.

The model estimation for the log variables is given below;

$$\text{LnRGDP}_t = \beta_0 + \beta_1 \text{LnK}_t + \beta_2 \text{LnL}_t + \beta_3 \text{INDEX}_t + \beta_4 \text{LnER}_t + \beta_5 \text{LnCPI}_t + \beta_6 \text{LnOP}_t + \varepsilon_t \quad (5)$$

Where Ln shows the use of the log and the other variables stands as defined in the other equations. The variables were log to bring them into the same common units since some of the variables were in monetary values and others in percentages.

Equation (5) is subsequently modelled with optimal lags of the variables to depict the ARDL representation.

The coefficients of β_1 , β_2 , β_3 , β_4 , β_5 , β_6 and β_0 in equation (5) are the various elasticities of the respective variables. Since the INDEX coefficient was not logged its value would interpret by multiplying it by 100. The choice of the variables used in the above model was based on the literature, economic theory, data available and their significance in the model.

Consequently, the study employs the Autoregressive Distributed Lag (ARDL) approach by Pesaran and Shin (1998) and Pesaran, Shin, and Smith (2001). Specifications with lags of both explanatory and explained variables are known as autoregressive distributed lag (ARDL) models. The authors came out with some features of the ARDL model which is as follows:

- a. It can be used with a mixture of I (0) and I (1) data.

- b. It involves just a single-equation set-up, making it simple to implement and interpret.
- c. Different variables can be assigned different lag-lengths as they enter the model.

This approach has some econometric advantages over the other cointegration techniques. First, ARDL modelling incorporates an adequate number of lags to capture the data generating process from general to specific modelling framework (Laurenceson & Chai, 2003 as cited in Shrestha & Chowdhury, 2005). Again, the bounds test approach to cointegration gives more robust results in small samples than the Johansen approach. Thus, the ARDL approach to cointegration is more efficient in finite samples compared with the Johansen approach that requires large data samples for one to get a valid result (Pesaran & Shin, 1999). Also, the problem of endogeneity is addressed in this technique because the model can distinguish dependent and explanatory variables which make the analysis efficient and unbiased.

Pesaran and Shin (1999), argued that modelling the ARDL with the appropriate lags will adjust for both serial correlation and endogeneity problems. Jalil, Ma, and Naveed (2011) contend that endogeneity is less of a problem if the estimated ARDL model is free from serial correlation. The problem of endogeneity is primarily important since the causal relationship between financial development and economic growth cannot be ascertained beforehand.

In general ARDL (p,q) of Y_t and X_t can be written in expanded form as:

$$\Delta Y_t = \alpha_0 + \alpha_1 \Delta Y_{t-1} + \alpha_2 \Delta Y_{t-2} + \dots + \alpha_p \Delta Y_{t-p} + \beta_0 \Delta X_t + \beta_1 \Delta X_{t-1} + \beta_2 \Delta X_{t-2} + \dots + \beta_q \Delta X_{t-q} + \Phi_0 Y_{t-1} + \Phi_1 X_{t-1} + \varepsilon_t \quad (6)$$

Therefore, the lagged Y_t constitute the autoregressive part and the lagged X_t constitute the distributed part of the ARDL (p,q) model, for there are p autoregressive terms and q distributed lag terms.

Hence, we specify the ARDL representation of equation (5) as:

$$\begin{aligned} \ln \text{RGDP}_t = & a + \beta_0 \ln \text{RGDP}_{t-1} + \beta_1 \ln K_{t-1} + \beta_2 \ln L_{t-1} + \beta_3 \ln \text{INDEX}_{t-1} + \beta_4 \ln \text{ER}_{t-1} \\ & + \beta_5 \ln \text{CPL}_{t-1} + \beta_6 \ln \text{OP}_{t-1} + \sum_{i=1}^p a_1 \Delta \ln \text{RGDP}_t + \sum_{i=0}^p a_2 \Delta \ln K_{t-i} + \sum_{i=0}^p a_3 \Delta \ln \text{INDEX}_{t-i} + \\ & \sum_{i=0}^p a_4 \Delta \ln \text{ER}_{t-i} + \sum_{i=0}^p a_5 \Delta \ln \text{CPL}_{t-i} + \sum_{i=0}^p a_6 \Delta \ln \text{OP}_{t-i} + \sum_{i=0}^p a_7 \Delta \ln L_{t-i} + \varepsilon_t \end{aligned} \quad (7)$$

Description of the variables

Real Gross Domestic Product (RGDP)

Real Gross Domestic Product (RGDP) refers to the overall monetary value of goods and services produced in an economy over a given period of time, irrespective of the nationality of the labour force used to produce it. This will be used as a proxy for economic growth. Odhiambo (2008) stated that it is economic growth (RGDP), which Granger causes financial development in Kenya. Put differently, it is the growth in the real sector that induces the expansion of the financial system by stimulating active participation in the financial markets. Again, Jiménez-Rodríguez and Sanchez (2005) empirically examined the effects of oil price shocks on the real economic activity of the main industrialized countries. They concluded that oil price increases have an impact on RGDP growth of a larger magnitude than that of oil price declines, with the latter being

statistically insignificant in most cases. Further, among oil importing countries, oil price increases were found to have a negative impact on economic activity in all cases.

Commodity price shocks

Commodity price shock is defined as a sudden change in prices of commodities, and the change can be either increase or decrease. In this study, the researcher uses the price changes of oil, gold and cocoa to create a single index for commodity price shock using Akpokodje (2000) formula. The study expects a positive relationship between positive or negative international commodity price shock and economic growth.

Inflation rate (CPI)

Inflation rate refers to the percentage rate of change in the general price level of commodities from one period to the other. Thus, a sustained increase in the general price level of goods and services in an economy over a period of time. This study will use (consumer price index overall) for the rate of inflation. The inflation rate has far-reaching implications for the performance of the economy. The low or moderate rate of inflation tends to encourage economic activity, particularly production: as the cost of acquiring inputs reduces. On the other hand, when the inflation rate is high it reduces aggregate demand, production, and employment, but increases trade deficits and balance of payment problems; surplus spending units divert their resources into interest yielding activities.

This in effect raises Gross Domestic Product (GDP), reduces unemployment and eases the balance of payment problems (Obi, Nurudeen & Wafure, 2009).

Trade openness

Trade openness is a measure of economic strategies that either constrain or call trade between countries. For instance, when a country sets high tariffs or embargo to restrict the desire for international trade to go on. For the purpose of this study trade as a percentage of the gross domestic product was used as a proxy for trade openness.

Exchange rate

It is referred to as the price of one currency expressed in terms of another currency. Thus, the rate or ratio of which one currency can be exchanged for the other currency at a given point in time. For the purpose of this study real exchange rate was used as a measure of the exchange rate. This is the weighted average of a country's currency relative to an index or basket of other major currencies adjusted for the effects of inflation. In an economy where the country's currency is depreciating against the other currency, such country will need more of its currency in order to purchase the foreign currency. On the other hand, when a country's currency is appreciating to the foreign currency then such country needs few local currencies to purchase the foreign currency. According to Hua (2012), they argue that when commodity prices experience a positive shock, this

leads to increased foreign exchange earnings which may lead to an excessive appreciation of the real exchange rate.

Capital (K)

The study used gross fixed capital formation as a measure of capital. Gross capital formation is the total value of additions to fixed assets by domestic enterprises, less disposals of fixed assets during the year, plus additions to the value of non-produced assets such as discoveries of mineral deposits, plant, machinery, and equipment purchases; and the construction of infrastructure and commercial and industrial buildings (Baafi & Opong, 2010). Gross fixed capital formation coefficient is expected to be positive *ceteris paribus*.

Labour force (L)

Labour force is made of the proportion of the population that is economically active. For the purpose of this study, the proportion of the total population aged from 15 years and 65 years who are active and productive was used as a measurement of the labour force. Solow (1956) recommended that the labour force should be included in the growth model because of its impact on growth.

Data and Sources of Data

This study used annual data from 1990 to 2016. Time series data on the international commodity prices (oil, gold and cocoa) used to create an index of

commodity price shock were taken from the Central Bank of Ghana while the control variables - capital (gross capital formation), labour (total labour force), real exchange rate, inflation rate (consumer price index overall), and openness (trade as a percentage to GDP) were taken from the database of the World Development Indicators. Real Gross Domestic Product (RGDP) which the researcher used as a measure or proxy for economic growth was taken from the database of the World Development Indicators. The easy access to secondary data from these dependable sources helped in the speed of carrying out this study.

The table below shows the summary of the dependent variable, independent variables and the control variables and how it will be measured and also their sources.

Table 1-Variables and its measurement

Variables	Proxy	Sources and years
Independent – International commodity price shock	International oil prices International cocoa prices International gold prices	Central Bank of Ghana from 1990-2016
Dependent – Economic growth	Real Gross Domestic Product (RGDP)	World Bank and World Development Indicators

Control variables

Exchange rate	Real exchange rate	World
Inflation	Consumer price index	Development
Capital	Gross fixed capital formation	Indicator
Labour	Total labour force	Database
Trade Openness	Trade as a % of GDP	

Source: Field Survey, Onomah (2019)

Estimation protocol**Trend analysis of international commodity price shock and economic growth**

Objective one was to carry out trend analysis of the international commodity prices shock and economic growth. To carry out trend analysis the researcher use the Excel to do the trend analysis. The researcher multiplies the index value by 100 because the value was too small to draw the trend.

Objective two and three and hypotheses one and two

Objective two and three were to examine the short-run and the long-run effect of a commodity price shock on economic growth in Ghana and these were estimated using econometric analysis ARDL technique. The choice of the ARDL model was because of my small sample size and also we presumed that the previous level of economic growth will affect the current level of economic growth. Also, for the researcher to use the ARDL model, all the data were tested to see if they contain a unit root. This was done using the Augmented Dickey-

Fuller (ADF) and the Philip-Perron (PP) tests. The researcher also performs or test lag length structure and also bound test and its later proceeds to test for the long-run and short-run relationship among the variables under study. Finally, a diagnostics test was performed on the model used.

Unit Root Testing

Time series containing unit roots are supposed to not be stationary. Non-stationary series leads to statistically spurious relationships, meaning that accurate conclusions cannot be drawn from the data as it includes means and variances that are not constant over time. To test the unit root of the data two tests were employed in line with empirical literature. Augmented Dickey-Fuller (ADF) test and Phillips and Perron (PP) test. In general, ADF and PP tests are consistent with each other; however, the researcher will include both to ensure accuracy concerning the conclusion (Skerman & Maggiora, 2009). The PP test is similar to ADF test but the reason why this study also tests the unit root using PP is that ADF test loses power for the sufficiently large value of p , the number of lags (Ghosh, Saidi & Johnson, 1999). It includes an automatic correction to the Dickey-Fuller process to allow for autocorrelated residuals (Brooks, 2008). This study will test each time series individually to ensure that none of the variables is differentiated at I (2). After the test of unit root on the variables then you have to formulate an "unrestricted" error-correction model (ECM).

Lag length structure

The Information Criterion that was used to determine the lag length for this study was both the Schwartz Bayesian Information Criterion and the Akaike Information Criterion to ensure the accuracy of the optimal lag length.

Bounds Test

After determining the appropriate lag length, the study proceeds to do ARDL bound test to examine the long-run relationships among the variables. This was done using F statistics and the Wald test. When this is done, then the study estimates the long run levels model. The ARDL bounds test is based on the assumption that the variables are I (0) or I (1). So, before applying this test, we determine the order of integration of all variables using the unit root tests. The objective is to ensure that the variables are not I (2) so as to avoid spurious results. In the presence of variables integrated of order two, we cannot interpret the values of F statistics provided by Pesaran et al. (2001). The ARDL cointegration approach has three advantages in comparison with other previous and traditional cointegration methods. The first one is that the ARDL does not need that all the variables under study must be integrated of the same order and it can be applied when the underlying variables are integrated of order one, order zero or fractionally integrated. The second advantage is that the ARDL test is relatively more efficient in the case of small and finite sample data sizes. The last and third advantage is that by applying the ARDL technique we obtain unbiased estimates of the long-run model (Harris & Sollis, 2003).

The ARDL model used in this study is expressed as follows:

$$\begin{aligned} \ln RGDP_t = & a + \beta_0 \ln RGDP_{t-1} + \beta_1 \ln K_{t-1} + \beta_2 \ln L_{t-1} + \beta_3 \ln INDEX_{t-1} + \beta_4 \ln ER_{t-1} \\ & + \beta_5 \ln CPL_{t-1} + \beta_6 \ln OP_{t-1} + \sum_{i=1}^p a_1 \Delta \ln RGDP_t + \sum_{i=0}^p a_2 \Delta \ln K_{t-i} + \sum_{i=0}^p a_3 \Delta \ln INDEX_{t-i} + \\ & \sum_{i=0}^p a_4 \Delta \ln ER_{t-i} + \sum_{i=0}^p a_5 \Delta \ln CPL_{t-i} + \sum_{i=0}^p a_6 \Delta \ln OP_{t-i} + \sum_{i=0}^p a_7 \Delta \ln L_{t-i} + \varepsilon_t \end{aligned} \quad (8)$$

Long-run and short-run tests

Once the bound test and co-integration are done, the next step is that the ARDL (p,q₁,q₂,q₃,q₄,q₅,q₆) models are estimated in order to obtain the long run coefficients (estimates). These are given by:

$$\begin{aligned} \ln RGDP_t = & a_0 + \sum_{i=1}^p a_1 \ln RGDP_{t-i} + \sum_{i=0}^{q_1} a_2 \ln K_{t-i} + \sum_{i=0}^{q_2} a_3 \ln L_{t-i} + \\ & \sum_{i=0}^{q_3} a_4 \ln INDEX_{t-i} + \sum_{i=0}^{q_4} a_5 \ln CPL_{t-i} + \sum_{i=0}^{q_5} a_6 \ln ER_{t-i} + \sum_{i=0}^{q_7} a_7 \ln OP_{t-i} + \varepsilon_t \end{aligned} \quad (9)$$

When there is a long run relationship among the variables, then the unrestricted ARDL error correction representation (short run) is estimated as:

$$\begin{aligned} D \ln RGDP_t = & a_0 + \sum_{i=1}^p a_1 D \ln RGDP_{t-i} + \sum_{i=0}^{q_1} a_2 D \ln K_{t-i} + \sum_{i=0}^{q_2} a_3 D \ln L_{t-i} + \\ & \sum_{i=0}^{q_3} a_4 D \ln INDEX_{t-i} + \sum_{i=0}^{q_4} a_5 D \ln CPL_{t-i} + \sum_{i=0}^{q_5} a_6 D \ln ER_{t-i} + \sum_{i=0}^{q_7} a_7 D \ln OP_{t-i} + \Phi ECT_{t-1} + \varepsilon_t \end{aligned} \quad (10)$$

From equation (10) the α 's are the coefficients relating to the short run results of the convergence to equilibrium, ECT_{t-1} is the error correction term resulting from the estimated long-run equilibrium relationship and Φ is the coefficient of the speed of adjustment to the long run equilibrium when there is a shock in the system. Here, the residuals from the co-integration equation, lagged one period was defined as:

$$\begin{aligned}
 ECT_t = & \ln RGDP_t - a_0 - \sum_{i=1}^p \phi_1 D \ln RGDP_{t-i} - \sum_{i=0}^{q1} \phi_2 D \ln K_{t-i} + \sum_{i=0}^{q2} \phi_3 D \ln L_{t-i} \\
 & - \sum_{i=0}^{q3} \phi_4 D \ln Index_{t-i} - \sum_{i=0}^{q4} \phi_5 D \ln CPL_{t-i} - \sum_{i=0}^{q5} \phi_6 D \ln ER_{t-i} - \sum_{i=0}^{q7} \phi_7 D \ln OP_{t-i} - \varepsilon_t
 \end{aligned}
 \tag{11}$$

The error term indicates the speed of adjustment as stated above to the long-run equilibrium in the dynamic models. Put it differently, its magnitude shows how fast the variables converge to equilibrium when they are being disturbed. The coefficient of the error term is expected to be statistically significant with a negative sign. The negative sign indicates that any shock that occurs in the short run will be corrected in the long run. Therefore, the larger the coefficients of the error term in absolute terms, the quicker the convergence to equilibrium.

Model Diagnostics and Stability Tests

The estimated regression model is based on the assumption that the model is correctly specified. Again, a financial analyst as a matter of necessity must diagnose every regression model before presenting it to management for decision making. This study conducted a test of the following;

1. The goodness of fit on the dependent variable.
2. Independent variable test.
3. Error term test.
4. Autocorrelation (serial correlation) test.

The goodness of fit (GoF) on the dependent variable.

The study test for the coefficient of determination or the adjusted R^2 and the Information Criteria (Akaike Information Criterion- AIC).

Independent variable test

The study also tests for independent t-test of significance and multicollinearity test on the independent variables.

Error term test

The study once again tenses a test on the error term to test for heteroscedasticity test. This was done by using Breusch- Pagan- Godfrey (BP) test to test for the heteroscedasticity of the error term.

Autocorrelation (Serial Correlation) test

Serial Correlation is more common in time series data. Therefore it is good to test for serial correlation, this study test for using Durbin-Watsons (WD). Hansen (1992) cautioned that the estimated parameters of a time series data could differ over time. Consequently, it is critical to conduct parameter tests in order to check for model misspecification that may arise as a result of unstable parameters and subsequently lead to bias estimates. Finally, the study employs the CUSUM and the CUSUMQ recursive residuals stability tests as suggested by Pesaran and Pesaran (1997).

Chapter Summary

This chapter addressed the research paradigm that was used for the study. The quantitative research design was used to find out the effects of international commodity price shocks on economic growth. The study used the Solow growth model in the form of Cobb-Douglas production to capture the effect of international commodity price shock and economic growth. Annual data on the variables used were from the WDI database from 1990 to 2016. Tests on the stationarity of the time series data were done using the ADF test and PP test. Finally, the Autoregressive Distributed Lag (ARDL) Model and the Bound test was used to analyze the data.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

The purpose of the study is to examine the effects of international commodity price shock on economic growth in Ghana. This chapter provides the results and discussions of the research findings. This chapter also presents the results of the findings including a diagnostic test and the trend analysis of commodity price shock index and economic growth. The main focus of this chapter is based on the research objectives. Objective one seeks to carry out trend analysis on international commodity price shock and economic growth in Ghana and objective two and three examine the long-run and short-run effect of commodity price shock on economic growth using the ARDL model. Finally, this chapter ends with a summary of the key findings.

Descriptive Statistics of the Variables

The variables used for the study were real GDP, Capital, Total Labour, Exchange rate, Openness, Consumer Price Index and Index of Commodity Prices. The study covered the period from 1990 to 2016. Since some of the variables were in monetary units and others in percentages, all the variables were logged to bring them into a common unit.

A summary of the descriptive statistics is given below in Table 2.

	LRGDP	LL	LOP	LER	LK	LCPI	INDEX
Mean	6.400678	4.381302	1.163961	-0.395613	3.150851	4.560117	0.493433
Median	6.525005	4.403116	2.096194	-0.099710	3.176290	4.915592	0.240159
Maximum	6.859342	4.754006	4.887654	1.435132	3.458982	6.001415	1.395222
Minimum	5.898385	3.828502	-5.956097	-2.956512	2.549445	2.150599	-0.265703
Std. Dev.	0.319841	0.224779	3.428679	1.213587	0.179952	1.112189	0.584029
Skewness	-0.219032	-0.602951	-0.539127	-0.515590	-1.264169	-0.711900	0.411512
Kurtosis	1.426832	2.735029	1.973239	2.336500	6.125220	2.505340	1.553187
Jarque-Bera	2.777871	1.587927	2.309241	1.566211	16.83281	2.366554	2.886079
Probability	0.249341	0.452050	0.315177	0.456985	0.000221	0.306273	0.236209
Sum	160.0170	109.5326	29.09902	-9.890332	78.77128	114.0029	12.33582
Sum Sq. Dev.	2.455157	1.212615	282.1401	35.34704	0.777185	29.68716	8.186144
Observations	25	25	25	25	25	25	25

Table 2- Descriptive Statistics of Variables

Note: Std. Dev. Represents Standard Deviation and Sum Sq. Dev. Represents Sum of Squared Deviation.

Source: Field Survey, Onomah (2019)

From Table 2, it can be seen that the mean of LRGDP, LL, LOP, LER, were 6.40, 4.38, 1.16 and -0.40 respectively, while those of LK, LCPI and INDEX were 3.15, 4.56 and 0.49 respectively. From the table again, it can be seen

that the LRGDP has a maximum value of 6.86 and a minimum of 5.90. LL also has a maximum of 4.75 and a minimum value of 3.83 and that of LOP was 4.89 maximum and -5.96 minimum, INDEX maximum was 1.40 and its minimum was -0.27 and that of LER, LK and LCPI has a maximum of 1.44, 3.56 and 6.00, and a minimum value of -2.96, 2.55 and 2.15 respectively. The table also depicts that the standard deviation of the variable with that of LRGDP, LLF, LOP, LER and INDEX were 0.32, 0.22, 3.43, 1.21 and 0.58 respectively. Also, LRGDP, LER, LK, LOP and LCPI are negatively skewed while INDEX was positively skewed. From the table, each variable's mean is greater than its standard deviation. This implies that each variable used in the study does not have much variation in itself, which is desirable. The null hypothesis for the Jarque-Bera statistics is it is normally distributed and the alternative hypothesis is not normally distributed. For Jarque-Bera statistics to be normal, the value for it should be more than 5. The Table above showed that the values for the Jarque-Bera were less than 5, which means that we fail to accept the null hypothesis and go for the alternative hypothesis that the variables were not normally distributed. Although, it is not normally distributed there is no remedy for it so this study leaves it like that.

Trend analysis on international commodity price shock and economic growth in Ghana

This unit also presents the trend analysis results which addressed the current study's objective of trend analysis on international commodity price shock and economic growth in Ghana from a period from 1990 to 2016. The figure

below is the trend results or analysis of the index of a commodity price shock and economic growth in Ghana from 1990 to 2016.

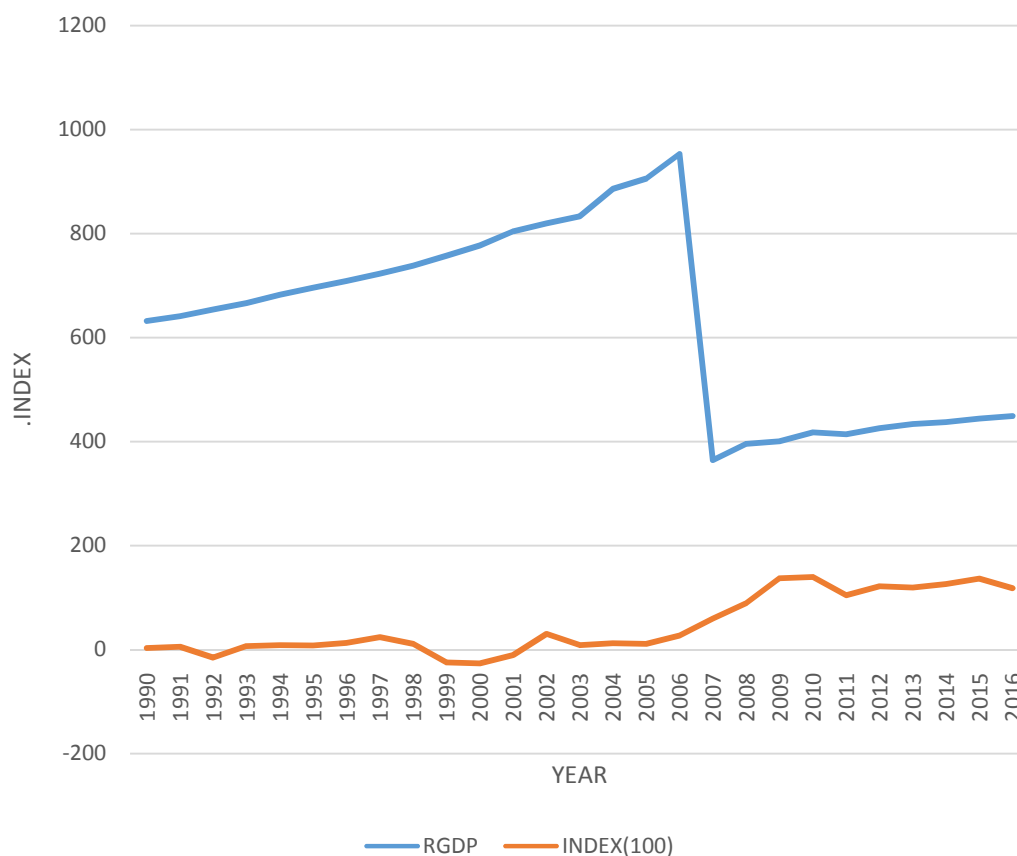


Figure 1: A graph showing the Index of International Commodity Price Shock and Economic Growth.

Source: Field Survey, Onomah (2019)

Figure 1 shows the trend analysis of the index of an international commodity price shock and economic growth in Ghana. The figure depicts that from 1992 to 1997, commodity price shock increase from a negative value of 15.43 to a positive value of 24.02 but, rGDP increase from 654.28 to 722.55. Again, from the year 2000, the price shock increase from a negative figure of 26.57 to 26.94 and rGDP rise from 777.10 to 952.74 in 2006. Moreover, in the

year 2011, international commodity price shock index sees a rise from 104.06 to 136.45 in 2015 while's rGDP depicts a rise from 414.37 in 2011 to 444.55 in 2015. From the figure, it could be seen that when the index of international commodity price shock increases, rGDP also increases and when it falls rGDP also falls. Again, the graph shows a drastic fall in rGDP from the year 2006 to the year 2007 but the same year saw the index rising. This means that there is a direct relationship between the commodity price index and rGDP. Looking at the graph we concluded that there is a trend between commodity price shock and rGDP in Ghana.

Test for Stationarity

There are differences in properties when it comes to stationary and nonstationary procedures and requires different inference procedures. According to Brooks (2008), stationary or otherwise of a series can influence its behaviour and properties. The use of nonstationary data in regression, for instance, when nonstationary variables are regressed on nonstationary variables, it can result in spurious regression.

Although the ARDL approach to cointegration does not necessitate pretesting of the variables for stationarity, it is, however important to perform these test to verify that the variables are not integrated of an order higher than one. This study employed Augmented Dickey-Fuller (ADF) test and the Philip Perron (PP) test to test for the unit root of the variables. The ADF test is conducted by 'augmenting' the preceding variables by adding the lagged values

of the dependent variables Dickey and Fuller while the Philips Perron test is a generalized ADF test allowing autocorrelated residuals (Philips & Perron, 1988).

The tests results from the two procedures are summarized in Table 3 below:

Table 3- Unit root test for both ADF and PP

VARIABLES	PP		ADF		DECISION
	I (0)	I (1)	I (0)	I (1)	
LRGDP	1.44(0.548)	5.47(0.000)	1.50(0.537)	5.46(0.000)	I (1)
LL	2.15(0.227)	4.96(0.000)	2.16(0.224)	4.96(0.000)	I (1)
LOP	5.79(0.000)		3.24(0.030)		I (0)
LER	1.98(0.291)	3.67(0.011)	1.98(0.291)	3.67(0.011)	I (1)
LK	3.06(0.041)		3.08(0.040)		I (0)
LCPI	2.14(0.231)	4.35(0.002)	2.13(0.231)	4.36(0.002)	I (1)
INDEX	0.6224(0.8490)	4.1476(0.0037)	2.9810(0.8990)	4.1767(0.0035)	I (1)

Source: Field Survey, Onomah (2019)

The null hypothesis for this is that the variables have a unit root. From Table 3 LRGDP was not stationary at levels at 5% significance level but was stationary

at first difference I (1) with a t- statistics of (5.4649) and a probability value of (0.0002). LL was also stationary at first difference with a t-statistics of 4.9605(0.0005). Again, the table showed that LOP was stationary at levels with a

t-statistics of 3.2461 and a probability value of 0.0300 and that of LK was stationary at levels with a t-statistics of 3.08453 and a probability value of 0.0000. The table above also depicts that LER was not stationary at levels but was stationary at first difference with a t-statistics and probability of 3.6747(0.0112) respectively. LCPI and INDEX were also stationary at first difference with t-statistics and probability values following respectively, 4.3611(0.0022) and 4.1767(0.0035). The PP test was also used to confirm the ADF test of stationarity in the table above. Since all the variables were stationary at I (0) and I (1), the researcher went ahead to do the ARDL test.

Lag order structure

The Information Criterion used for this study was both the Schwartz Bayesian Information Criterion (SIC) and the Akaike Information Criterion (AIC).

Table 4- lag order selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-17.29525	NA	1.78e-08	2.024604	2.368203	2.115761
1	134.9201	202.9538*	3.95e-12*	-6.576672*	3.827880*	-5.847417*

Source: Field Survey, Onomah (2019)

From table 4, using SIC and AIC as the information criterion, the lag length of the model under study was lag one. This can be also represented using graph

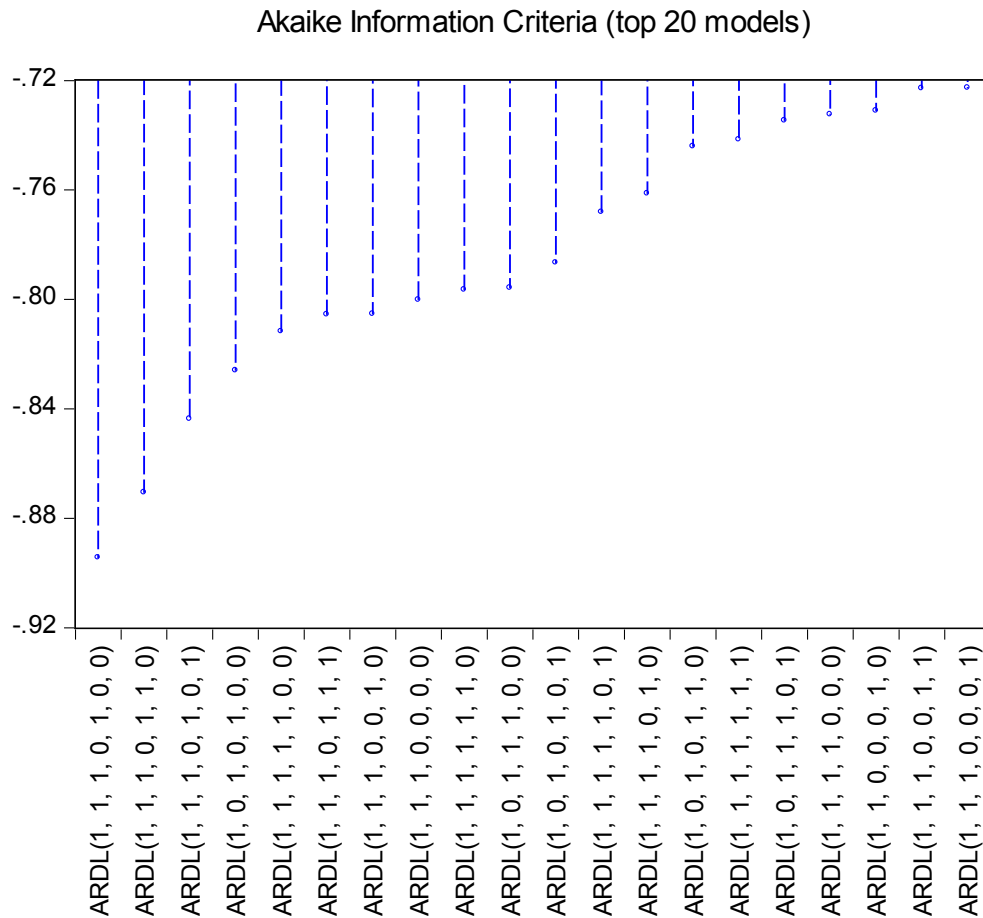


Figure 2: Akaike Information Criteria lag selection graph for top 20 models.

Source: Field Survey, Onomah (2019)

From figure 2, the ARDL (1, 1, 1, 0, 1, 0, 0) has the least Akaike Information Criteria value of (-0.92).

ARDL Model

The ARDL model used in this study was expressed as follows:

Where

$$\begin{aligned} \ln RGDP_t = & a + \beta_0 \ln RGDP_{t-1} + \beta_1 \ln K_{t-1} + \beta_2 \ln L_{t-1} + \beta_3 \ln INDEX_{t-1} + \beta_4 \ln ER_{t-1} \\ & + \beta_5 \ln CPI_{t-1} + \beta_6 \ln OP_{t-1} + \sum_{i=1}^p a_1 \Delta \ln RGDP_t + \sum_{i=0}^p a_2 \Delta \ln K_{t-i} + \sum_{i=0}^p a_3 \Delta \ln INDEX_{t-i} + \\ & \sum_{i=0}^p a_4 \Delta \ln ER_{t-i} + \sum_{i=0}^p a_5 \Delta \ln CPI_{t-i} + \sum_{i=0}^p a_6 \Delta \ln OP_{t-i} + \sum_{i=0}^p a_7 \Delta \ln L_{t-i} + \varepsilon_t \end{aligned} \quad (12)$$

$RGDP_t$ refers to Real Gross Domestic Product (dependent variable),

K_t is Gross fixed capital formation which was used to measure capital

L_t is Labour and will use total labour force as a measurement,

$INDEX_t$ also the index of the three commodity prices namely gold, oil and cocoa,

ER_t represents Real exchange rate,

CPI_t represents Inflation Rate and

OP was Trade Openness.

Bounds Test

After determining the appropriate lag length, the study proceeded to do ARDL bound test to examine the long-run relationships among the variables using the F statistics and the Wald test. Thus, to know if the coefficients of the “unrestricted ECM” part of the estimated model are simultaneously zero. The null hypothesis is thus

$$H_0: \theta_0 = \theta_1 = \theta_2 = \theta_3 = 0 \quad (13)$$

The F test has a non-standard distribution which depends upon: (i) whether the variables included in the ARDL model are to be I (0) or I (1), (ii) the number of regressors, and (iii) whether the ARDL model contains an intercept and or a trend. Two sets of critical values are reported in Pesaran et al. (2001): one set is calculated assuming that all variables included in the ARDL model are I (1) and the other is estimated considering the variables are I (0). If the computed F values fall outside the inclusive band, a conclusive decision could be drawn without knowing the order of integration of the variables (Islam et. al., 2013). To test for the bounds testing, we view the representation of the model below: they are C (1), C (3), C(5) and C (8). These variables are selected from the ARDL model.

Table 5- Wald test

	Value	df	Probability
F-statistic	4.191696	(4, 13)	0.0214
Chi-square	16.76679	4	0.0021

Null Hypothesis: $C(1)=C(3)=C(5)=C(8)=0$

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1)	0.082241	0.201033
C(3)	0.525843	0.360311
C(5)	-0.635309	0.277420

C(8)	0.623861	0.392539
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Restrictions are linear in coefficients.
Source: Field Survey, Onomah (2019).

The null hypothesis is that there is no long-run relationship between the variables. From Table 5, it is clear that we fail to accept the null hypothesis of no long-run relationship in the ARDL (1, 1, 1, 0, 1, 0, 0) at 5% significance level. The p-value (0.0214) was less than (0.05) significant level. Thus, we accept the alternative hypothesis that there is a long run relationship in the ARDL (1, 1, 1, 0, 1, 0, 0) model. The researcher also used the F-statistic to confirm the long run relationship in the model used and this was presented in table 6.

Table 6- Bound test for ARDL model (1, 1, 1, 0, 1, 0, 0)

Test Statistic	Value	K
F-statistic	4.744810	6

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	1.99	2.94
5%	2.27	3.28
2.5%	2.55	3.61
1%	2.88	3.99

Source: Field Survey, Onomah (2019).

From table 6, F- statistic of 4.744810 exceed both the I (0) and I (1) Bounds at the 10%, 5%, 2.5% and 1% significance levels. So, we fail to accept the null hypothesis that there is no long-run relationship that exists in the ARDL model (1, 1, 1, 0, 1, 0, 0) and go for the alternative hypothesis that there is a long run relationship in the ARDL model (1, 1, 1, 0, 1, 0, 0).

Long Run Relationship

This area presents the long-run estimation results of the long-run relationship between international commodity price shock and economic growth in Ghana. The table below shows the long-run results of the ARDL model.

Table 7- Long run results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.385490	1.621751	3.320788	0.0038
LL	0.066443	0.035490	1.872161	0.0680
LOP	0.200472	0.047057	4.260201	0.0000
LER	0.051612	0.294724	0.175120	0.8629
LK	0.149043	0.026461	5.632536	0.0000
LCPI	-0.006505	0.153611	-0.042350	0.9667
INDEX	0.256582	0.104581	2.453428	0.0083
R-squared	0.785733	Mean dependent var		6.400678
Adjusted R-squared	0.714310	S.D. dependent var		0.319841
S.E. of regression	0.170955	Akaike info criterion		-0.463339
Sum squared resid	0.526060	Schwarz criterion		-0.122054
Log likelihood	12.79174	Hannan-Quinn criter.		-0.368681
F-statistic	11.00121	Durbin-Watson stat		1.899001

Prob(F-statistic)	0.000034
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Source: Field Survey, Onomah (2019)

From table 7 the coefficient of determination which is the R-Square was 79% (0.785733). That is to say, only 21% (0.21) of the variations in the real GDP cannot be explained by the regressors in the model. Thus, 79% of the variations in the real GDP can be explained by the regressors in the model. From the Table the Durbin-Watson statistic was 1.90(1.899001) which was close to 2 meaning there was a good indicator of no serial correlation in the model.

From the table, the t-statistic of the INDEX was 2.453428 with a probability value of 0.0083 which is less than the significance value of 0.05 and a positive coefficient of 0.256582. Which means we reject the null hypothesis of no long-run relationship between the variables and accept the alternative hypothesis that there is a long run positive relationship between the INDEX and RGDP. This result indicated that there is a positive and significant relationship between the index of the commodity price shock and economic growth at 5% level of significance. This implies that a decrease of 1% of the index of commodity price shock will lead to a decrease in economic growth by 25.65% and when index of a commodity price shock increase by 1% economic growth will increase by 25.65%. This is consistent with a study conducted by Boheman and Maxén (2015) in their work titled, “Oil price shocks effect on economic growth – Organization of Petroleum Exporting Countries (OPEC) versus non-OPEC economies, using vector autoregressive models (VARs),” reported that a 1% increase in the change of the oil price will increase the GDP growth rate the following year with 0.145%

(OPEC) versus 0.141% (non-OPEC). They again reported that there is a positive relationship between oil price shocks and economic growth. Also, Berument, Ceylon Dogan (2010) examined how oil price shocks affect the output growth in some net-exporting and net-importing countries in the Middle Eastern and North African (MENA) region, with the GDP figures ranging from 1952-2005. They suggest that oil price shocks have a significantly positive effect on the outputs of Algeria, Iran, Iraq, Kuwait, Libya, Oman, Qatar, Syria and the United Arab Emirates, of which the majority are OPEC countries, except Oman and Syria. Meanwhile, oil-price shocks showed no impact on the outputs of Bahrain, Djibouti, Egypt, Israel, Jordan, Morocco and Tunisia, all of which are net-importers. Again, Park and Ratti (2008) concluded that Norway exhibits a positive response in real stock returns to an oil price increase. Similar results were also presented by Medoza and Vera (2010).

Other studies also revealed that there is a negative relationship between a commodity price shocks on economic growth. Malik and Ewing (2009) examined the relationship between stock market and oil prices in Greece using Cointegration, VECM and a multivariate VAR method. They found that oil prices exercise significant negative influence on the stock market. Rentschler (2013) concludes that an increase in oil price volatility can have negative consequences for the economies of both oil exporting and importing countries.

This test result of a positive long-run relationship between the index of a commodity price shock and economic growth contradicts with Malik and Ewing (2009) and Rentschler (2013). This may be due to differences in sample periods

and methodology employed and also Ghana being a net exporter of the commodities used in this study.

Again, the table depicts the t-statistic of the total labour force to be 1.872161 and the coefficient value of 0.066443 and a p-value of 0.0680, which means that there is a positive long-run relationship between total labour force and economic growth but significant at 10% level of significance. This implies that a 1% increase in total labour force will lead to 0.066443% increase in economic growth in the long run but at 10% significance level. This was in line with a study done by Hossain (2012). He revealed that there was a positive relationship between total labour force and economic growth (GDP). A study by Raleva (2014) revealed a mixed relationship between the years used in his research. Some years have negative relationships and others positive relationship.

Furthermore, the table shows the t-statistic of the exchange rate of 0.175120 with a probability value of 0.8629 which was more than the significance value of 0.05 and a positive coefficient of 0.051612. The table revealed the long run relationship between the exchange rate and economic growth. This result indicated that there is a positive and insignificant long-run relationship between exchange rate and economic growth at 5% level of significance. This implies that a decrease of 1% of the exchange rate will lead to a decrease of 0.051612% in economic growth but not significant. This is consistent with a study by Kogid, Asid, Lily, Mulok, and Loganathan (2012) which investigated the effects of the exchange rates on economic growth in Malaysia using time series data spanning from 1971 to 2009. The results of the ARDL bounds test suggest that long-run

cointegration exists between both nominal and real exchange rates and economic growth with a significant positive coefficient recorded for real exchange rate.

Aman, Ullah, Khan, and Khan (2013) explored the relationship between exchange rate and economic growth in Pakistan for period 1976–2010. Using a simultaneous equation model, employing two, and three-stage least square (2SLS and 3SLS) techniques and found that exchange rate has a positive association with economic growth. Tarawalie (2010) main focus is to examine the impact of the real effective exchange rate on economic growth in Sierra Leone. The empirical results suggest that the real effective exchange rate correlates positively with economic growth, with a statistically significant coefficient. The results also indicate that monetary policy is relatively more effective than fiscal policy in the long run, and evidence of the real effective exchange rate causing economic growth was profound. The test results were not inconsistent with other studies and this may be as a result of differences in the methodology employed and the type of variables used.

Also, table 7 shows the t-statistic of the gross fixed capital formation to be 5.632536 with a p-value of 0.0000 which was less than the 5% level of significance and coefficient value of 0.149043. This showed that there is a significant positive long-run relationship between gross fixed capital formation and economic growth. This results revealed that when gross fixed capital formation increased by 1%, economic growth will also increase by 0.149043%. Thus, when we increase gross fixed capital in the country, more businesses will

be established and people will be employed and in return increase growth. This was consistent with a study by Ugochukwu and Chinyere (2013).

Moreover, the t-statistic of the consumer price index was 0.042350 with a probability value of 0.9667 and a coefficient value of 0.006505. The table shows that at 5% level of significance the consumer price index p-value was more than 0.05 which means that there is a negative long-run relationship between consumer price index and economic growth but not significant. The results depicted that when inflation increase by 1%, economic growth will also decrease by 0.006505% but not significant. Thus, the rate of change in the consumer price index which captures macroeconomic instability has an insignificant adverse effect on economic growth in Ghana. This result is in line with theory and empirical literature.

Finally, the t-statistic of Trade Openness was 4.260201 with a p-value of 0.0000 which was less than the significance level of 0.05 and a coefficient value of 0.200472. This means that there is a positive significant long-run relationship between trade openness and economic growth. Thus, they both move in the same direction. The results revealed that increase in trade openness by 1%, will lead to 0.200472% increase in economic growth in Ghana. This means that whenever there is an increase in trade activities in Ghana, economic growth will also increase. These current results validate the trade-led growth hypothesis in the case of Ghana. This study is in line with a study by Keho (2017) and Zarra-Nezhad, Hosseinpour and Arman (2014). They concluded that trade openness has a positive significant long-run relationship with economic growth. Nevertheless, a study by

Rigobon and Rodrik (2005) found that there is a negative relationship between trade openness and economic growth.

The long-run results indicate that any disequilibrium in the model as a result of a shock can be corrected in the long-run by the error correction term. Therefore, the error correction term that estimated the short-run adjustments to equilibrium is generated as:

$$ECT = \ln RGDP - 0.0664 \ln L - 0.200 \ln OP - 0.149 \ln K - 0.052 \ln ER + 0.007 \ln CPI - 0.256582 \text{INDEX} - 5.385C$$

Short Run Relationship

This section captures the short-run estimation results of the short-run relationship between international commodity price shock and economic growth in Ghana. After long-run cointegration result has been estimated the study proceeded to estimate the short-run dynamics relationship among the variables in the model. The table below shows the short-run results of the model.

Table 8-Short-run results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.004151	0.065941	-0.062954	0.9506
D(LL)	0.098230	0.372560	0.263662	0.7954
D(LOP)	0.469263	0.049966	9.391566	0.0053
D(LER)	0.218023	0.282805	0.770931	0.4520
D(LK)	0.055431	0.025824	2.146492	0.0000
D(LCPI)	-0.035891	0.119233	-0.301016	0.7673
D(INDEX)	0.265286	0.092953	2.853978	0.0052

ECT(-1)	-0.605410	0.138612	-4.367659	0.0005
R-squared	0.597390	Mean dependent var		-0.015646
Adjusted R-squared	0.421248	S.D. dependent var		0.202208
S.E. of regression	0.153831	Akaike info criterion		-0.644724
Sum squared resid	0.378623	Schwarz criterion		-0.252040
Log likelihood	15.73669	Hannan-Quinn criter.		-0.540545
F-statistic	3.391529	Durbin-Watson stat		1.889417
Prob(F-statistic)	0.020406			

Source: Field Survey, Onomah (2019).

From table 8 we noted that the coefficient of the error correction term, ECM (-1) is negative and significant and appropriately so since there is a cointegrating relationship amongst the variables. From the above table, the coefficient of the error correction term was around 0.605 and was negative at 5% level of significance. This means that the magnitude of this coefficient implies that nearly 61% of any disequilibrium amongst the variables is corrected within one period (one year). This means that it will take less than two years for the deviations in the market to be corrected in the long-run. In generic terms, the coefficient of ECM (-1) is the parameter indicating the speed of adjustment to the equilibrium level after shock. The sign must be negative and significant to ensure convergence to the long run equilibrium. The rule of thumb is that the larger the error correction term coefficient in absolute terms, the faster the variables equilibrate in the long-run when shocked.

Consistent with the long-run results, the coefficient of the international commodity price shock index has a positive significant effect on economic growth in the short-run. The results from the table showed that a 1% increase in

commodity price shock index will lead to an increase in economic growth by 26.52% in the short-run and a 1% decrease in commodity price shock index will lead to a decrease in economic growth by 26.52%. The study realized that international commodity price shock index has a higher effect on economic growth in the short-run than in the long run. This was in line with a study by Deaton and Miller (1996). They found that commodity prices increase have a positive impact on economic growth in African countries as compared to a commodity price decrease in the short-run. The current study was also in line with a study by Collier and Goderis (2012).

Again, consistent with the long-run results, the coefficient of trade openness maintained its positive sign and statistically significant at 5%. The results indicated that a 1% increase in trade openness will also increase economic growth by 0.469% in the short-run and a 1% decrease in trade openness will also decrease economic growth by 0.469%. This implies that trade openness is vital in economic growth in the short-run than in the long-run. The current study is in line with a study by Zarra-Nezhad, Hosseinpour and Arman (2014) which they found that there is a positive short-run relationship between trade openness and economic growth.

Moreover, the coefficient of gross fixed capital formation also has a positive significant short-run relationship with economic growth at 5% level of significance. The table depicts a coefficient of 0.055431 for gross fixed capital formation. This means that a 1% increase in gross fixed capital formation will lead to 0.055% increase in economic growth in the short-run and a 1% decrease in

gross fixed capital formation will lead to 0.055% decrease in economic growth. This means that in Ghana there is both a positive long-run and short-run relationship between capital and economic growth. This current study is consistent with a study by Ugochukwu and Chinyere (2013).

In addition, total labour force and real exchange rate showed a positive relationship with economic growth in the short-run but not significant. The consumer price index in the short-run maintained its negative relationship with economic growth but this time was not significant. This is in line with a study conducted by Hossain (2012).

Finally, the R-Square of the short-run results shows that about 60% of the variations in the economic growth are explained by the regressors in the model. That is to say that, only 40% of variations cannot be explained by the regressors in the long run. It can also be seen that the Durbin Watson statistic value is closer to 2 (1.9) indicating that there is no problem of autocorrelation.

Model Diagnostics

Serial correlation test

The study also diagnoses the errors of the ARDL (1, 1, 1, 0, 1, 0, 0) for serial correlation. The DW statistics of 2.11 in the Appendix shows that there is a good indication of no serial correlation, but the study further test for this using the Serial Correlation LM Test. The study fails to reject the null hypothesis of no serial correlation in the error terms at the 5% level of significance. The table below shows the serial correlation LM Test results

Table 9- Serial correlation test

 Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.893264	Prob. F(2, 11)	0.4370
Obs*R-squared	3.353268	Prob. Chi-Square(2)	0.1870

Source: Field Survey, Onomah (2019).

The null hypothesis is that there is no serial correlation in the error term. From Table 9 the p-value was (0.4370) which was more than the 5% significance level and therefore, we cannot reject the null hypothesis of no serial correlation in the error terms. Hence, there is no serial correlation in the error terms of this model.

Stability test

Finally, Pesaran (1997) argued that it is extremely important to ascertain the constancy of the long run multipliers by testing the error correction model for the stability of its parameters. This study used the cumulative sum (CUSUM) test and the cumulative sum of square (CUSUMQ) to test for the stability of the parameters.

CUSUM stability test

The stability test results from the CUSUM stability test is explained below.

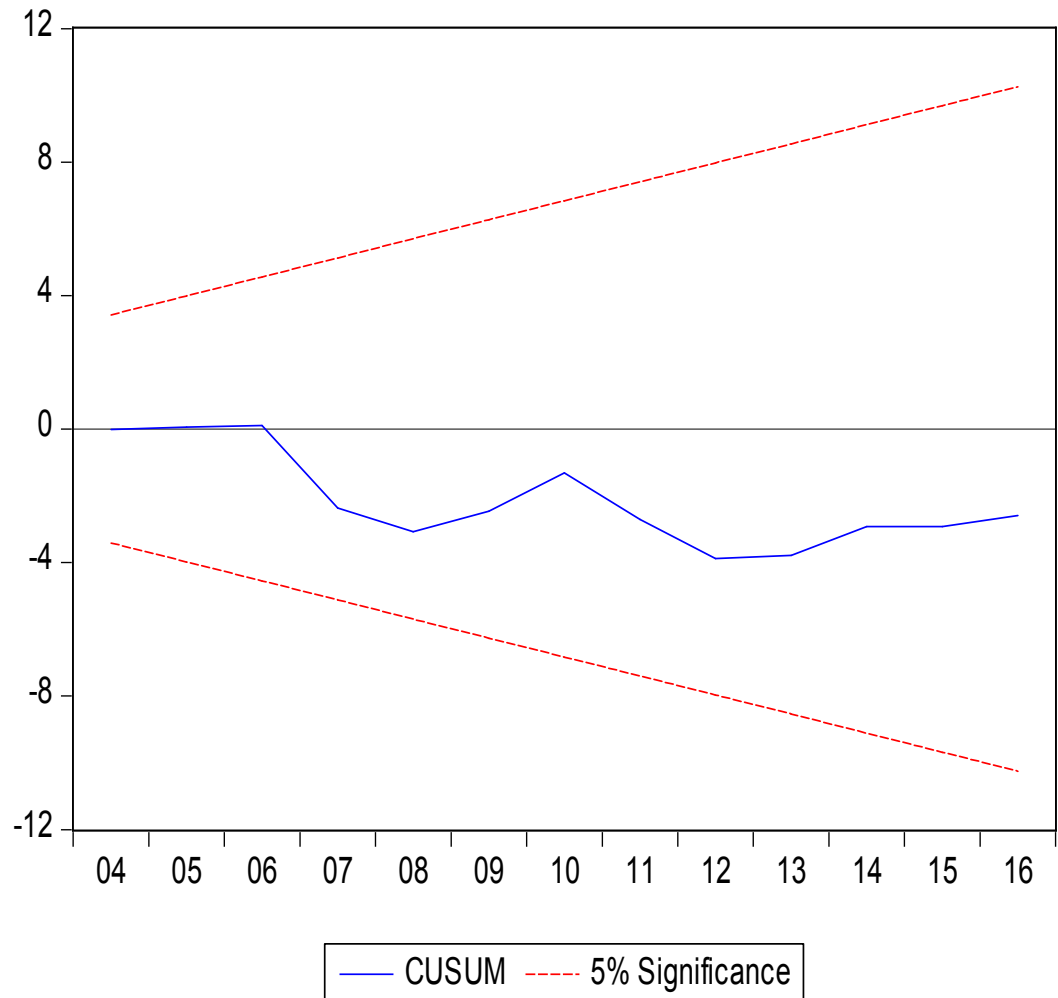


Figure 3: CUSUM stability test

Source: Field Survey, Onomah (2019)

The figure shows that the ARDL model used for the study is stable. From the figure, it clearly shows that the blue curve which is the CUSUM curve is within the red lines indicating that the model is stable at 5% significance level.

CUSUMQ stability test

The stability test results using the CUSUMQ test is also explained below.

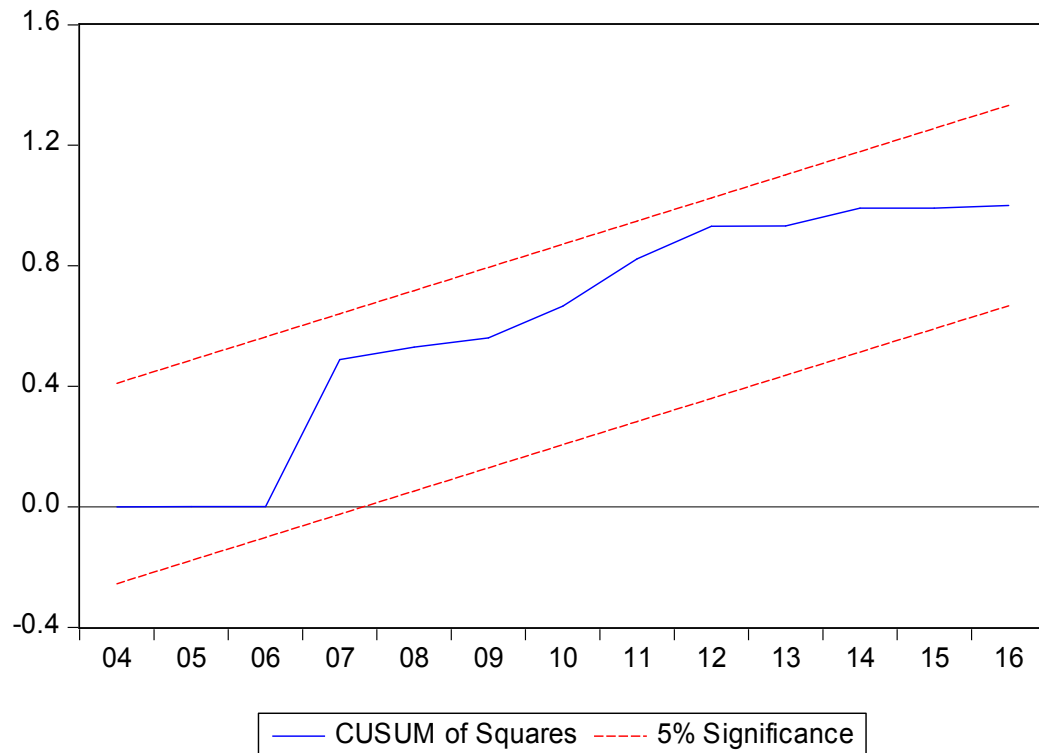


Figure 4: CUSUMQ stability test

Source: Field Survey, Onomah (2019)

The CUSUMQ stability test in Figure 4 above also shows that the model is stable because both the CUSUM and the CUSUMQ curve lie within the 95% confidence boundaries.

Chapter Summary

In this chapter, the results of the study were reported and discussed thoroughly with respect to the research objectives, question and the hypotheses. The study revealed that there is a positive relationship between commodity price shock and economic growth in both short-run and the long-run in Ghana. The trend analysis and the relationships between the variables were studied and discussed. The relationships range from significant to non-significant ones. At the

end of the discussions, the study found that index of commodity price shock has a significant effect on economic growth in Ghana.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

The purpose of this study was to examine the effects of a commodity price shock on economic growth. This chapter covers the summary of the study, a summary of key findings, conclusions and recommendations. It provides a summary of the test techniques, test results and conclusion. It then ends with some recommendations to guide policymakers and researchers in the area of the study and suggestions for further studies.

Summary of the study

The study established that international commodity price shock affects economic growth in Ghanaian. The background to the study was centred on how shock in international commodity prices affects economic growth. The study established that international commodity price shock affects the following variables namely; household, investment, exchange rate, inflation, government revenue, infrastructure development and debt. The objective of the study was to carry out trend analysis on international commodity prices shock and economic growth and also to examine the relationship between international commodity price shocks on economic growth.

The study also reviews related literature on commodity price shock, oil prices, gold prices and cocoa prices and its effect on economic growth. Theories

that underpin these studies were linear/symmetric relationship theory, asymmetry in effect and renaissance growth theory.

The current study adopted a quantitative research paradigm. Secondary data on the variables used were from the central bank of Ghana and World Development Indicator. Annual data were used from 1990 to 2016. The study also used the standard normalization combined with a moving average approach used by Akpokodje (2000) to calculate the international commodity price shock index.

Research question one was analyzed using the excel tool to find the trend between international commodity price shock and economic growth.

Research question two was analyzed using the Autoregressive Distributed Lag (ARDL) model to establish the long-run and short-run relationship between international commodity price shock and economic growth.

The study uses the ADF test and PP test to test for the stationarity of the variables to see if none of the variables was stationary at I (2). Diagnostic test conducted also show that the results of the model passed the test of serial correlation, and the graph of CUSUM and CUSUMQ test show that there is a stability of the parameters.

Summary of key findings

One of the key findings of this study is that, there exists a trend between international commodity price shock and economic growth in Ghana.

Again, the current study revealed that there is a significant positive long-run relationship between the index of commodity price shock and economic

growth in Ghana. The relationship was direct, which means that in the long-run an increase in commodity price shock resulted in an increase in economic growth in Ghana.

Finally, the study also established that there is a significant short-run relationship between international commodity price shock and economic growth in Ghana with a speed of adjustment towards the long-run equilibrium of about 61%.

Conclusions

Findings from this study revealed that there is a trend between international commodity price shock and economic growth in Ghana. This means that when the shock in prices of international commodity fall, economic growth will fall and when it rises, economic growth will rise.

The study was to examine the effects of international commodity price shock on economic growth in Ghana. International commodity price shock poses a challenge for the Ghanaian economy and the world at large, thereby affecting our long-run growth, investment, monetary and exchange rate, debt, infrastructure development and inflation. The study showed a long run and a short-run significant positive relationship between the index of a commodity price shock and economic growth. This means that when the shock in the prices of the commodity rise, economic growth also rises and when the shock in the price fall economic growth falls. The current study is in line with the empirical literature

that there exists a relationship between commodity price shock and economic growth.

Also, the study revealed that capital, labour and trade openness have statistically significant effect on economic growth and CPI and real exchange rate have impact on economic growth but not statistically significant.

Recommendations

Based on the research findings the following recommendations were made:

Since trend exists between international commodity price shock and economic growth, the study recommends for a multidisciplinary approach to help importers and exporters to know the importance of the trend in the commodities they trade especially those into import and export of the commodities under study.

There should be strategies that will help set up more manufacturing companies that will transform our raw materials into semi-finished and finished goods to help add value to the commodities that we export in their raw state.

Policymakers should try and come out with strategies on the benefits of adding values to our raw materials and patronizing our local goods.

Also, measures should be put in place to check the shock in commodity prices to help stabilized the Ghana economy.

The findings also revealed that labour force positively impacts on economic growth. That is when labour force increase, economic growth also increase. The government should promote private sector businesses and creating more jobs for the youth and this will lead to high economic growth.

Finally, since there is a relationship between capital formation and economic growth, the government through the central bank should come out with policies that encourage savings and investment which in return enhance capital formation and consequently increase economic growth.

Suggestions for Future Research

The study has contributed to the understanding of international commodity price shock and its effects on economic growth. However, there is still the need to further analyse the existing knowledge of the variables studied. The effects of international commodity price shock will be better appreciated if it was studied with more than the three commodities used (oil, gold and cocoa). There should be further studies that will use other commodity prices in addition to this to create an index to find the real effects on economic growth. Further studies should be done using different control variables of the determinants of economic growth.

REFERENCES

- Acemoglu, D. (2003). Why not a political coase theorem? Social conflict, commitment, and politics. *Journal of Comparative Economics*, 31(4), 642-650.
- Acemoglu, D., & Pischke, J. S. (1998). Why do firms train? Theory and evidence. *The Quarterly Journal of Economics*, 113(1), 100-109.
- Acemoglu, D., Johnson, S., Robinson, J., & Thaicharoen, Y. (2003). Institutional causes, macroeconomic symptoms: Volatility, crises, and growth. *Journal of Monetary Economics*, 50(1), 118-122.
- Adam, A. M., & Tweneboah, G. (2008). Macroeconomic factors and stock market movement: Evidence from Ghana. *SSRN Electronic Journal*, 7(3), 10-26.
Retrieved from <https://doi.org/10.2139/ssrn.1289842>
- Addison, T., Ghoshray, A., & Stamatogiannis, M. P. (2016). Agricultural commodity price shocks and their effect on growth in Sub-Saharan Africa. *Journal of Agricultural Economics*, 67(1), 50-61.
- Adjasi, C. K. (2009). Macroeconomic uncertainty and conditional stock-price volatility in frontier African markets: Evidence from Ghana. *The Journal of Risk Finance*, 10(4), 342-349.
- Aghion, P., Bacchetta, P., Ranciere, R., & Rogoff, K. (2009). Exchange rate volatility and productivity growth: The role of financial development. *Journal of Monetary Economics*, 56(4), 494-502.

- Aghion, P., Angeletos, G. A., Banerjee, A., & Manova K. (2005). *Volatility and growth: Credit constraints and productivity-enhancing investments* (NBER Working Paper No. 11349), Cambridge, Mass: National Bureau of Economic Research.
- Ahuru, R. R., & James, U. E. (2015). Macroeconomics of oil price volatility. *Journal of Research in National Development*, 13(1), 253-263.
- Akabzaa, T. (2009). Mining in Ghana: implications for national economic development and poverty reduction. *Journal of Development Economics*, 3(2), 25-65.
- Akabzaa, T., & Darimani, A. (2001). Impact of mining sector investment in Ghana: A study of the Tarkwa mining region. *Third World Network*, 4(2), 47-61.
- Akide, A. (2007). Growth implications of oil price variations. *A case study of Nigeria*, 8(2), 20-27.
- Akinley, S. O., & Ekpo, S. (2013). Oil price shocks and macroeconomic performance in Nigeria. *Economía Mexicana Nueva Época*, 2, 570-578.
- Akpokodje, G. (2000). The effect of export earnings fluctuations on capital formation in Nigeria. *African Economic Research Consortium*, 103(15), 13-18.
- Alexeev, M., & Conrad, R. (2009). The elusive curse of oil. *The Review of Economics and Statistics*, 91(3), 586-598.

- Aloui, C., & Jammazi, R. (2009). The effects of crude oil shocks on stock market shift behaviour: A regime switching approach. *Energy Economics*, 31(5), 789-799.
- Aman, Q., Ullah, I., Khan, M.I., & Khan, S. (2013). Linkages between exchange rate and development: An empirical investigation. *American Economic Review*, 91(8), 1395-1401.
- Amoro, G., & Shen, Y. (2012). The determinants of agricultural export: Cocoa and rubber in Cote d'Ivoire. *International Journal of Economics and Finance*, 5(1), 228-232.
- Anderson, K., & Brückner, M. (2012). *Distortions to agriculture and economic growth in sub-Saharan Africa*. Washington, DC: The World Bank.
- Arezki, R., & Gylfason, T. (2011). *Commodity price volatility, democracy, and economic growth*. (CESifo Working Paper No.3619). Resource and Economics, Munich: Center for Economic Studies and Ifo Institute.
- Arezki, R., Dumitrescu, E., Freytag, A., & Quintyn, M. (2014). Commodity prices and exchange rate volatility: Lessons from South Africa's capital account liberalization. *Emerging Markets Review*, 19, 96-105.
- Arouri, M. E. H., & Nguyen, D. K. (2010). Oil prices, stock markets and portfolio investment: Evidence from sector analysis in Europe over the last decade. *Energy Policy*, 38(8), 4528-4539.
- Arouri, M. E. H., & Rault, C. (2012). Oil prices and stock markets in GCC countries: empirical evidence from panel analysis. *International Journal of Finance & Economics*, 17(3), 247-253.

- Arouri, M. E. H., Lahiani, A., & Nguyen, D. K. (2011). Return and volatility transmission between world oil prices and stock markets of the GCC countries. *Economic Modelling*, 28(4), 1815-1825.
- Aryeetey, E., & Asmah, E. (2011). Africa's new oil economies: Managing expectations. *Foresight Africa*, 22(5), 15-30.
- Auty, R. M. (1994). Industrial policy reform in six large newly industrializing countries: The resource curse thesis. *World Development*, 22(1), 11-26.
- Ayelazuno, J. (2014). Oil wealth and the well-being of the subaltern classes in Sub-Saharan Africa: A critical analysis of the resource curse in Ghana. *Resources Policy*, 40(11), 66-73.
- Azizi, F. (2004). Empirical test of the relationship between influence & stock return in Tehran Stock Market. *Journal of Economic Researches*, 13(7), 10-12.
- Baafi A. J., & Oppong K. F. (2010). Globalization and its influence on economic growth performance. *Journal of Finance*, 8(5), 31-42.
- Balke, N. S., & Wynne, M. A. (1996). Supply shocks and the distribution of price changes. *Economic Review-Federal Reserve Bank of Dallas*, 10(3), 50-60.
- Bapna, I., Sood, V., Totala, N. K., & Saluja, H. S. (2012). Dynamics of macroeconomic variables affecting price innovation in gold: A relationship analysis. *Pacific Business Review International*, 5(1), 1-10.
- Bernanke, B. S., Gertler, M., Watson, M., Sims, C. A., & Friedman, B. M. (1997). Systematic monetary policy and the effects of oil price shocks. *Brookings Papers on Economic Activity*, 7(1), 91-157.

- Berument, M. H., Ceylan, N. B., & Dogan, N. (2010). The impact of oil price shocks on the economic growth of selected MENA countries. *The Energy Journal*, 2(3),149-176.
- Blattman, C., Hwang, J., & Williamson, J. G. (2007). Winners and losers in the commodity lottery: The impact of terms of trade growth and volatility in the periphery 1870–1939. *Journal of Development Economics*, 82(1), 156-179.
- Bleaney, M., & Greenaway, D. (2001). The impact of terms of trade and real exchange rate volatility on investment and growth in sub-Saharan Africa. *Journal of Development Economics*, 65(2), 491-500.
- Boheman, H., & Maxén, J. (2015). Oil price shocks effect on economic growth- OPEC versus non-OPEC economies. School of Economics and Management, Lund University. Retrieved from <http://lup.lub.lu.se/student-papers/record/7374279>
- Borensztein, E., De Gregorio, J., & Lee, J. W. (1998). How does foreign direct investment affect economic growth? *Journal of International Economics*, 45(1), 125-135.
- Bourguignon, F., Lambert, S., & Suwa-Eisenmann, A. (2004). Trade exposure and income volatility in cash-crop exporting developing countries. *European Review of Agricultural Economics*, 31(3), 379-387.
- Broda, C. (2004). Terms of trade and exchange rate regimes in developing countries. *Journal of International Economics*, 63(1), 31-58.

- Brooks, C. (2008). *Introductory econometrics for finance*. Cambridge: Cambridge University Press.
- Brückner, M., & Ciccone, A. (2010). International commodity prices, growth and the outbreak of civil war in Sub-Saharan Africa. *The Economic Journal*, *120*(544), 527-534.
- Brunnschweiler, C. N., & Bulte, E. H. (2008). The resource curse revisited and revised: A tale of paradoxes and red herrings. *Journal of Environmental Economics and Management*, *55*(3), 248-264.
- Bulte, E. H., Damania, R., & Deacon, R. T. (2005). Resource intensity, institutions, and development. *World Development*, *33*(7), 1029-1044.
- Calderón, C., & Servén, L. (2014). *Infrastructure, growth, and inequality: An overview*. (Policy Research Working Paper No.7034). The World Bank.
- Capie, F., Mills, T. C., & Wood, G. (2005). Gold as a hedge against the dollar. *Journal of International Financial Markets, Institutions and Money*, *15*(4), 343-352.
- Carlin, W., & Amos, O. A. (2003). Finance, investment and growth. *Journal of Financial Economics*, *69* (7), 191-226.
- Casanova, C., & Garcia-Herrero, A. (2016). *Africa's rising commodity export dependency on China* (BBVA Working Paper No. 16/09), South America, Argentina: Banco Bilbao Vizcaya Argentaria.
- Cavalcanti, T. V., Raissi, M., & Mohaddes, K. (2015). Commodity price volatility and the sources of growth. *Journal of Applied Economics*, *30*(6), 857-875.

- Chang, R., & Fernández, A. (2013). On the sources of aggregate fluctuations in emerging economies. *International Economic Review*, 54(4), 1285-1293.
- Chen, Q., & Lv, X. (2015). The extreme-value dependence between the crude oil price and Chinese stock markets. *International Review of Economics & Finance*, 39(8), 121-132.
- Coakley, G. J. (2014). *The mineral industry of Ghana: Geological survey, minerals information*. Washington, DC: US.
- Coatsworth, J. H., & Williamson, J. G. (2004). Always protectionist? Latin American tariffs from independence to great depression. *Journal of Latin American Studies*, 36(2), 205-232.
- Cody, B. J., & Mills, L. O. (1991). The role of commodity prices in formulating monetary policy. *The Review of Economics and Statistics*, 35(13), 358-365.
- Collier, P., & Goderis, B. (2007). *Commodity prices, growth and the natural resource curse: Reconciling a conundrum* (CSAE Working Paper No.17315). University of Oxford: Munich Personal RePEc Archive (MPRA).
- Collier, P., & Goderis, B. (2012). Commodity prices and growth: An empirical investigation. *European Economic Review*, 56(6), 1241-1260.
- Collier, P., & Gunning, J. W. (1999). Explaining African economic performance. *Journal of Economic Literature*, 37(1), 89-111.

- Conforti, M., Cornuéjols, G., & Zambelli, G. (2010). Extended formulations in combinatorial optimization. *A Quarterly Journal of Operations Research*, 8(1), 29-48.
- Cong, R. G., Wei, Y. M., Jiao, J. L., & Fan, Y. (2008). Relationships between oil price shocks and the stock market: An empirical analysis from China. *Energy Policy*, 36(9), 3544-3553.
- Creswell, J. W. (2002). *Educational research: Planning, conducting, and evaluating quantitative*. Upper Saddle River, NJ: Prentice Hall.
- Creswell, J. W., Plano Clark, V. L., & Garrett, A. L. (2008). Methodological issues in conducting mixed methods research designs. *Advances in Mixed Methods Research*, 2(3), 66-83.
- Creswell, J. W., Hanson, W. E., Clark Plano, V. L., & Morales, A. (2007). Qualitative research designs: Selection and implementation. *The Counselling Psychologist*, 35(2), 236-264.
- Deaton, A. (1999). Commodity prices and growth in Africa. *Journal of Economic Perspectives*, 13(3), 23-40.
- Deaton, A., & Miller, R. I. (1996). *International commodity prices, macroeconomic performance, and politics in Sub-Saharan Africa*. International Finance Section, Department of Economics: Princeton University.
- Dees, S., Karadeloglou, P., Kaufmann, R. K., & Sanchez, M. (2007). Modelling the world oil market: Assessment of a quarterly econometric model. *Energy Policy*, 35(1), 178-191.

- Dehn, J., & Centre for the Study of African Economies. (2000). *Private investment in developing countries: The effects of commodity shocks and uncertainty*. University of Oxford, Institute of Economics and Statistics: Centre for the Study of African Economies.
- Dercon, S. (2004). Growth and shocks: evidence from rural Ethiopia. *Journal of Development Economics*, 74(2), 309-329.
- Dornbusch, R. (1976). Expectations and exchange rate dynamics. *Journal of Political Economy*, 84(6), 1161-1176.
- Easterly, W., Kremer, M., Pritchett, L., & Summers, L. H. (1993). Good policy or good luck? *Journal of Monetary Economics*, 32(3), 459-483.
- El-Anashasy, A. (2006). *Oil prices, fiscal policy, and Venezuela's economic growth*. Washington, DC: University of Washington.
- El-Sharif, I., Brown, D., Burton, B., Nixon, B., & Russell, A. (2005). Evidence on the nature and extent of the relationship between oil prices and equity values in the UK. *Energy Economics*, 27(6), 819-830.
- Erb, C. B. & Harvey, C. R. (2006). The strategic and tactical value of commodity futures. *Financial Analysts Journal*, 62(2), 69-97.
- Eryiğit, M. (2012). The dynamical relationship between oil price shocks and selected macroeconomic variables in Turkey. *Economic Research-Ekonomska Istraživanja*, 25(2), 273-276.
- Fafchamps, M. (2003). *Market institutions in sub-Saharan Africa: Theory and evidence*. Cambridge: MIT press.

- Ferderer, J. P. (1996). Oil price volatility and the macroeconomy. *Journal of Macroeconomics*, 18(1), 16-26.
- Frankel, J. A. (1986). Expectations and commodity price dynamics: The overshooting model. *American Journal of Agricultural Economics*, 68(2), 344-348.
- Ghosh, A., Saidi, R., & Johnson, K. (1999). Who moves the Asia- pacific stock market- US or Japan? Empirical evidence based on the theory of cointegration. *The Financial Review*, 4(1), 150-159.
- Gilbert, C. L. (2009). Cocoa market liberalization in retrospect. *Review of Business and Economics*, 54(3), 294–312.
- Gilbert, C. L., & Tabova, A. (2004). *Commodity prices and debt sustainability*. The University of Trento, Italy: University of Trento Press.
- Gisser, M., & Goodwin, T. H. (1986). Crude oil and the macroeconomy: Tests of some popular notions. *Journal of Money, Credit and Banking*, 18(1), 95-103.
- Gorajek, A., & Rees, D. (2015). Lower bulk commodity prices and their effect on economic activity. *RBA Bulletin*, September, 31-38.
- Gurara, D. Z., & Ncube, M. (2013). *Global economic spillovers to Africa: A GVAR approach*. Abidjan: African Development Bank.
- Gylfason, T., Herbertsson, T. T., & Zoega, G. (1999). A mixed blessing: natural resources and economic growth. *Macroeconomic Dynamics*, 3(2), 214-225.

- Hamilton, J. D. (1983). Oil and the macroeconomy since World War II. *Journal of Political Economy*, 91(2), 238-248.
- Hansen, B. E. (1992). Testing for parameter instability in linear models. *Journal of Policy Modeling*, 14(4), 527-533.
- Harri, A., Nalley, L., & Hudson, D. (2009). The relationship between oil, exchange rates, and commodity prices. *Journal of Agricultural and Applied Economics*, 41(2), 501-510.
- Harris, R., & Sollis, R. (2003). Applied time series modelling and forecasting. *The Review of Economics and Statistics*, 35(6), 43-61.
- Hausmann, R., & Rigobon, R. (2003). *An alternative interpretation of the resource curse: Theory and policy implications* (NBER Working Paper No. 9424). Cambridge: National Bureau of Economic Research.
- Hoffmaister, A. W., Roldós, J. E., & Wickham, P. (1998). Macroeconomic fluctuations in sub-Saharan Africa. *Staff Papers*, 45(1), 132-160.
- Hooker, M.A. (2002). Are oil shocks inflationary? Asymmetric and nonlinear specifications versus changes in regime. *Journal of Money, Credit and Banking*, 34(5), 540-561.
- Hospers, G. J. (2005). Joseph Schumpeter and his legacy in innovation studies. *Knowledge, Technology & Policy*, 18(3), 20-37.
- Hossain, M. I. (2012). *Total labour force and GDP of Bangladesh: An analysis in between the year 2002-2009* (MPRA Working Paper No.37557). Retrieved from <https://mpra.ub.uni-muenchen.de/37557/>

- Hua, P. (2012). Real exchange rate and economic growth in China. *Journal of Reviews on Global Economics, 1*, 89-105.
- Hummels, D. (2007). Transportation costs and international trade in the second era of globalization. *Journal of Economic Perspectives, 21*(3), 131-154.
- Institute for Fiscal Studies (2015). *Ghana: Impact of the falling crude oil prices*, 5, 5-23.
- Islam, M. A., Ali, R., & Ahmad, Z. (2011). Is modified Jones model effective in detecting earnings management? Evidence from a developing economy. *International Journal of Economics and Finance, 3*(2), 116-125.
- Iwayemi, A., & Fowowe, B. (2011). Impact of oil price shocks on selected macroeconomic variables in Nigeria. *Energy policy, 39*(2), 603-612.
- Jacoby, H. G., & Skoufias, E. (1997). Risk, financial markets, and human capital in a developing country. *The Review of Economic Studies, 64*(3), 321-335.
- Jalil, A., Ma, Y., & Naveed, A. (2011). The finance-fluctuation nexus: Further evidence from Pakistan and China. *Journal of Chinese Economics and Finance, 1*(5), 67-85.
- Jawadi, F., Arouri, M. E. H., & Bellalah, M. (2010). Nonlinear linkages between oil and stock markets in developed and emerging countries. *International Journal of Business, 15*(1), 19-24.
- Jensen, R. (2000). Agricultural volatility and investments in children. *American Economic Review, 90*(2), 399-404.

- Jiménez-Rodríguez, R., & Sánchez, M. (2005). Oil price shocks and real GDP growth: empirical evidence for some OECD countries. *Applied Economics*, 37(2), 221-228.
- Kapusuzoglu, A. (2011). Relationships between oil price and the stock market: An empirical analysis from the Istanbul stock exchange (ISE). *International Journal of Economics and Finance*, 3(6), 99-107.
- Keho, Y. (2017). The impact of trade openness on economic growth: The case of Cote d'Ivoire. *Cogent Economics & Finance*, 5(1), 133-140.
- Kilian, L., & Park, C. (2009). The impact of oil price shocks on the US stock market. *International Economic Review*, 50(4), 1267-1287.
- Kogid, M., Asid, R., Lily, J., Mulok, M., & Loganathan, N. (2012). The effect of exchange rates on economic growth: Empirical testing on nominal versus real, *The IUP Journal of Financial Economics*, 10 (1), 1-17.
- Kopiński, D., Polus, A., & Tycholiz, W. (2013). Resource curse or resource disease? Oil in Ghana. *African Affairs*, 112(449), 583-601.
- Koren, M., & Tenreyro, S. (2007). Volatility and development. *The Quarterly Journal of Economics*, 122(1), 243-287.
- Kose, M. A., & Riezman, R. (2001). Trade shocks and macroeconomic fluctuations in Africa. *Journal of Development Economics*, 65(1), 55-80.
- Kraay, A., & Ventura, J. (2007). Comparative advantage and the cross-section of business cycles. *Journal of the European Economic Association*, 5(6), 1300-1333.

- Laurenceson, J., & Chai, J. C. (2003). *Financial reform and economic development in China*. Edward Elgar Publishing.
- Lee, K. S., Ni, R. & Ratti, A. (1995). Oil shocks and macroeconomy: The role of price variability. *Energy Journal*, 16(4), 39-56.
- Leedy, D. P., & Ormrod, E. J. (2010). *Research: Planning and design (9th ed.)*. Merrill, Upper Saddle River: Pearson Education Inc.
- Lopez-Murphy, P., & Villafuerte, M. (2010). *Fiscal policy in oil-producing countries during the recent oil price cycle* (IMF Working Paper No.1). Retrieved from <https://ssrn.com/abstract=1555440>
- Lunieski, C. (2009). Commodity price volatility and monetary policy uncertainty: A garch estimation. *Issues in Political Economy*, 19(7), 108-124.
- Maghyereh, A., & Al-Kandari, A. (2007). Oil prices and stock markets in GCC countries: new evidence from nonlinear cointegration analysis. *Managerial Finance*, 33(7), 449-460.
- Malik, F., & Ewing, B. T. (2009). Volatility transmission between oil prices and equity sector returns. *International Review of Financial Analysis*, 18(3), 95-100.
- Mark, G., Olsen, T., & Mysen, Y. (1994). Impact of oil price variation on the growth prospects of African economies. *African Economic Writer's Publication*, 2(5), 80-83.
- Marquis, M. H., & Cunningham, S. R. (1990). Is there a role for commodity prices in the design of monetary policy? Some empirical evidence. *Southern Economic Journal*, 9(6), 394-412.

- Matthews, C. (2016, January 26). Ghana's success story built on gold, oil and cocoa is foundering. *The Finder*, p. 10.
- Mehrara, M., & Oskoui, K. N. (2007). The sources of macroeconomic fluctuations in oil exporting countries: A comparative study. *Economic Modelling*, 24(3), 365-379.
- Mendoza, E. G. (1995). The terms of trade, the real exchange rate, and economic fluctuations. *International Economic Review*, 5(3), 101-137.
- Miller, J. I., & Ratti, R. A. (2009). Crude oil and stock markets: Stability, instability, and bubbles. *Energy Economics*, 31(4), 559-568.
- Mork, K. A. (1989). Oil and the macroeconomy when prices go up and down: an extension of Hamilton's results. *Journal of Political Economy*, 97(3), 740-744.
- Narayan, P. K., & Narayan, S. (2010). Modelling the impact of oil prices on Vietnam's stock prices. *Applied Energy*, 87(1), 356-361.
- North, D. C. (2003). The new institutional economics and third world development. *The New Institutional Economics and Third World Development*, 3(5), 31-40.
- Obi, B., Nurudeen, A., & Wafure, O. B. (2009). An empirical investigation of the fisher effect in Nigeria: A cointegration and error correction approach. *International Review of Business Research Papers*, 5(5), 96-109.
- Odhiambo, N. M. (2008). Financial depth, savings and economic growth in Kenya: A dynamic causal linkage. *Economic Modelling*, 25(4), 704-713.

- Okyere, E., & Mensah, A. C. (2016). Cocoa production in Ghana: trends and volatility. *International Journal of Economics, Commerce and Management*, 5 (3), 462-471.
- Olomola, P. A., & Adejumo, A. V. (2006). Oil price shock and macroeconomic activities in Nigeria. *International Research Journal of Finance and Economics*, 3(1), 28-34.
- Omar, K. M. R., & Kabir, S. H. (2013). The relationship between commodity prices and exchange rate in light of global financial crisis: Evidence from Australia. *International Journal of Trade, Economics and Finance*, 4(5), 265-270.
- Oriakhi, D. E., & Osaze, I. D. (2013). Oil price volatility and its consequences on the growth of the Nigerian economy: An examination (1970-2010). *Asian Economic and Financial Review*, 3(5), 683-694.
- Papapetrou, E. (2001). Oil price shocks, the stock market, economic activity and employment in Greece. *Energy Economics*, 23(5), 511-532.
- Park, J., & Ratti, R. A. (2008). Oil price shocks and stock markets in the US and 13 European countries. *Energy Economics*, 30(5), 2587-2608.
- Peersman, G., & Van Robays, I. (2009). Oil and the Euro area economy. *Economic Policy*, 24(60), 633-651.
- Pesaran, M. H., & Pesaran, B. (1997). *Working with Microfit 4.0: Interactive econometric analysis; (Windows version)*. Oxford: Oxford University Press.

- Pesaran, M. H., & Shin, Y. (1998). An autoregressive distributed lag modelling approach to cointegration analysis. *Econometric Society Monographs*, 31, 371-413.
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3), 289-326.
- Pesaran, M. H., Shin, Y., & Smith, R. P. (1999). Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American Statistical Association*, 94(446), 621-634.
- Philips, P.C.B. and Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, 75 (2), 335–346.
- Raddatz, C. (2007). Are external shocks responsible for the instability of output in low-income countries? *Journal of Development Economics*, 84(1), 155-187.
- Raleva, S. (2014). Impact of labour on economic growth in Bulgaria (1991-2013). *Economic Alternatives*, 3(2), 5-14.
- Raguindin, C. E., & Reyes, R. G. (2005). *The effects of oil price shocks on the Philippine economy: a VAR approach*. University of the Philippines School of Economics: University of the Philippines.
- Rentschler, J. E. (2013). Oil price volatility, economic growth and the hedging role of renewable energy. *Journal of Development Economics*, 6(2), 20-32.

- Rigobon, R., & Rodrik, D. (2005). Rule of law, democracy, openness, and income: Estimating the interrelationships. *Economics of Transition*, 13(3), 533-564.
- Rodriguez, F., & Sachs, J. D. (1999). Why do resource-abundant economies grow more slowly? *Journal of Economic Growth*, 4(3), 277-303.
- Rosenzweig, M. R., & Wolpin, K. I. (1993). Credit market constraints, consumption smoothing, and the accumulation of durable production assets in low-income countries: Investments in bullocks in India. *Journal of Political Economy*, 101(2), 223-244.
- Ross, M. L. (2012). *The oil curse: how petroleum wealth shapes the development of nations*. Princeton: Princeton University Press.
- Roumasset, J. A. (1976). *Rice and risk. Decision making among low-income farmers*. North Holland: North Holland Publ. Comp.
- Sachs, J. D., & Warner, A. M. (1999). The big push, natural resource booms and growth. *Journal of Development Economics*, 59(1), 43-76.
- Schumpeter, J. A. (1932). *The theory of economic development*. Cambridge: Harvard University Press, MA.
- Seemuang, A., & Romprsert, S. (2013). Gold value movement and macroeconomics. *Journal of Business and Economics*, 6(3), 752-760.
- Semboja, H. H. H. (1994). The effects of an increase in energy efficiency on the Kenya economy. *Energy Policy*, 22(3), 217-225.

- Sharma, G. D., & Mahendru, M. (2010). Impact of macroeconomic variables on stock prices in India. *Global Journal of Management and Business Research*, 10(7), 19-24.
- Shrestha, M. B., & Chowdhury, K. (2005). *ARDL modelling approach to testing the financial liberalisation hypothesis*. (University of Wollongong, Australia). Retrieved from <http://www.uow.edu.au/commerce/wpaper>.
- Šimáková, J. (2011). Analysis of the relationship between oil and gold prices. *Journal of Finance*, 51(1), 651-662.
- Skerman, R., & Della Maggiora, D. (2009). *Johansen Cointegration Analysis of American and European Stock Market Indices: An Empirical Study*. Unpublished master's thesis, Department of Finance, Lund University.
- Solow, R. M. (1956). A contribution to the theory of economic growth. *Quarterly Journal of Economics*, 62(5), 540-552.
- Takizawa, M. H., Gardner, M. E., & Ueda, K. (2004). *Are developing countries better off spending their oil wealth upfront?* (IMF Working Paper No. 4-141). International Monetary Fund.
- Tarawalie, A. B. (2010). Real exchange rate behaviour and economic growth: evidence from Sierra Leone. *South African Journal of Economic and Management Sciences*, 13(1), 8-25.
- Thomas, C. D., Cameron, A., Green, R. E., Bakkenes, M., Beaumont, L. J., Collingham, Y. C., & Hughes, L. (2004). Extinction risk from climate change. *Nature*, 427(69), 145-152.

- Ugochukwu, U. S., & Chinyere, U. P. (2013). The impact of capital formation on the growth of Nigerian economy. *Research Journal of Finance and Accounting*, 4(9), 36-42.
- Unctad, T. (2005). *Development report. United Nations, New York and Geneva: The United Nations Conference on Trade and Development.*
- Wahyuni, D. (2012). The research design maze: Understanding paradigms, cases, methods and methodologies. *Journal of Applied Management Accounting Research*, 10(1), 69-80.
- Wang, M. L., Wang, C. P., & Huang, T. Y. (2010). Relationships among oil price, gold price, exchange rate and international stock markets. *International Research Journal of Finance and Economics*, 47(7), 80-89.
- World Bank (2007). *World Development Report: Agriculture for Development.* Washington, DC: The World Bank.
- World Bank (2008). *Country brief: Ghana.* Washington DC. The World Bank.
- World Bank. (2014). *World development indicators on online (WDI) database.* Retrieved May 12, 2017, from World Bank: <http://www.worldbank.org>
- Yahyazadehfar, M., & Babaie, A. (2012). Macroeconomic variables and stock price: new evidence from Iran. *Middle-East Journal of Scientific Research*, 11(4), 408-415.
- Zarra-Nezhad, M., Hosseinpour, F., & Arman, S. A. (2014). Trade-growth nexus in developing and developed countries: An application of extreme bounds analysis. *Asian Economic and Financial Review*, 4(7), 915-928.

APPENDIX A

ARDL OUTPUT

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LRGDF(-1)	0.082241	0.201033	0.409093	0.6891
INDEX	0.064185	0.178992	0.358593	0.7257
LCPI	0.106545	0.137554	0.774567	0.4525
LDINV	0.011886	0.357960	0.033206	0.9740
LDINV(-1)	0.623861	0.392539	1.589299	0.1360
LER	0.066295	0.261042	0.253965	0.8035
LINFD	0.542901	0.266426	2.037720	0.0625
LINFD(-1)	-0.635309	0.277420	-2.290061	0.0394
LOP	0.046129	0.446585	0.103292	0.9193
LOP(-1)	0.525843	0.360311	1.459414	0.1682
C	0.845143	2.033269	0.415657	0.6844
R-squared	0.806160	Mean dependent var		6.397226
Adjusted R-squared	0.733976	S.D. dependent var		0.326244
S.E. of regression	0.132931	Akaike info criterion		-0.894404
Sum squared resid	0.229720	Schwarz criterion		-0.354462
Log likelihood	21.73284	Hannan-Quinn criter.		-0.751157
F-statistic	12.55341	Durbin-Watson stat		2.109738
Prob(F-statistic)	0.000040			

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

