UNIVERSITY OF CAPE COAST

EXCHANGE RATE, INTEREST RATES, INFLATION RATE AND GROSS

DOMESTIC PRODUCTION (GDP) IN GHANA

NTEKO TORWOKO KWESI ENUAMEH

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BY

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DECLARATION

Candidate's Declaration

I hereby declare that this dissertation 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: Nteko Torwoko Kwesi Enuameh

Supervisors' Declaration

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

Supervisor's Signature………………………… Date……………..……….

Name: Dr. Anokye M. Adam

ABSTRACT

This study aimed at examining the effects of exchange rate, interest rate and inflation rate on Gross Domestic Product in Ghana between the periods of 1990 to 2015. Quarterly Data was collected from the World Bank Development Indicators and Bank of Ghana websites. The research made use of the Autoregressive Distributed Lag and Vector Error Correction Model for data estimation and analysis using the E-views 9.0 package. The results for the study showed that there exist significant effects of the exchange rate, interest rate and inflation rate on GDP in Ghana. This implies that, the variable are highly related and change in any of the variables would have an impact on the GDP of Ghana. From the Vector Error Correction Model, all the variables were significant with the exception of Foreign Direct Investment (FDI), using the rule of the thumb. The real effective exchange rate was found to have a negative effect on GDP in the long run analysis. Interest rate (MPR) which is also an explanatory variable had a negative impact on GDP. Inflation also recorded a negative effect on GDP. In addition, other control variables introduced name; gross fixed capital formation, household consumption and Government expenditure all had a positive effect on the GDP. The study recommends that stakeholders in macroeconomic planning take into serious account the dynamics and consider the effects of all the variable that matter on the GDP of the country. In order to achieve this, the key players in the formulation of macro-economic policies will have to take into account, the various effect of the variables namely, exchange rate, interest rate, inflation rate, Government expenditure, household consumption and gross fixed capital formation on GDP of Ghana.

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DEDICATION

To Mr Eugene Eyomekor Osie-Tutu

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LIST OF ACRONYMS

GDP   Gross Domestic Product

MPC   Monetary Policy Committee

BOG   Bank of Ghana

IMF   International Monetary Fund

ERP   Economic Recovery Programme

ISSER   Institute of Statistical Social and Economic Research

SAP   Structural Adjustment Programme

ECOWAS   Economic Community of West African States

CEPS   Customs Exercise and Preventive Service

IRS   Internal Revenue Service

VATS   Value Added Tax Service

RAGB   Revenue Agencies Governing Board

WDI   World Development Indicators

MNEs   Multinational Enterprises

FDI   Foreign Direct Investment

IS-LM   Investment Savings, Loanable Funds Market (money market)

ROI   Return to investment

U.K   United Kingdom

U.S   United States of America

OLS   Ordinary Least Square

APR   Annual Percentage Rate

PLS   Partial Least Squares

ARDL   Autoregressive Distribution Lag

VECM   Vector Error Correction Model

CHAPTER ONE

INTRODUCTION

Background of study

In recent times, the growth of Gross Domestic Product is an important indicator of a country's development (Mendoza, 1995). In the process of achieving a high rate of growth, developed and developing countries are changing their policies. It is well known that Gross Domestic Product (GDP) is an important indicator of economic growth and includes all the economic activity of a country within a year. The economic activity of a country is divided into three important sectors, namely the primary, secondary and tertiary sectors. The primary sector includes agriculture and allied activities, forestry, mining and quarrying; the secondary sector includes manufacturing industries, construction and electricity, water and gas supply; and the last (tertiary sector or service sector) includes banking, insurance, transport and communication, trade and commerce (Mendoza, 1995). The world's growth performance continuously increases from time to time. However, there are a number of debates that provide a significant theory over the trend break and identify how these macro and micro factors affecting economic growth. Fischer (1993) believes that the exchange rate, inflation rate and interest rate are the main factors that destabilize the economy. This is because these variables are highly volatile and if not controlled will lead to economic instability.

Ghana is one of the developing countries aiming to achieve a higher rate of growth through its policies. These policies are directed toward achieving a stable economy, reduce poverty and inequality, and increase our

GDP, among others. The performance of the economy of Ghana, as measured by the rate of growth of GDP, has been registering positive values since the latter part of the 1980s. For instance, the rate of growth of GDP, averaged at an annual rate of 3.5% per annum in the 1980s; 4.3% in the 1990s; 6.2% from 2000-2010 and 11.45% from 2011-2012 (World Bank Development Indicators, 2014). In order to maintain this impressive trend of positive growth rates, and also achieve an accelerated growth rate which will propel the country into the desired higher middle income status of a benchmark per capita income of $3975 (that will create more employment, reduce poverty and inequalities) the macroeconomic framework must be well strengthened.

Macroeconomic instability has always concerned itself with exchange rate volatility, high inflationary pressures and high interest rate making the cost of borrowing high. This is in line with Mendoza (1995) who asserted that these three macro indicators are interdependent and hence economists must strive to control these variables concurrently. Exchange rate volatility distorts market trends given the expectation from traders. On the other hand, high exchange rate cripples domestic currency and often leads to high inflationary pressures since many will have to import at a higher cost (Alhassan & Fiador, 2014). The high interest rate also increases the cost of borrowing, crippling businesses and often results in high prices of goods. In an economic sense, any attempt to achieve a stable macroeconomic indicator often results in instability of another indicator if that indicator is not taken into consideration. It is becoming increasingly difficult to ignore the impact of fluctuation of the exchange rate, interest rate and inflation on GDP in Ghana.

Problem Statement

In Ghana, monetary and fiscal policies are aimed at sustaining high growth rates in terms of GDP together with low inflation by way of price stability. Ghana has been targeting a single-digit average inflation rate since its independence. It has been a practice by most developing and middle-income countries as a monetary policy measure. The Monetary Policy Committee (MPC) of the Bank of Ghana on 15th May, 2011 reduced its policy rate from 13.5% to 13% as a result of improvement in the economy. This was expected to trigger a reduction in the interest rate of the commercial banks and consequently make the cost of borrowing cheaper (Angalega & Antwi, 2013). According to Boyd, Levine & Smith (2001), at low to moderate rates of inflation, increases in the rate of inflation lead to markedly lower volumes of bank lending to the private sector, lower levels of bank liabilities outstanding and significantly reduced levels of stock market capitalization and trading volume. This finding relates to a cross-sectional examination of a five-year (1960- 1965) average observation of bank liabilities outstanding, stock market capitalization and market volume after the period of lending credits to the private sector.

According to the monetary policy of the Bank of Ghana, the inflation rate is normally targeted towards a single digit since studies have shown that, a higher inflation rate will negatively affect the GDP. This is evidenced by the statement by two researchers (Nsiah, Fayissa, & Wu, 2016) who stated (in their write up) that, a high rate of inflation above 14% would hurt GDP. Gyimah-Brempong and Gyapong (1993) who examined the exchange rate and economic growth conclude that (what – is it that high exchange rate) has a

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deleterious effect on economic growth rate. The negative effect is imparted through reduced investment and constriction of international trade.

Graham, Leary and Roberts (2015) believe these major indicators (exchange rate, interest rate and inflation rate) are correlated and as such, any attempt to address a particular indicator will result in more volatility in other indicators. Ghana experienced such a similar economic imbalance somewhere 2015 and this led the then government to seek a bailout from International Monetary Fund (IMF).

There has been minimal empirical work that specifically looks into factors that affect GDP taking into the consideration exchange rate, interest rate and inflation rate interdependently in developing economies. The target of Ghana becoming a higher middle income earning country by 2020 will require a much consolidated economic programme and policies to address the problems of exchange rate volatility, high interest rate and inflationary pressures that affect our macroeconomic stability. These macroeconomic instabilities create a situation of economic uncertainty, where the economy does not seem to have settled in a position of steady equilibrium, thereby making it difficult to make predictions and inhibiting good planning (Fasanya, Onakoya, & Agboluaje, 2013).

According to the World Bank group, the latest total global GDP report released in 2017 computed from values produced from 2016 stood at $75.5 trillion dollars. The United States of America, China, Japan, Germany and France, are the top five countries which have the largest economies in the world constituting more than half the global GDP weight chronicled for 192 countries.

The Ghana data website provides up to date information on the GDP growth of Ghana from 1960 to the year 2017. Ghana's worse GDP growth occurred in the year 1975 recording a value of -12.45 %. In 2011 Ghana recorded its best GDP growth since attaining republican status at a value of 14.05%. These values might have emerged in correlation to the corresponding economic management of micro and macroeconomic factors such as real effective exchange rate, inflation rate and interest rate. However, the extent to which the combination of these factors affects Ghana's GDP growth has not been fully explored hence the need to undertake this project to make such knowledge available. Result obtained from this project could serve as basis for conducting further studies in the future with the aim of optimising conditions for accelerating Ghana's economic performance while in the short term the impact of this work is expected to influence decision of policymakers, investors, business analysts, government agencies and the general business community to appreciate how their activities influence the economic indicators and by extension to GDP growth or decline.

General objective

The general objective of the study is to examine the effect of the exchange rate, interest rate and inflation rate on Gross Domestic Product in Ghana.

The specific objectives are to:

1. Examine the long and short-run effects of real effective exchange rate on GDP in Ghana

2. Examine the long and short-run effects of the real interest rate on GDP in Ghana

3.   Examine the long and short-run effects of the inflation rate on Ghana's GDP.

Hypotheses

The following alternative hypotheses were tested.

1.   The exchange rate has a significant effect on Ghana's GDP.

2.   The real interest rate has a significant effect on Ghana's GDP.

3.   The inflation rate has a significant effect on Ghana's GDP.

Significance of the Study

This work is determined to establish the synergistic effect of interest rate, inflation and exchange rate on Ghana's GDP. Available literature mostly concentrates on the individual effect of some macroeconomic indicators on GDP within time periods of 5, 10 and 20 years intervals.

This work however diverse greatly in that approach into two main ways.

1. It combines the effect of interest rate, inflation and exchange rate on Ghana's GDP.

2. The work examined documents from 1960 to 2018

This trajectory would give a comprehensive assessment of how the Ghanaian Economy has performed under varied political and social seasons. When the anticipated body of knowledge is established, future extrapolations would be done with much more confidence and precision.

Scope of Research

This work is a rudimentary part of the overall impact of varied activities and principles that shape Ghana's economic outlook. These activities

and principles include growth trends, sectoral analysis, fiscal monetary and financial sector development, labour, employment and livelihood among other factors are the driving forces of economic growth and stability the world over. This study to a large extent may have a high positive correlation with the listed factors however it was limited to issues concerning; inflation, interest rate and exchange rate on Ghana's GDP.

Organization of the Study

This study has been divided into five (5) chapters. Chapter One (1) considers an introduction of this research with a background of the study, statement of the problem, objectives of the research, the significance of the study, statement of hypothesis and scope of research. Chapter Two (2) reviewed both theoretical and empirical literature available for the study. The literature review examines related articles and to provide information in relation to this study so as to look for a better approach to this research. Chapter Three (3) discusses the methodology together with the estimation techniques, and issues relating to data collection and analysis of the study. Chapter Four (4) formulates the estimated model, analysis and presentation of empirical results. Finally, Chapter Five (5) deals with the conclusion, policy implications, limitations of the study and directions for future research.

CHAPTER TWO

LITERATURE REVIEW

Introduction

The chapter gives a review of the related literature of the study. A brief overview of the Ghanaian economy was discussed followed by some conceptual definition in this research. This chapter analyses the phenomenon of the important issues in the literature and doing that the study discussed the review of the literature, both theoretical and empirical on the various works of some authorities in the field of the exchange rate, interest rate and inflation rate on the Gross Domestic Product (GDP).

General Overview of the Ghanaian Economy

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

change in the composition of goods and services, improvements in sector contributions and social developments (Killick, 2010).

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

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

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

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

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

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

Gross Domestic Products and Macroeconomic Indicators in Ghana

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

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

In addition, poor expenditure management processes coupled with weak revenue forecasting capacity, corruption, unaccounted spending, pork-barrel spending as well as political business cycle have resulted in a situation where it had been almost consistently difficult to synchronize revenue and spending targets for a very long period (Alesina & Tabellini, 1990). These challenges have been compounded by an over-reliance on the export of primary raw materials such as gold, cocoa, timber, to mention a few whose prices are highly volatile, donor support for planning budget expenses, lack of flexibility in fiscal management due to significant resource earmarking and statutory payments, corruption and political business cycle. These have led to persistent levels of fiscal deficits compared to the experience of other countries within the ECOWAS sub-region and led to increasing levels of inflationary financing and increasing public debt. Unfortunately, the commercialization of oil in Ghana is yet to have a significant impact on the fiscal performance of the country (Asiamah, Akosah & Owusu-Afriyie, 2014; Osei, R. D., & Telli, H., 2017).

Ghana was on the path toward fiscal balance courtesy of the enhanced HIPC relief offered by its donor creditors since 2001 (Amo-Yartey, 2014). To utilize the fiscal account, there was the introduction of some new taxes by authorities to engineer a fiscal consolidation and this successfully saw the overall level of fiscal deficit (cash) decrease from 9.81 percent of GDP in 2000 to 2.96 percent of GDP in 2005 (Asiamah *et al*., 2014). The stock of public debt which stood at 187.3 percent of GDP in 2000, declined to 26.2 percent of GDP in 2006. Total interest payments on the debt as a share of total revenue reduced from 42.3 percent in 2000 to 15.3 percent in 2005, moderating the debt service burden on public finance. Subsequently, events that have unfolded from 2006 up till now have however exposed the inherent weaknesses in Ghana's revenue mobilization capacity and poor public financial management systems, notwithstanding decades of structural reforms in these areas (Aryeetey et al., 2000).

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

Another area of concern is the issue of the fallen price of its primary exports. The country either benefits from these export commodities through foreign revenue or taxes on export earnings. Since our major commodities are exported in raw form and their prices highly unstable, targeted revenue from

this sector does not ensure significant revenue mobilization for the growth of the country (Deaton, 1999).

In 2009, the three tax revenue agencies, the Customs Excise and Preventive Service (CEPS), the Internal Revenue Service (IRS), the Value Added Tax Service (VATS) and the Revenue Agencies Governing Board (RAGB) Secretariat were merged in under the Ghana Revenue Authority Act 2009, Act 791. This was done with the view to bring a number of benefits to taxpayers and tax administration; reduced administrative and tax compliance cost; better service delivery; improved departmental information flow; a holistic approach to domestic tax and customs administration; and enhanced revenue mobilization (Addison & Osei, 2001). This notwithstanding, the envisaged benefits from the restructuring of the revenue agencies are yet to be realized. In particular, this made possible by adjusting for oil revenues for 2011-2013 that contributed an average of 1.46 percent of GDP, as well as the upward revision in GDP numbers in 2011.

The government's spending since 2006 has been generally high relative to both domestic revenue outturns and annual spending ceilings. The surge in spending in 2006 was to tackle the energy crises in 2006, which probably started the new round of fiscal profligacy. Ghana celebrated 50 years of independence in 2007, with its associated large spending programs. Then the onset of the global financial crisis, coupled with some domestic activity widened significantly the gap between the end year spending outturn and the annual target. Spending restraint aimed at achieving some consolidation from 2009 was short-lived, as spending ceilings breached consistently from 2010 to 2012. In addition, the implementation of the Single

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Spine Pay Policy stretched the narrowed fiscal space which had placed public finance under severe stress resulting in austere fiscal measures in the 2014 budget statement aimed at some adjustment (Asiama et al., 2014). It is observed that a disproportionately significant amount of government's spending has been executed in favour of recurrent expenditure, denying the country the opportunity to invest in critical capital projects to spearhead its growth agenda.

Ghana's fiscal operations are also susceptible to donors (both bilateral and multilateral) honouring their pledges to support the budget. There were many instances including but not limited to perceived lack of domestic efforts and shortfalls in meeting some required conditions, donors failed to honour their pledges that normally had a severe toll on the economy. Donor support since 2006 has generally seen significant shortfalls, which have been replaced with higher levels of domestic financing with its resultant crowding-out effects. The country's inability to synchronize its spending programmes with its revenue mobilization capacities has resulted in persistent fiscal deficit levels at variance with programmed limits (Addison & Osei, 2001). The fiscal targets have been consistently breached, a blow to the country's consolidation effort, except in 2007, It makes sense that years of running budget deficits with overshooting annual deficit targets have built some momentum in the evolution of the stock of public debt. The total public debt that amounted to US$5,296.57 million (26.1 percent of GDP) in 2006, increased to US$ 7,988.79 million (36.1 percent of GDP) in 2008 and further surged to US$18,067.45 million (46.5 percent of GDP) and US$23,454.55 million (55.2 percent of GDP) in 2012 and 2013 respectively.

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

Theoretical Review

This segment of the work acknowledges gives an overview of Solow's growth theory.

Solow's growth theory

The theoretical model specification for this study relied on the growth model by Solow (1956). The neoclassical growth model is based on a large number of contemporary theoretical 7 and empirical studies conducted on economic growth. The model was extensively used because it hinges on the essential role it plays in bringing together and incorporating a number of studies in public finance macro and international economics. This model, as a result, enjoys a comprehensive usage in aggregate economic analysis. The fundamental argument of Solow (1956) was that there will be no hostility between natural and unwarranted growth rates when production takes place normally under conditions of variable proportions and constant returns to scale. The system can adjust itself to any given growth rate of labour force and ultimately move towards a steady-state proportional expansion. The Solow growth model, portray that the only drivers of economic growth, in the long run, are the accumulation of labour and capital, with no role for tax or any

other policies. However, changes in tax structures can have a bearing on the long run levels of GDP growth, with the effects occurring over a transitional period towards a new equilibrium. The length of such transitions is in principle uncertain, but given considerable adjustment costs of capital or education, it is imaginable that it can take decades to reach a new equilibrium. Nonetheless diverse roles for public policies arise, in more recent models of endogenous growth. For instance, Lucas (1988), explains that policies and institutions can have a direct effect on the long-run economic growth rate.

Gross Domestic Product

The Gross Domestic Product (GDP) is one of the important indicators used to measure the growth of a country's economy. It represents the total dollar value of all goods and services produced over a specific time period; you can think of it as the size of the economy. Economic production, performance and growth are basically represented by GDP. It, therefore, has a large impact on nearly everyone within an economy. A significant change in GDP, whether up or down, usually has a significant effect on the standard of living (GDP per Capita) and the stock market. It's easy to understand why; a bad economy usually means lower earnings for companies, which translates into lower stock prices. Investors really worry about negative GDP growth, which is one of the factors economists use to determine whether an economy is in a recession.

GDP considers the monetary measure of final goods and services that is, those that are bought by the final user produced in a country in a given period of time (say a quarter or a year). It counts all of the output generated

within the borders of a country. GDP comprises of goods and services produced for sale in the market and also include some nonmarket production, such as defense or education services provided by the government. For the purpose of this study, Gross Domestic Product (Constant LCU) obtained from world Development Indicators was used as a proxy for Gross Domestic Product used in the research. The variables were quarterlies and log transformation was applied to ensure linearity.

Real Effective Exchange Rate

The exchange rate is the price of a country's currency expressed in terms of one unit of another country's currency. There are different types of exchange rate regimes but in Ghana, we operate the managed floating exchange rate regime where the forces of demand and supply of goods and services determine the exchange rate but the government intervenes when the need comes. In measuring the exchange rate we also use the multilateral rate where the averages of a number of countries that are the major trading partners' currencies are weighed against the cedi. The main reason for using the multilateral rate as a measure is that the cedi can appreciate against one foreign currency like the dollar and at the same time depreciate against another foreign currency such as the euro due to different terms of trade and the different type of foreign policy that Ghana has with them.

The exchange rate is very vital in this study because its rate determines the level at which the country trades with other countries. Its relationship with economic growth is a direct one. Thus, a higher exchange rate means a depreciation of the local currency. Depreciation stimulates exports in the local economy by increasing export and thereby increases in the

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current account balance (X-M) holding imports constant. This ultimately increases national income hence economic growth. Pinto (1986) shows that by the early 1980s, the black market premium was as high as 500% a misalignment that was not sustainable. Following severe foreign exchange and economic crises dating from the 1960s to the early 1980s, she instituted a far-reaching economic recovery program, including foreign exchange and trade reforms beginning in 1984. Currently, Ghana is considered by economists to be one of the few economies in sub-Saharan Africa that are performing satisfactorily. The coefficient of the exchange rate can, therefore, be positive or negative.

Real Interest Rate

An interest rate is a rate at which interest is paid by a borrower for the use of money that they borrow from a lender in the market. It is mostly confused with the rate of return, which is the gain on investment of savings. The interest rates are influenced by macroeconomic factors. In economics, an interest rate is a monetary policy tool that stipulates how much the Central Bank should change the nominal interest rate in response to changes in inflation, output, or other economic conditions. In particular, the monetary policy rate is often interchanged with the real interest rate. Taylor (1993) recommends a relatively high-interest rate (a "tight" monetary policy) when inflation is above its target or when output is above its full-employment level, in order to reduce inflationary pressure. It recommends a relatively low interest rate ("easy" monetary policy) in the opposite situation to stimulate output. The real interest rate is believed to effects GDP through either Investment or speculative demand for money. This study proxy real interest

rate by the monetary policy rate obtained from the bank of Ghana (BOG) quarterly times series.

Inflation Rate

Inflation is used in the model as an explanatory variable that explains changes in the economic growth rate. Inflation, which is defined as the persistent and appreciable increase in the general price level, affects several macroeconomic variables such as the interest rates, the balance of payment position among others, all of which affect the growth of the economy. If the general price level increases, the cost of borrowing (interest rate) increases, reducing the level of investment in the economy. This is because of the inverse relationship between investment and interest rates. With the reduced investment, the level of the output of the economy (GDP) is also reduced. Inflation thus affects the growth of the economy. However, under stabilizing inflation or low level of inflation there is significant economic growth, therefore not only is inflation a decreasing function of growth but also can be a leading indicator of growth. Under high inflation rate growth of an economy is obscured but favourable under stabilizing inflation or policy control inflation. Inflation should hence be included in estimating the relationship with economic growth. Consequently, we expect the coefficient of inflation to positive or negative.

Gross Fixed Capital Formation (Domestic Investment)

Investment is one of the macroeconomic variables that affect the Gross Domestic Product on theoretical and empirical growth models. Investment (capital stock) is the asset including machinery, buildings, and vehicles used in

production. Investment has been examined using different indicators including, gross fixed capital formation (physical capital), stock market, etc. However, this research used gross fixed capital formation includes improvement in land, plant, machinery and equipment purchase and the construction of roads, etc. Physical capital, in other words, refers to any non-human asset made by humans and then used in production. Summers and Heston (1991) have shown support for the prediction. A high investment role is associated with a high income per person. More capital means more production and more production means more output and hence growth. Investment is included in the model because the accumulation of capital stock remains one key variable in traditional and modern theories determining GDP. The bulk of theoretical and empirical evidence indicates that the relationship between economic growth and the capital stock is positive (Hoover & Perez, 2004). Consequently, the study expects the coefficient of capital stock to be positive.

Private Household Consumption

Household final consumption expenditure is an important variable in the national account's use of output or expenditure accounting in Gross Domestic Product. It is a significant part of aggregate demand (GDP) at the macroeconomic level. There are two components of consumption in the basic model: induced consumption (which is affected by the level of income) and autonomous consumption (which is not). Household consumption expenditure consists of the expenditure incurred by resident households on individual consumption of goods and services, such as rent, food, clothing, and transportation, among others. It also includes various kinds of imputed

expenditure of which the imputed rent for services of owner-occupied housing (imputed rents) is generally the most important one. The household sector covers not only those living in traditional households but also those people living in communal establishments, such as retirement homes, boarding houses and prisons. Household final consumption expenditure is however not an exhaustive measure of the goods and services consumed by households because government spending and subsidies on households are not included.

Final Household Consumption (current LCU) was used as a measure for private household Consumption obtained from WDI. The Gandolfo approach was used to quarterlies the annual series.

Government Expenditure

General government spending, as a share of GDP and per person, provides an indication of the size of the government across countries. General government spending generally consists of central, state and local governments, and social security funds. The large variation in this indicator highlights the variety of countries' approaches to delivering public goods and services and providing social protection, not necessarily differences in resources spent. Government spending or expenditure includes all government consumption, investment, and transfer payments. In National Income Accounting the acquisition by governments of goods and services for current use, in order to directly satisfy the individual or collective needs of the community, is classed as government final consumption expenditure. Government acquisition of goods and services intended to create future benefits, such as infrastructure investment or research spending, is classed as government investment (government's gross capital formation).

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These two types of government spending, on final consumption and on the gross capital formation, together constitute one of the major components of Gross Domestic Product. Government spending can be financed by government borrowing, seigniorage, or taxes. Changes in government spending are a major component of fiscal policy used to stabilize the macroeconomic business cycle. The study adopted general government expenditure (current US$) as a measure of Government expenditure obtained from WDI. This was further quarterlies using the Gandolfo approach.

Foreign Direct Investment

Foreign direct investment refers to long-term participation by country A into country B. It usually involves participation in management, joint venture, transfer of technology and expertise (Shim J. K. et al, 1995). Foreign direct investment plays an important role in driving economic growth through an increase in production levels. It has been acknowledged as the most crucial factor in enhancing economic development and the standard of living for emerging economies. It has also been suggested that a foreign corporate presence generates positive externalities such as improvement in human capital and local institutions According to Tang, Selvanathan, and Selvanathan (2008), multinational enterprises (MNEs) diffuse technology and management know-how to domestic firms. When FDI is undertaken in high-risk areas or new industries, economic rents are created accruing to old technologies and traditional management styles. These are highly beneficial to the recipient country. In addition, FDI helps in bridging the capital shortage gap and complement domestic investment especially when it flows to high-risk areas of new firms where domestic resources are limited. The almost universal

belief in the growth-enhancing effects of FDI is demonstrated by the scramble of governments to attract foreign investment with all kinds of incentive packages (Asafu-Adjaye, 2005). Consequently, the study expects the coefficient of FDI to be positive.

Based on the empirical literature and justification above, the expected signs of the coefficients are: $a_1 > 0 \ or \ < 0, a_2 < 0, a_3 < 0, a_4 > 0, a_5 > 0, a_6 > 0, a_7 > 0$.

Theoretical Model

Theoretically, GDP can be viewed in three different ways:

● The *Output or production approach* sums the "value-added" at each stage of production, where value-added is defined as total sales less the value of intermediate inputs into the production process. For example, flour would be an intermediate input and bread the final product; or an architect's services would be an intermediate input and the building the final product.

● The *expenditure approach* adds up the value of purchases made by final users—for example, the consumption of food, televisions, and medical services by households; the investments in machinery by companies; and the purchases of goods and services by the government and foreigners.

● The *income approach* considers the incomes generated by production—for example, the compensation employees receive and the operating surplus of companies (roughly sales fewer costs).

GDP in a country is usually calculated by the national statistical agency, which compiles the information from a large number of sources. In Ghana GDP is calculated by the Ghana Statistical Service. In making the calculations, however, most countries follow established international

standards. The international standard for measuring GDP is contained in the *System of National Accounts*, 1993, compiled by the International Monetary Fund, the European Commission, the Organization for Economic Cooperation and Development, the United Nations, and the World Bank.

IS-LM Model
Origin

The IS-LM model was developed by Harrod & Meade (2015) as a macroeconomic model to determine the equilibrium output of an economy (GDP). The development of the model as a result of an article presented in June 1936 by David Champernowne and W. Briam Reddaway followed by three papers presented to an Econometric Society session at New College, Oxford on 26 September 1936. This new method of determining the gross output of an economy came to simplify the aggregate demand analysis of John Maynard Keynes' General Theory of Employment, Interest, and Money to small systems of simultaneous equations. The IS-LM model also provides us with a framework that can be used in policy analysis and implementation in a country. The teaching of economics was shaped by the diagram that Hicks labeled SI-LL. Alvin Hans then renames as IS and LM curves in the year 1949. Indeed the coming forth of this model was attributed to Hicks, it is also important to know that he was privy to Harrod's paper for the system of equations and Meade's paper for notation before writing his own.

The model

The IS-LM model shows the intersection between two curves to determine the total output in a given economy graphically. The IS or the investment curve may be a variation of the income-expenditure model which

includes the market interest rates (demand), the liquidity preference/money provide equilibrium (LM) on the opposite hand curve represents the number of cash accessible for investment (supply). The combination of this model explains the decisions made by investors when it comes to investments with the amount of money available and the interest they will receive on their investment. Equilibrium in the model arrives when the amount invested by an investor equals the amount available to invest. Even though the IS-LM has witnessed many criticisms, the model has been one of the main tools for macroeconomic teaching and policy analysis especially in the developed economies and the field of economics.

The IS-LM model describes the mixture demand of the economy victimization the connection between output and interest rates. In associate degree economy wherever there's no governing, we have a tendency to expect that an increase in charge per unit can reduce combination demand within the merchandise market, sometimes investment demand and/or demand for durable goods. This lowers the amount of output and ends up in leveling the amount demanded with the amount created. The condition explained on top of equals to the condition that in associate degree economy planned investment equals saving. The negative relationship between charge per unit and output is thought because of the IS curve. The second relationship deals with the money market, wherever the amount of cash demanded will increase with combination financial gain and reduces with the charge per unit.

The IS Curve

The IS curve is a locus of combinations of real income (Y) and interest rate (r) that yields equilibrium in the goods or product market, with the

assumption that firms are willing to supply any amount that is demanded in the market. The IS, therefore, shows the combination of income(Y) and interest rate (r) that ensures equilibrium in the goods market that the total demand of a given economy must be equal to the supply. Mathematically express as:

$$Yd(y,r) = Y$$

The $Yd(y,r)$ on the left hand represents income and the Y, which in this case is the total consumption of goods and services, and the Y on the right-hand side is the total supply in the economy. The above equation confirms basic national accounting identity that quantity supplied in the market must be equal to the income it creates in the market. Hence we expect the total demand (GDP) in the economy is the summation of consumption demand, investment demand, government demand, and net foreign demand. Mathematically written as:

$$GDP = Cd + Gd + Id + NXd$$

Where Cd, Id, Gd, and Nxd represent the consumption demand, investment demand, government demand, and net export respectively. The net export is the difference between the export demand and the import demand of a country. It will be negative if import demand exceeds the export demand and vice versa.

The LM Curve

The LM curve, on the other hand, shows the combinations of real income (Y) and interest rate (r) that equilibrate the money market, given the economy's nominal money supply M and price level P. Hence, the LM curve represents all the possible values of income(Y) and the rate of interest r that

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must be combined to ensure the equilibrium in the money market is achieved. The equilibrium in the market is realized when the total money demand is equal to the total real money supply in the market. Mathematically:

$$Md(y,r) = \frac{M}{P}$$

Where Md is the total money demand and $\frac{M}{P}$ is the total real money supply.

In deriving the LM curve, the real money supply is assumed exogenous. Hence, any change in the money supply will cause a shift in the curve. The money demand on the hand is assumed to positively related to income (Y) and inversely related to the rate of interest (r) making the LM curve an upward sloping curve. The diagram below shows how the IS-LM model determines GPD (Y*) in an economy which is the intersection of the IS-LM curves.

Figure 1: *IS-LM Curves*

From the diagram above, the equilibrium output (GDP) is set at the intersection of the IS-LM at E. One major criticism of the IS-LM model was given by Kim (2014) in his paper "Critique of the IS-LM model: commercial enterprise deficits, Loanable funds, Keynesians Cross and IS-LM" that was meant to debate some problematic aspects that IS-LM has once coped with commercial enterprise deficits, particularly when considering loanable funds model. Several others have targeted on its assumptions for criticism of IS-LM where Minseong Kim in the main critique touched on the basic modeling nature of the model. To mention specifically, he argued that normal IS-LM analysis is in contradictory nature to a co-occurring equilibrium system.

Empirical Review

The driving forces of growth and development of every economy include indicators such as exchange rate and monetary policies, which comprise interest rate and inflation rate. The extent to which these indicators influence growth especially in developing countries depends on how they are related. There is a vast number of empirical literature on how these indicators influence GDP. Below are some of them:

Exchange Rate and Economic Developments

Kolapo and Ajayi (2012) examined the impact of exchange rate volatility for the period 1986-2011 on macroeconomic performance in Nigeria. They revealed that the exchange rate is positively related to Gross Domestic Product. Prior to the study of Kolapo and Ajayi, Akinlo (2001) had investigated and reported the impact of exchange rate depreciation on output and inflation in Nigeria using quarterly data for the period 1970-1995. They estimated an impulse response function, which shows that exchange rate

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depreciation has an expansionary effect on output in both the 15 medium and long-term, but had a contractionary effect in the short run.

Report from neighbouring countries such as those chronicles by (Obansa et al, 2013) conducted in Nigeria to examine the connectedness between exchange rate and economic growth for the period 1970-2000. They revealed that the exchange rate contributes significantly to economic growth. They further emphasized that Nigeria should embark on exchange rate liberalization to enhance more growth. Similar researches to the works of Obansa and his colleagues might have induced the change in the status quo of Ghana's exchange market operations.

Both the intra-national and international trade and payments system in Ghana has metamorphosed significantly from a controlled system to a more liberalized system. Following several years of pursuing a restrictive foreign exchange rate regime, Ghana finally adopted the flexible exchange rate system as part of its economic reforms in 1983. The short-term of this policy shift was a sharp increase and improvement in Ghana's external trade performance and advanced external trade visibility fortified with competitiveness this observation was consistent with the works of. The reforms in foreign trade and payments facilitated and improved the balance of payments issues and helped the course of poverty reduction through increases in rural incomes (Asenso-Okyere et al, 1997). The softening in conditions of the exchange rate market encouraged the availability of foreign exchange to domestic enterprises to import needed goods; raw, semi-finished or finished materials such as spare parts and inputs to boost production local capacity building and promote economic growth.

Barely 10 years into a more liberalized system from 1983 there was unstable and rapid depreciation of the exchange rate. This phenomenon raised concerns about the negative effect of the liberalization policy on the growth of domestic enterprises in the country and questioned the adaptation of the policy and its usefulness to the Ghanaian economy. A classical observation was for instance, between 1990 and 2000, the Ghanaian cedi depreciated annually on average by 36.3% together with an average annual inflation rate of 29.3% and average lending rate of 38.5%, it became difficult for domestic enterprises to undertake fair and effectively competitiveness with overflowing competing imported goods. At the same time, the dominance of primary commodities in the country's export was largely raw materials including; cocoa, unprocessed minerals (example Gold, bauxite, iron) and timber makes response to the exchange rate depreciation insignificant leading to increased trade deficits, which in turn exerts pressure on the exchange rate and domestic prices. The snail-paced growth of the manufacturing sector has contributed enormously to the drop in the sectors' contribution to national output and this situation has a positive correlation with the external trade imbalance and exchange rate constraints. Adebiyi and Dauda (2009) further stressed the importance of the manufacturing sector on economic prosperity, they employed the error correction model to argue on the contrary the assertion by other researchers that liberalizing trade enhances growth in the industrial sector in Nigeria and the exchange rate market to be stabilized for the period 1970 -2006. They indicated that the index of industrial production is positively related to real export. When real export increases by one percent it will lead to a 12.2 percent increase in the index of industrial production. Hence, the deregulation policy

will enhance export positively when the exchange rate depreciates. Apart from the abysmal performance of the manufacturing sector other challenges such as high cost of credit and unstable domestic prices contribute immensely to the poor exchange change rate competitiveness. The three most common suggestions that are often cited for addressing the external trade challenges of the country include; firstly the need to add value to the primary export commodities to be in the forms of semi-finished or finished goods, secondly development of local taste for local products and thirdly the integration of the Economic Community of West African States (ECOWAS) market to promote intra-regional trade. However, the arguments on standard and quality and prices of local products are cited as the paramount reason for the high patronage of imported goods. In addition, due to the proximity of the member states ECOWAS as well as their accessibility to the almost similar type of resources with less variation within sub-regional trade activity does not seem to be making any great headways.

Ghana's major exports which are still dominated by unprocessed primary commodities are mainly exported to countries including the UK, France, Italy and Netherlands while Ghana's imports are mainly from China, Nigeria and the United States.

Inflation and Economic Growth

Blanchard (2000) defines inflation in economic terms as the sustained increase in the price level of goods and services in an economy over a period of time.

Countries the world over consider high and stable economic growth and low inflation as two of the main objectives of macroeconomic policy.

Most authorities agree that macroeconomics perceived as low inflation was essential for economic growth. However, Munir and Mansur (2009) observed that there exist diverse views about the relationship between economic growth and inflation in such a way that it invites numerous interest for debate. Mallik and Chowdhury (2011) reported evidence from two major schools of thought, on the one hand, structuralists to believe that inflation is necessary for economic growth on the other hand monetarist believe that inflation is harmful to economic growth.

Ghosh and Phillips (1998) argue it is undeniable that high inflation is bad for growth in an economy, but there are fewer consensuses about the effect of moderate inflation. They revealed a statistically and economically significant inverse relationship between inflation and economic growth, which holds at all but the least inflation, rates using panel regressions, which is a control for non-linearity specification.

Stockman 1981 advanced a model he called the equilibrium growth model' which was ranked on the assumption of cash in advance constraint which in basic terms can be stated that investment and real money have complementary effects on each other. A contradictory view to the equilibrium growth model' is the Mundell-Tobin Effect a combined theory that evolved from the works of Mudell (1963) and Tobin (1965) this theory argues that the increase in nominal interest rate caused by inflation makes an investment more profitable than consumption that will have ripple effect to cause an increase in capital accumulation which will lead to economic growth, in other words, people who invest in businesses will receive their returns in monetary form thus investment and real money balances will be reduced by inflation paving

the path for inflation to negatively affect economic growth. The Mundell-Tobin Effect has been augmented by findings of some scholars such as De Gragario(1992) who studied some 12 countries in Latin America by analyzing data from 1950 to 1985 by employing the generalizing the least-squares he established a negative relationship between economic growth and inflation rate. Fisher (1993) after analyzing data from 93 nations concluded that economic growth is negatively associated with the rate of inflation and that inflation reduces growth in productivity and investment.

He noted that high inflation is not consistent with sustained economic growth. Borro (1995) after conducting empirical studies on data gathered from 100 countries from 1960-1990 concluded that significantly negative relation exists between inflation and growth, practically a 10% increase in the average inflation per capita GDP growth rate in the range of 0.2 to 0.3 percentage points. The equilibrium growth model receives attention again when Mallik and Chowdhury (2001) conducted a short and long-run dynamic analysis of four Asian Countries using inflation and economic growth as the major factors. The study found a long-run positive correlation between growth and inflation for the four Countries. Other scholars who worked on this subject had results suggesting no correlation between economic growth and inflation. Paul et al(1997) was a classic example when he reported a study he conducted on 70 countries using data available from 1960 to 1989, the study suggested no relationship between growth and inflation for 40% of the sample, 20% of sample produced bidirectional effect and 40% of the sample produced unidirectional effect. Inflation-growth analysis conducted on Turkey by

Erbaykal and Kuyan (2008) revealed there was no long-run effect of inflation on Growth.

Hasanov et al (2010) investigated the effect of inflation on economic growth for the period 2000-2009 in Azerbaijani economy using a threshold model in their analysis. He showed that in Azerbaijani, economic growth has a non-linear relationship with the level of inflation. There was a 13-threshold level of inflation for GDP growth. The study concluded that there exists a positive relationship between inflation and GDP. Espinoza *et al.* (2010) found that a 10 percent threshold level of inflation for GDP growth, was about 10 percent with the (exception of industrialized countries with a lower threshold level). The estimates of their results suggested that when there is a 13 percent high inflation, real non-oil GDP declined by 207 percent in each year.

In the case of Ghana, Frimpong and Oteng-Abayie, (2010) indicated an 11 percent threshold effect of inflation on economic growth between 1960 and 2008. In their study, they drop the growth rate of the aggregate labour force and money supply growth and had a robust 11 percent insignificant threshold inflation level with close coefficients using OLS models. They further opined that inflation is still significant when there is a relatively lower threshold level. The outcome of their study emphasized the need to include the analysis of this study to deal with lower threshold levels in search of that evidence.

Interest Rate and Economic Growth

According to Investopedia (2018) interest rate is the amount of charge expressed as a percentage of principal by a lender to a borrower for the use of

assets. Interest rates are hypothetically noted on annual bases known as the Annual Percentage Rate (APR). The assets borrowed could include cash, consumer goods and large assets such as vehicles or buildings.

Nicholas (2009) studied the relationship between interest rate liberalization and economic growth. He examined the dynamic impact of interest rate reforms on economic growth and empirical results from the study show that there is strong evidence for the positive impact of interest rate liberalization on financial deepening.

Di Giovanni & Shambaugh (2008) examined the relationship between interest rates in major industrial countries and annual real output growth in other countries. The study indicated in the domestic economy that, high foreign interest rates cause a decreasing effect on annual real GDP growth, however, this effect is centered on countries with fixed exchange rates.

Orabi & Saymeh (2013) explored the effect of real GDP, interest rate, and inflation on real economic growth in Jordan. The study Orabi & Saymeh (2013) employed a set of econometric tools such as Unit root, Co-integration test, Granger Causality, ARCH effect, Ljung-Box Q statistic, and GARCH model. The findings indicated that GDP was affected by interest rate and the real growth rate was affected by the inflation rate. But there was a reverse relationship between the interest rate and real growth rate. Hence this study proved that interest rate and real growth rate have an interdependent lead and lag relationship.

Arhin et al (2017) reported that among the vast body of literature available on the management of interest rate, there are four outstanding

theories which include; the classical theory, the loanable theory, the Keynesian theory and the modern theory.

The loanable fund's theory; determines the interest rate by demand for and supply of loanable funds, it relates to the interest rate with savings hoarding and bank money on the supply side.

Classical theory concludes that interest rate is only determined by the loanable funds market while fluctuations in economics are influenced by stock of money as buttressed by the works of Meltzer (1976) where he reported that money stipulates cyclical fluctuations in small velocities relative to changes in money supply hence, minimising the effects velocity on interest rate or relative prices and output.

The Keynesian theory determines interest rate taking into account the by demand for and supply of money as given during the short run and determines the interest rate by liquidity preference or demand for money.

The monetarist believes that economic growth is not only dependent on the interest rate but also on other factors such as wealth and relative prices.

Udoka (2000) stated that prominent among the preferred sectors were the agricultural manufacturing and solid mineral sectors which were accorded priority and deposit money banks were directed to charge preferential interest rates on all loans to encourage the upsurge of small-scale industrialisation which is a catalyst for economic development.

In a write up by Arhin et al (2017), they chronicled some effects of actions that are taken by central banks to increase interest rates to reduce

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demand and reduce the rate of economic growth. The effect of increased interest rate on an economy include; increased cost of borrowing, increased incentive to save rather than spend, increased domestic currency as more investors are likely to save in domestic banks, Consumers and firms with the economy likely to experience falls in consumption and investment,, Government debt interest payments increase, Reduced confidence, thus it discourages investment; firms and consumers become less willing to take out risky investment and purchases.

Borro and Becker (1989) used a standard growth model where real interest rates were given by the inverse of the discount factor in a steady state. They concluded that there is a long-run relationship between real interest rates and fertility. The standard growth model predicts a negative correlation between economic growth and the real interest rate.

Another well-established means of determining interest rate-economic growth is the application of restrictions. Shaw (1973) and McKinnon (1973) reported that whenever a country imposes limits on deposit, financial repression rises. Their remarks were that terminating financial restrictions re-enforcing market forces determine real interest rate results in higher real interest rate, in other words, higher savings leads to higher real rates of return which is a precursor of positive economic growth.

Arhin et al. (2017) reported that in the case of the Ghanaian economy, the interest rate has a statistically significant impact on economic growth. More specifically, a 1% decrease in interest rate increases economic growth by 0.508% all other things being equal. The findings of Arhin et al (2017). Ghana

was consistent with reports by Udoka and Roland (2012) who described an inverse relationship between the interest rate and economic growth in Nigeria.

Summary and Conclusion

Nurina and Hetane (2015) employed Partial Least Square (PLS) to analyse the effect of inflation, interest rates, and exchange rates on GDP in Indonesia. The model used in the study was developed by Sewall Wright (1934) with the motive of explaining the direct and indirect result of several independent variables on the dependent variable. Their results indicated a significant negative relationship of interest rates on GDP and a significant positive relationship of the exchange rates on the GDP, but inflation did not enhance GDP significantly.

This chapter reviewed some economic theories from which the different levels and approaches in understanding GDP were considered. Further, the theoretical and empirical works were reviewed and we realized a most empirical analysis of exchange rate, interest rate, inflation rate and GDP outcome had different results. The varying results in the literature were attributed to macroeconomic indicators having an interdependent relationship. The Ghanaian economy has suffered macroeconomic instability including exchange rate volatility, high-interest rate, high inflation rate and unemployment, high debt burden and fiscal deficits. There is, therefore, a need empirically to analyse the impact of the exchange rate, interest rate and inflation rate on its Gross Domestic Product in achieving macroeconomic stability.

CHAPTER THREE

METHODOLOGY

Introduction

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

Research Design

There are quite a number of possible alternative methods for social science research. Numerous studies have employed; panel data techniques, and time-series data techniques examining the effects of the exchange rate, interest rate and inflation rate on GDP. However, the decision to apply any of the possible alternative methods for research depends on the data for more variability and usefulness of research and the objective of the study. Exchange rate, interest rate and inflation rate affect GDP through either a direct or an indirect channel. This research employs quarterly time series data for the period 1990-2015 in Ghana. To achieve the objectives of the study, the Autoregressive Distribution Lag (ADL) model and Vector Error Correction Model were adopted for data estimation and analysis using E-views 9.0 package.

Theoretical Model Specification

The macroeconomic theory has identified various factors that influence the Gross Domestic Product of a country from the classical, neoclassical and

the new growth theories. These factors include natural resources, investment, human capital, innovation, technology, economic policies, governmental factors, aid, trade openness, institutional framework, foreign direct investment, educational level, political factors, socio-cultural factors geography and demography and many other in order to examine the empirical evidence of the macroeconomic determinants of Gross Domestic Product in Ghana ,the study consider some of these factors.

Based on theoretical considerations, it is helpful to begin with the Keynesian Aggregate Expenditure Function. The Aggregate Expenditure Function identity provides the basis for the relationship between Interest rate, exchange rate which relates to Gross Output through Investment and net export respectively. This model also links household consumption, domestic investment and government expenditure to output. The model starts with the national income identity for an open economy that can be represented as follows:

$$Y = C + I + G + X - M \ldots\ldots\ldots\ldots\ldots (7a)$$

Or

$$Y = C(YD) + I(r) + G + X(e) - M(e, Y) \ldots\ldots\ldots\ldots\ldots (7b)$$

Where Y is real GDP, C is private consumption which is dependent on disposal income (YD), I denote investment dependent on interest rate (r), G is government expenditure, and X is net exports depends on exchange rate (e) and real GDP (e, Y) and is the difference between exports (X) and imports (M). This model is important since it includes net export indicating the importance of foreign participation in the domestic economy through foreign

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direct investment. This model explains our national income discussion in a good market.

To achieve the said objectives, the study examined the following set of variables of interest in

$$GDP = F(REER, MPR, INF, K, FCL, GFC, FDI) \dots \dots \dots \dots \dots 8a$$

where GDP represents Gross Domestic Product, REER represents real effective exchange Rate, MPR represents Real Interest Rate (monetary policy rate), INF indicates inflation rate , K shows Domestic Investment (Gross Fixed Capital Formation), FCL represents Household consumption, GFC represents Government Expenditure and FDI representing foreign Direct Investment.

The Autoregressive Distributed Lag Model

The basic autoregressive distributed lag model is given in Equation. 8b.

Equation 8b

$$yt = \beta0 + \beta1\ yt{-}1 + \dots + \beta k\ yt{-}p + \alpha1\ xt{-}1 + \alpha2\ xt{-}2 + \dots \dots + \alpha q\ xt{-}q + \varepsilon t$$

where εt is a random disturbance term which is serially independent. The ARDL model for the variables will be estimated as in Equation 10 where, Δ represents first order difference.

Equation 8c

$$\Delta yt = \beta0 + \sum\beta i\ \Delta yt{-}1 + \sum\gamma j\ \Delta x1t{-}j + \sum\delta k\ \Delta x2t{-}k + + \theta0\ yt{-}1 + \theta1\ \Delta x1t{-}1 +$$

$$\theta2\ \Delta x2t{-}1 + \mu t\ .$$

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From estimating the model in Equation 8d, an F test on the null hypothesis H0 : $\theta_0 = \theta_1 = \theta_2 = 0$ is performed to determine if the variables

y_{t-1}, x_{1t-1} and x_{2t-1} which have long run coefficients are statistically significant. If the variables are statistically significant and cointegrated then a normal error correction model is used to estimate the given long run relationships among them. This is given in Equation 8e.

Equation 8c

$\Delta y_t = \beta_0 + \sum \beta_i \Delta y_{t-1} + \sum \gamma_j \Delta x_{1t-j} + \sum \delta_k \Delta x_{2t-k} + \varphi z_{t-1} + \mu_t$.

Where Z_{t-1} is the error-correction term and it is the OLS (Ordinary Least Squares) residual from estimating the model with the level variables. The shortrun effects can therefore be extracted from the unrestricted ECM as in Equation 8d.

Equation 8d shows that in the long-run equilibrium,

$$\Delta y_t = 0,$$

$$\Delta x_{1t} = \Delta x_{2t} = 0.$$

Therefore the long run inflation, exchange rates and interest rates in Ghana: an Autoregressive Distributed Lag Model coefficients of x1 and x2 are given by $-(\theta_0 / \theta_1)$ and $-(\theta_0 / \theta_2)$ respectively

Empirical Model Specification

Equation (8d) is a fundamental Aggregate Demand Function. Based on economic estimation, we modify equation 1 in the interest of this study and to accommodate the various variables based on literature to influence Gross Domestic Product. The study applied natural log transformation on some variables

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The above discussion in a transform model can be written mathematically

$$lnGDP_t = a_0 + a_1 lnREER_t + a_2 MPR_t + a_3 INF_t + a_4 K_t$$

$$+ a_5 lnFCL_t + a_6 lnGFC_t + a_7 FDI_t + e_t \dots \dots \dots \dots (11)$$

Where ln denotes natural log, since variables in rate cannot be in log form, the above model is semi logged to bring about linearity in the values. GDP represents Gross Domestic Product proxy by GDP (constant LCU). REER represents exchange rate measured by real effective exchange rate (2010-100), R represents real interest rate which for this research considered the Monetary Policy rate, INF is inflation rate proxy by Inflation rate (consumer prices), K is investment proxy by gross fixed capital formation (percentage of GDP), FCL is household consumption proxy by Final Household Consumption (current LCU), GFC represent Government Expenditure proxy by General government final expenditure (Current US$), FDI representing foreign Direct Investment proxy by foreign direct investment, net inflows (percentage of GDP) and "e" is error term assumed to be normally and independently distributed at zero mean and constant variance. In addition, the error term captures all other explanatory variables, which influence Gross Domestic Product, but was not included in the model.

Justification and Measurement of the Variables

Sources of Data

This research employed secondary data and quarterly time series data were generated from the annual time series collected from 1990 to 2015 using the Gandolfo algorithm (Gandolfo, Martinengo, & Padoan, 1981). The series was drawn from World Development Indicators (Gross Domestic Product, Real effective Exchange rate, inflation rate, gross fixed capital formation, final

Consumption expenditure, government expenditure and foreign direct investment) and Bank of Ghana (interest rate).

Estimation Procedure

To investigate the relationships as well as the dynamics effects between exchange rate, interest rate and inflation rate on the gross domestic product the vector error correction model (VECM) was applied. The testing procedure involves the following steps. The study first investigated the time series properties of our data by using the Augmented Dickey-Fuller (ADF) and the Phillips-Perron tests. The unit root test was done to check the stationary position of our series. In the second step, we tested for cointegration using the Johansen cointegration approach. In the presence of cointegration among variables, we used the Vector Error Correction Model (VECM)to estimate the long run and short run parameters. In the final step, stability test was done to ensure the coefficients are stable and there is no break of each variables contribution to Gross domestic output.

Unit Root Test

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

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

The study used a variety of unit root test to ensure reliable results for stationarity test. The study employed both Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests. They are considered reliable and as such accepted by econometric analysis for the test for a unit root. There are similarities in the tests except that they differ with respect to the way they correct for autocorrelation in the residuals. The PP non-parametric test simplifies the ADF procedure and allows for less restrictive assumptions for time series in question. Thus, the null hypothesis to be tested is that the variables under study have a unit root.

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

$$\Delta X_t = a + \delta t + \rho X_{t-1} + \sum_{i=1}^{p} \beta_i \Delta X_{t-1} + v_t \quad (9)$$

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

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

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

H_0: Series has a unit root

H_1: Series has no unit root

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

Cointegration Tests

An appropriate solution to a series that are non-stationary and contains unit root is by taking the first difference. Nevertheless, first differencing results eliminate all the long-run information that invariably the interest of economists. Granger (1986) identified a link between non-stationary processes and preserved the concept of a long-run equilibrium. Two or more variables are said to be cointegrated (that is a long-run equilibrium relationship exist

among variables) if they share a common trend. Cointegration exists when a linear combination of two or more non-stationary variables is stationary.

Johansen and Juselius Approach to Cointegration

Johansen (1988) and Juselius and Johansen (1992) developed multivariate method that explicitly used the Vector Autoregressive (VAR) and the Vector Error Correction (VECM) framework for the testing of the presence of cointegration and estimation of long-run and short-run relationships among non-stationary macroeconomic time series. Johansen (1988) cointegration techniques allow us to test and determine the number of cointegrating relationships between the non-stationary variables in the system using a maximum likelihood procedure. Johansen (1988, 1991) and Johansen and Juselius (1990) proposed the use of two test statistics namely, the trace statistic and the maximum Eigenvalue statistics in order to make references about the number of cointegrating variables.

VECM Framework

In order to develop a strong, robust and reliable model that captures the effects of the exchange rate, interest rate and inflation rate on Gross Domestic Product, and following after Sims (1980), the Autoregression Distribution Lag (ARDL) approach was applied as an estimation technique.

ARDLs have the desirable property of focusing on the impact of shock first, the relevant shocks are identified, and then the response of the system to shocks is described through the analysis of impulse responses (the propagation mechanism). The ADL model expresses the current value of an endogenous variable as a function of deterministic terms and the lagged values of the endogenous variables. In other words, in ADL, each endogenous variable is

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explained by its lagged or past values and the lagged values of all other endogenous variables in the model. Furthermore, the use of variance decomposition analysis makes it possible to quantify the relative importance of each variable and their fluctuations. Another advantage of using ADLs over cross-sectional regressions is the ability they provide to look at the dynamic effects of the exchange rate, interest rate, inflation rate on GDP; the cross-sectional method, in contrast, estimates only a one period effect. In addition, the ADL is suitable for multivariate time series analysis as it supplies different criteria to suggest the optimal lengths for the variables. The use of ADLs permits the direct and indirect effects of the exchange rate, interest rate, inflation rate on GDP to be disentangled. ADL model is expressed as follows:

$$X_t = \mu + \delta_1 X_{t-1} + \cdots + \delta_k X_{t-k} + V_t \qquad t = 1,2 \ldots n \quad (9)$$

Where X_t is a 1×7 vector of intregated series of order one (Gross domestic Product, exchange rate, interest rate, inflation rate, gross fixed capital formation, household consumption, government expenditure and foreign direct investment), μ is a vector of intercepts while V_t is a vector error terms and k represents the lag length of the series.

In essence, the presence of cointegration relationship among variables informs the use of Vector Error Correction Model (VECM) to examine the long and short run relationships among the variables. The VECM is expected to be negative and statistically significant. The VECM measure the speed of adjustment from disequilibrium to equilibrium. Equation (13) transformed into an equilibrium error correction model can be expressed as:

$$\Delta X_t = \delta + \sum_{i=1}^{k-1} \Phi_i \Delta X_{t-1} + \Pi X_{t-k} + \varepsilon_t \qquad (10)$$

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

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

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

$$\Delta X_t = \delta + \Phi_1 X_{t-1} + \Phi_2 X_{t-2} + \cdots + \Phi_{p-1}\Delta X_{t-p+1} + \theta(B'X_{t-p})$$
$$+ \varepsilon_t \qquad (11)$$

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

Data Analysis

The study employed both descriptive and quantitative analysis. Table summary statistics were employed to aid in the descriptive analysis. Unit root test w carried out on the variables to ascertain their order of integration in order to avoid the problem of spurious regression. The study also tests for cointegration among variables to ascertain their long-run relationship. Further, the study adopted the ARDL model, econometric model. In addition, the Vector error correction model (VECM) was employed to examine the long run and short run impulse translate to other variables involved with particular

interest on Gross Domestic Product. All estimations were carried out using E-views 9.0 package.

Stability Tests

A common means of testing for parameter stability in the absence of prior information is the test developed by Brown, Durbin, and Evans (1975). The test is based on recursive residuals. The test covers specific issues like the one-step residuals, standard errors of recursively-estimated equations and estimated values of coefficients of explanatory variables throughout the recursive periods.

In utilizing the means residual test, the null hypothesis tested is that their coefficient is the same in every period and the alternative is that they are not. The hypothesis of stability is rejected when the plot of recursive from the regression crosses at least one of the critical bands at 5% level of significance. Eviews version 9 will provide the facility at 5% level of significance for the tests. This test becomes necessary because, in Ghana, there have been changes in government programmes aimed at increasing the Gross Domestic Product.

Summary and Conclusion

This chapter developed and presented the methodology framework suitable for conducting the study. The model was developed from the theoretical formulations of the Keynesian Aggregate demand. Quarterly time series data of Gross Domestic Product, exchange rate, interest rate, inflation rate, gross fixed capital formation, foreign direct investment and final household consumption from 1990-2015 using Gandolfo approach was employed for the study. The stationarity test was conducted using ADF and PP tests to ensure that the variables are not integrated in higher order than one to

avoid spurious regression. Cointegration test was done to the established long-run relationship among variables. ARDL model was employed as an estimation technique and VECM was used to analyze the long and short run effects GDP.

The systematic framework of this chapter now establishes the relationship between exchange rate, interest rate, inflation rate and Gross Domestic Product that guides us in our estimation, this has a link with our models as well as guiding us to interpret our estimation results in the subsequent chapters and make policy recommendations based on the outcome of findings.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter presents the empirical findings and discussions of the results of the study. The aim is to unearth the relationship between exchange rate, inflation rate and the interest rate on GDP and provide empirical findings to rank their time importance to fluctuations in GDP. In addition, the study examines the time series properties of the data to determine the stationarity status of the variables using the Augmented Dickey-Fuller and Phillips-Perron (PP) tests and further tested for cointegration using the Johansen cointegration test; exploratory data analysis, descriptive presentation; unit root and cointegration test; the VECM results and analysis.

Descriptive Statistics

The study conducted descriptive statistics of all the variables employed. The descriptive statistics include the mean, median, maximum, minimum, standard deviation, skewness, kurtosis, sum, sum squared deviation and number of observations. These statistics are illustrated extensively in Table 2. From Table 1, it can be seen that all the variables have positive average values (mean and median). In addition, the deviation of the variables from their means as shown by the standard deviation gives an indication of a relatively high fluctuation among these variables over the period under consideration.

With reference to skewness, Gross Domestic Product, real effective exchange rate, monetary policy rate (interest rate), inflation rate, government final consumption expenditure and foreign direct investment were positively

skewed while gross fixed capital formation and household final consumption expenditure are negatively skewed.

Table 1-*Summary Statistics of the Variables*

	LNGDP	LNREER	MPR	INF	K	LNFCL	LNGFC	FDI
Mean	22.176	3.2930	25.026	5.1319	6.9414	20.977	19.774	0.9918
Median	22.065	3.2367	24.500	4.0083	6.7797	21.006	19.195	0.6790
Max	22.892	3.7313	45.000	15.575	9.7747	24.139	21.615	2.5117
Min	21.521	2.8112	12.500	2.1280	3.6386	17.531	18.554	0.0169
Std. Dev.	0.4122	0.2270	10.183	3.0907	1.3504	2.0289	0.9712	0.7945
Skew	0.3743	0.1750	0.6799	1.6121	-0.1027	-0.0810	0.6280	0.5422
Kurtosis	1.9568	2.4748	2.3759	5.3097	2.9393	1.7281	1.9187	1.7064
J-Bera	7.1441	1.7261	9.7014	68.169	0.1989	7.1232	11.902	12.348
Prob	0.0281	0.4218	0.0078	0.0000	0.9053	0.0283	0.0026	0.0020
Sum	2302.4	342.48	2602.8	533.71	722.43	2181.6	2056.5	103.15
Sum Sq. Dev.	17.501	5.3087	10681.1	983.92	187.84	423.99	97.10	65.018
Observ	104	104	104	104	104	104	104	104

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

Source: Computed using Eviews 9.0 Package.

Unit Root Test Results

In order to examine the impact of exchange rate, interest rate and inflation rate on GDP in Ghana, the stationarity status of all variables including Gross Domestic Product, real effective exchange rate, monetary policy rate (interest rate), inflation rate, government final consumption expenditure, foreign direct investment, gross capital fixed formation and household final consumption in the model specified for the study were determined. This was done to ensure that the variables were not integrated of order zero or two (That is I (0) or I (2) stationary), and to avoid spurious

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results. The order of integration of the variables was tested using Augmented

Dickey-Fuller (ADF) and Phillips-Perron (PP) units root tests.

Table 2- *Unit Root Test (ADF) for Order of Integration: At Levels and First Difference with Intercept Only*

Var	ADF-statistic	Lags	Var	ADF-statistics	lags	O1
LNGDP	0.757795 (0.8261)	5	DLGDP	-1.569914(0.4941)	4	I(2)
LNREER	-1.163886 (0.6871)	5	DLNREER	-3.618720 (0.0070)***	4	I(1)
MPR	-1.336572 (0.6100)	5	DMPR	-4.393397 (0.0006)***	4	I(1)
INF	-2.857900 (0.0541)*	5	DINF	-3.824231 (0.0037)***	4	I(0)
K	-3.448516 (0.0115)**	1	D K	-6.176406 (0.0000)***	0	I(0)
LNFCL	-1.483797 (0.5377)	5	DLNFCL	-3.228788 (0.0212)**	4	I(1)
LNGFC	-0.541152 (0.8773)	5	DLNGFC	-2.918689 (0.0468)**	4	I(1)
FDI	-1.254351 (0.6479)	9	DFDI	-2.950303 (0.0435)**	8	I(1)

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

Table 3-*Unit Root Test (ADF) for Order of Integration: At Levels and First Difference with Intercept and trend*

Var	ADF-statistic	Lags	Var	ADF-statistics	lags	O1
LNGDP	-2.517731 (0.3191)	5	DLGDP	-1.095780 (0.9240)	4	I(2)
LNREER	-3.543714 (0.0403)**	5	DLNREER	-3.593408 (0.0355)**	4	I(0)
MPR	-1.389507 (0.8582)	5	DMPR	-4.390959 (0.0036)***	4	I(1)
INF	-4.676619 (0.0014)**	9	DINF	-3.792698 (0.0210)**	4	I(0)
K	-4.114444 (0.0083)***	2	D K	-6.202940 (0.0000)***	0	I(0)
LNFCL	-1.000576 (0.9385)	5	DLNFCL	-3.228788 (0.0503)*	4	I(1)
LNGFC	-2.110579 (0.5332)	5	DLNGFC	-2.918689 (0.1529)	4	I(2)
FDI	-2.537987 (0.3096)	5	DFDI	-2.929258 (0.1583)	8	I(2)

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

Table 2 and 3 report the ADF test for intercept only and

intercept with trend respectively, at levels and first difference. Most

variables are non-stationary at levels considering ADF in Table 3 and 4

except inflation rate (INF) and gross fixed capital formation (K_t) which is stationary at 5 percent that is ADF test intercept only and with both intercept and trend; real effective exchange rate, inflation rate and gross fixed capital formation (K_t) were stationary at 5 percent, implying they are $I(0)$. Variables such as Gross domestic Product indicated an I(2) variable with intercept only and with intercept and trend; gross domestic product, government expenditure and foreign direct investment reported I(2).

Table 4-*Unit Root Test (PP) for Order of Integration: At Levels and First Difference with Intercept Only*

Var	PP-statistic	Bwd	Var	PP-statistics	Bwd	O1
LNGDP	1.567846 (0.9994)	6	DLGDP	-3.855080 (0.0033)***	10	I(1)
LNREER	-1.425731 (0.5669)	3	DLNREER	-4.676346 (0.0002)***	15	I(1)
MPR	-1.347512 (0.6050)	7	DMPR	-6.107205 (0.0000)***	21	I(1)
INF	-2.008634 (0.2828)	0	DINF	-5.012248 (0.0001)***	21	I(1)
K	-2.325821 (0.1659)	0	D K	-5.538352 (0.0000)***	0	I(1)
LNFCL	-1.174793 (0.6831)	2	DLNFCL	-4.954948 (0.0001)***	19	I(1)
LNGFC	-0.165498 (0.9382)	6	DLNGFC	-4.577164 (0.0003)***	10	I(1)
FDI	-1.098525 (0.7143)	5	DFDI	-4.704547 (0.0002)***	10	I(1)

Table 5-*Unit Root Test (PP) for Order of Integration: At Levels and First Difference with Intercept and Trend*

Var	PP-statistic	Bwd	Var	PP-statistics	Bwd	O1
LNGDP	-1.289488 (0.8850)	6	DLGDP	-3.782533 (0.0214)**	10	I(1)
LNREER	-2.479906 (0.3374)	3	DLNREER	-4.641755 (0.0015)***	15	I(1)
MPR	-1.825082 (0.6855)	6	DMPR	-6.069170 (0.0000)***	21	I(1)
INF	-2.008985 (0.5893)	0	DINF	-4.964199 (0.0005)***	21	I(1)
K	-1.954434 (0.6187)	0	D K	-5.498984 (0.0001)***	13	I(1)
LNFCL	-1.174983 (0.9099)	2	DLNFCL	-4.780122 (0.0010)***	21	I(1)
LNGFC	-1.564353 (0.8003)	6	DLNGFC	-4.565598 (0.0020)***	10	I(1)
FDI	-2.008624 (0.5291)	5	DFDI	-4.674619 (0.0014)***	10	I(1)

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

Table 4 and 5 report the results of the unit root tests with intercept only and intercepts with the trend at levels and first differences respectively. From Table 4 and 5, all variables were stationary at 1st difference under PP test but not at levels. It suffices to state that the ADF and PP tests were both done to confirm the stationarity of each variable at the first difference. The ADF and the PP statistics are higher than their respective critical (in absolute terms) values implying stationarity after first differences, implying all variables are $I(1)$.

Lag Selection Criteria

It is essential, before estimating a VAR model, to determine the optimal lag length of the model. Table 6, reports on the optimal lag selection criteria based on the sequential modified LR test statistic (LR), Final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ) and where * indicates lag order selected by the criterion.

Cointegration Analysis

To establish the relationship between exchange rate, interest rate, inflation rate and gross domestic product, it is imperative to test for the existence of long-run equilibrium among these variables by testing for cointegration. In determining the number of cointegrating vectors, Trace test and Maximum Eigenvalue test using the more recent critical values of MacKinnon, Haug, & Michelis (1999) were performed. The assumption of no

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deterministic trend and restricted constant was used for all the variables. Given that the study employs quarterly data and a lag length of 8,

Table 7 and 8 reports on the Johansen Trace and Maximum Eigen test. After the stationarity was determined, the lag length tests statistics and cointegration tests within the framework of the model conducted. The Null Hypothesis (H_0), which says that there are no cointegrating vectors is therefore rejected while the alternative hypothesis of the presence of cointegrating vectors conveniently accepted. Thus, it has concluded that a long run relationship exists among the variables.

Table 6- *Unrestricted Cointegration Rank Test (Trace)*

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.990736	1267.129	159.5297	1.0000
At most 1 *	0.926372	822.3752	125.6154	0.0001
At most 2 *	0.853101	574.5456	95.75366	0.0001
At most 3 *	0.771060	392.3347	69.81889	0.0001
At most 4 *	0.700721	252.2768	47.85613	0.0001
At most 5 *	0.613632	137.6708	29.79707	0.0001
At most 6 *	0.392312	47.32921	15.49471	0.0000
At most 7	0.000108	0.010286	3.841466	0.9189

Trace test indicates 7 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

From Table 6, it can be seen from the trace statistics indicates the presence of at most seven cointegrating relationships. The null hypothesis is rejected given the trace statistics of 47.32 is greater than the critical value of 15.49, hence the existence of cointegration among variables.

Table 7 - *Unrestricted Cointegration Rank Test (Maximum Eigenvalue)*

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.990736	444.7535	52.36261	0.0001
At most 1 *	0.926372	247.8296	46.23142	0.0000
At most 2 *	0.853101	182.2109	40.07757	0.0001
At most 3 *	0.771060	140.0579	33.87687	0.0000
At most 4 *	0.700721	114.6060	27.58434	0.0000
At most 5 *	0.613632	90.34158	21.13162	0.0000
At most 6 *	0.392312	47.31893	14.26460	0.0000
At most 7	0.000108	0.010286	3.841466	0.9189

Max-eigenvalue test indicates 7 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

Again, it can be seen from Table 7 that the maximum-Eigen value statistics indicate seven cointegrating relationships among the variables. The maximum-Eigen value statistics of 47.32 is greater than the critical value of 14.26 accepting the alternative hypothesis of cointegration among variables.

The Long Run Effect on Gross Domestic Product

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

The long run relationship was derived by normalizing LNGDP and dividing each of the cointegrating coefficients by the coefficient of Gross Domestic Product.

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Table 8

Normalized cointegrating coefficients (standard error in parentheses)

LNGDP	LNREER	MPR	INF	K	LNFCL	LNGFC	FDI
1.000000	0.484815	0.006507	0.022589	-0.030633	-0.036614	-0.148980	-0.000659
	(0.04399)	(0.00051)	(0.00208)	(0.00449)	(0.00729)	(0.00397)	(0.01119)

Table 8 reports the long run results and test statistics of the estimated VECM model. From the long run estimates, any disequilibrium as a shock in the short run can be corrected by the error correction term. Hence, the error correction term measures the speed of adjustment from disequilibrium to equilibrium.

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

$$ECM = LNGDP + 20.08C - 0.48LNREER - 0.007MPR - 0.023INF$$
$$+ 0.03K + 0.04LNFCL + 0.15LNGFC + 0.0007FDI$$

Where C is constant trend, $LNREER$ is real effective a exchange rate, MPR is real interest rate, INF is inflation rate, K is gross fixed capital formation, $LNFCL$ is household final consumption, $LNGFC$ is government expenditure and FDI is foreign direct investment.

Table 9- *VECM long run estimates – Dependent variable is LNGDP*

Variable	Coefficient	Standard error	T-ratio
LNREER	-0.484815	0.04399	-11.0213*
MPR	-0.006507	0.00051	-12.7938*
INF	-0.022589	0.00208	-10.8612*

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K	0.030633	0.00449	6.81701*
LNFCL	0.036614	0.00729	5.02273*
LNGFC	0.148980	0.00397	37.5647*
FDI	0.000659	0.01119	0.05883
C	20.08253		

Note: * indicate significant level compared with rule of thumb [2]
Source: Computed using Eviews 9.0 Package

Table 9 above presents the long-run estimated result for the Vector Error Correction Model. On the whole, all the variables were significant compared with the rule of thumb (2) except foreign direct investment.

Specifically, the coefficient for real effective exchange rate recorded a negative value with the gross domestic product in the long run. It can, therefore, be inferred from the coefficient of the variable that a percentage increase in the real effective exchange rate will lead to a reduction in GDP by 0.4848 percent holding all other variables constant. This is not in support with the findings of Kolapo and Ajayi (2012), Obansa et al (2013) among others, who found a positive relationship with GDP hence economic growth. The exchange rate in Ghana has been relatively been unstable and it has distorted economic behaviour and in decision-making. A rising exchange rate (depreciation) would have a positive impact if the economy is export based and its elasticity of import and export exceeds unitary (Mundel Fleming). Ghana's economy is import based than export and as such does not guarantee a positive impact of a rising exchange rate to our GDP. In addition, as exchange rates are based on anticipation, so are many household and private business enterprise decisions based also on anticipation. Such anticipation

often leads to loss of investment capital and dollarization of domestic economy often benefitting expatriate and locals. This translates to a negative impact on the Gross Domestic Product of Ghana.

This study also considered Interest rate (MPR) as one of the explanatory variables. From the table, it can be seen that the sign for the coefficient was according to the a priori expectation. As such, the coefficient can be interpreted, as a one percent increase in interest rate will cause GDP to decrease by 0.007 percent holding all other variables constant. The IS-LM model that specifies that as interest rate increases it causes investment to reduce by increasing the cost of borrowing confirms the result. Furthermore, an increasing cost of borrowing also reduces investment, which affects the production of goods and services, leading the overall GDP of the country to reduce. Another channel through which real interest rate affect GDP, is through the speculative demand for money. High interest rate reduces the speculative use of money which our Gross domestic product.

Inflation in this model was also adopted as one of the explanatory variables for this study. Inflation has its coefficient sign to be according to the a priori expectations. In view of that, it can be inferred that, as inflation in the country increases by one percent, GDP reduces by 0.0225 percent holding all other variables constant. Hasanov (2014) results rather indicated both appositive and negative relationship with GDP. In the Ghanaian economy, an increase in the general price level causes the cost of borrowing (interest rate) to increase, this causes reduce the level of investment and then makes economic growth to reduce. High inflation distorts consumer behaviour and business decisions. High prices reduce expenditure by reducing real income or

real wage. Reduction in real income leads to low purchasing power and this negative affect Gross Domestic Product (Frimpong & Oteng-Abayie, 2010).

The coefficient sign for gross fixed capital formation, which was one of the explanatory variables, also met the a priori expectation of this study. Its coefficient can be interpreted, as a percentage increase in gross fixed capital formation will increase economic growth by 0. 031 percent, holding all other variables constant in the long run. Gross fixed capital formation captures the level of domestic investment in the country. Increase in investment by locals ensures the growth of output and economic growth. This follows basic Keynesian macro aggregate expenditure model of a positive relationship with GDP.

The household consumption variable also recorded a positive coefficient from the Table and was according to the a priori expectation. It can be inferred from the coefficient of the variable that in the long run, as household consumption increases by one percent, it leads to an increase in GDP by 0.036614 percent in the Ghanaian economy. Keynesian aggregate expenditure model shows a positive relationship between private consumption with GDP or output. When nationals increase their expenditure patterns rather than holding unto money in a real asset or stocks it tends to spur the growth of domestic national income.

Government expenditure coefficient was also positive and in line with the a priori expectation. The coefficient for the variable indicates that in the long run as the government increases its expenditure by one percent, GDP increases by 0.148980 percent in the Ghanaian economy. The result is confirmed by the Keynesian theory that emphasises the importance of

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government expenditure as an injection into the economy that serves as a form of investment, which propels economic growth. Moreover, the work of Al Bataineh (2012) that investigated the impact of government expenditure on economic growth in Jordan also concluded on the positive relationship.

Short Run Dynamic Results ($lnGDP$ is Dependent Variable)

When variables are cointegrated, their dynamic relationship can be specified by an error correction representation in which an error correction term (ECT) computed from the long-run equation must be incorporated in order to capture both the short-run and long-run relationships (Engle & Granger, 1991). The existence of a long run relationship among fiscal imbalance and its explanatory variables necessitates the estimation of its long-run coefficients and short run dynamic parameters.

Table 10-*Short run results (Dependent Variable is LNGDP)*

	Coefficient	Std. Error	t-Statistic	Prob.
ECM(-1)	-0.092130	0.006358	-14.49107	0.0000***
D(LNGDP(-1))	0.449787	0.093351	4.818254	0.0000***
D(LNGDP(-2))	0.427561	0.106891	3.999955	0.0002***
D(LNGDP(-4))	0.382644	0.111915	3.419070	0.0012***
D(LNGDP(-5))	0.451653	0.112992	3.997214	0.0002***
D(LNGDP(-6))	0.473006	0.126477	3.739852	0.0005***
D(LNREER(-1))	0.105968	0.015762	6.723191	0.0000***
D(LNREER(-2))	0.068859	0.019119	3.601683	0.0007***
D(LNREER(-3))	0.044583	0.011729	3.800924	0.0004***
D(LNREER(-5))	0.076815	0.014247	5.391610	0.0000***
D(LNREER(-6))	0.066989	0.019725	3.396072	0.0013***
D(LNREER(-7))	0.031127	0.011288	2.757607	0.0080***
D(LNREER(-8))	-0.057749	0.015030	-3.842370	0.0003***
D(MPR(-3))	0.000302	0.000152	1.983206	0.0525*
D(MPR(-5))	0.000267	0.000148	1.797344	0.0780*
D(MPR(-7))	0.000380	0.000138	2.758878	0.0079***
D(MPR(-8))	0.000465	0.000142	3.267964	0.0019***
D(INF(-1))	0.002658	0.000405	6.570490	0.0000***
D(INF(-2))	0.002017	0.000411	4.907347	0.0000***

D(INF(-3))	0.001927	0.000402	4.794332	0.0000***
D(INF(-4))	-0.003769	0.000521	-7.235386	0.0000***
D(K(-2))	0.001901	0.000745	2.552665	0.0136**
D(K(-4))	-0.006854	0.000840	-8.160568	0.0000***
D(K(-8))	-0.016335	0.001232	-13.25451	0.0000***
D(LNFCL(-1))	0.018175	0.010086	1.801925	0.0772*
D(LNFCL(-2))	0.022331	0.010510	2.124790	0.0383**
D(LNFCL(-3))	0.016549	0.007992	2.070808	0.0433**
D(LNFCL(-4))	-0.091719	0.010140	-9.045657	0.0000***
D(LNFCL(-5))	0.026730	0.010793	2.476698	0.0165**
D(LNFCL(-6))	0.020196	0.010310	1.958775	0.0554*
D(LNGFC(-1))	-0.047301	0.010883	-4.346303	0.0001***
D(LNGFC(-2))	-0.048395	0.012313	-3.930218	0.0002***
D(LNGFC(-3))	-0.015040	0.006323	-2.378620	0.0210**
D(LNGFC(-4))	-0.047671	0.006540	-7.289495	0.0000***
D(LNGFC(-5))	-0.022056	0.009009	-2.448232	0.0177**
D(LNGFC(-6))	-0.027593	0.010713	-2.575585	0.0128**
D(LNGFC(-8))	-0.051763	0.006688	-7.739589	0.0000***
D(FDI(-2))	-0.006223	0.003197	-1.946508	0.0569*
D(FDI(-4))	-0.020017	0.003630	-5.513839	0.0000***
D(FDI(-6))	-0.010292	0.003646	-2.822698	0.0067***
D(FDI(-8))	-0.004933	0.003613	-1.365396	0.1779
C	-0.005553	0.001746	-3.180300	0.0025***
R-squared	0.949446	Mean dependent var		0.013360
Adjusted R-squared	0.910338	S.D. dependent var		0.007379
S.E. of regression	0.002210	Akaike info criterion		-9.091432
Sum squared resid	0.000259	Schwarz criterion		-7.962350
Log likelihood	473.8430	Hannan-Quinn criteria.		-8.635198
Durbin-Watson stat	2.022477			

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

Source: Computed Using Eviews version 9.0

Table 10 reports the short run results of the estimated Vector Autoregressive Model (VECM) and shows that there is a significant impact on the exchange rate, interest rate and inflation rate on Gross Domestic Product. Gross Domestic Product is affected by its own lags from the results reported in Table 10. It is significant in the first, second, fourth, fifth and sixth previous quarters with a coefficient of about 0.45, 0.43, 0.38, 0.45 and 0.47 respectively, all at 1 percent significant level. They all showed a positive relationship to current Gross Domestic Product. Hence, previous Gross

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Domestic Product significantly affects the current Gross Domestic Product. This is true given government policies to increase GDP also take into consideration the previous output. This becomes important in the measure of economic growth and development, hence the positive effects of previous output on the current output level.

The exchange rate is significant and affects GDP both positively and negatively from the first to eight lags with the exception of the fourth lag. The first, second, third, fifth, sixth, seven and eight coefficients are 0.11, 0.07, 0.04, 0.08, 0.07, 0.03 and -0.06 percent respectively. They were all significant about 1 percent significance level. The fluctuation impact is expected given that the exchange rate of Ghana is very unstable. It suffices to admit that during the period of a relatively stable exchange rate the economy's GDP exhibit a positive trend in GDP and vice versa. Though the invisible forces determine the exchange rate in Ghana, the government comes in to manage the system in periods of the high exchange rate to control the negative impact on GDP.

Real interest rate shows a significant positive relationship in the third, fifth, seventh and eight lags with coefficients about 0.0003, 0.0003, 0.0004 and 0.0005 respectively. The third and fifth lags are significant at 10 percent significance level whiles the seventh and eight previous quarters significant at 1 percent significance level. The positive relationship in the short run counters macroeconomic theory of a negative relationship between interest rate and GDP. This is however possible if firms borrow to undertake productive investment GDP will increase even at a higher interest rate. The effect of interest rate on GDP must consider the use of borrowed funds.

In addition, a positive significant relationship from the inflation rate was recorded from the first to third lags with a coefficient of about 0.003, 0.002 and 0.002 percent respectively, all at 1 percent significance level. However, the inflation rate recorded a negative significant effect in the fourth quarter lag with a coefficient of about 0.004 and also at 1 percent alpha level. Inflation does not always exert a negative impact of GDP and economic growth. Increase in prices serves as an incentive to producers and this boost their production levels leading to Positive GDP. The negative effects of inflation on GDP stems from the reduction in real wages and income leading to a fall in purchasing power.

Gross fixed capital formation reported a positive significant relationship in the second lag with 0.002 percent coefficients at 5 percent significance level. This the other hand, recorded a negative significant effect of about 0.007 and 0.02 in the fourth and eight lags respectively, both at 1 percent significant level. The positive effect of fixed capital formation on GDP is in line with basic economic theory. Domestic investment into fixed asset attracts return that contributes significantly to the growth of GDP. However, some investments take time to reap the benefit or due to factors such as depreciation, inflation and other domestic investment turns to be negative. Depreciation leads fall in the value of the asset and worn out machinery.

Household Consumption had a significant effect on GDP both positively and negatively from first to sixth lags. Coefficients of about 0.02, 0.02, 0.02, -0.09, 0.03 and 0.02 were recorded for the first to sixth lags respectively. The first and sixth lags were significant at 10 percent; second significant at 5 percent alpha level and fourth lag significant at 1 percent alpha

level. Economic theory expects a positive relationship between household consumption and GDP. This, therefore, supports the positive lag effect of consumption and GDP. Private household consumption expenditure does exert a negative impact on GDP if such as expenditure falls on unproductive goods or foreign goods. Expenditure on foreign goods cripples domestic market and improve foreign market leading to falling in GDP.

Government expenditure was negative and significant from first to eight lags with the exception of the seventh lag. The coefficients were -0.05, -0.05, -0.02, -0.05, -0.02, -0.03 and -0.05 for the first, second, third, fourth, fifth, sixth and eight previous quarters respectively. The first, second, fourth and eight lags were significant at 1 percent and third, fifth and sixth previous quarters significant at 5 percent alpha level. Government expenditures on unproductive sectors rather than capital expenditures lead to negative GDP. Unproductive expenditures may include payment of judgement debts, state celebrations or anniversary, parties etc. do not improve GDP growth. However, expenditures on health, education, infrastructure, roads, which are deemed essential, contribute positively to GDP.

Foreign direct investment also recorded a significant negative effect on GDP in the second, fourth and sixth lags. The second and fourth lags had coefficients of about -0.006 and -0.02, both significant at 10 percent alpha level. However, the sixth previous quarter was significant at 1 percent alpha level and coefficient of about -0.01 percent. A prior expectation was a positive effect and not negative. The negative effect record the various lags increase in foreign direct investment rather affects negatively on Ghana's GDP. Opening up our economy to foreigners cripple domestic activities and business. Foreign

investors often repatriate their profit back to their own country. Ghana lacks monitoring systems on foreign activities and most foreign firms engage in capital flight or transfer pricing. Many are given tax holidays often resell or change ownership to avoid paying taxes to the country. These practices negatively affect Ghana's GDP from foreign participation rather than benefits.

Diagnostics

The regression for the VECM also had significant post-estimation test results. From the results in Table 10, the first order serial correlation problem is eliminated as seen from the DW statistic of 2.022477 that is 2 approximately, which is an indication of the acceptance of null hypothesis of no serial correlation in the residuals.

The model also recorded a high R-squared of 0.949446 and adjusted R-squared 0.910338 implying a high predictive power of the determinants. The high R- squared shows a tight fit for the model, implying the independent variables accounting for the explanations in the dependent variable.

Table 11: *Post Estimation test for VECM*

Test	Statistic	Conclusion
ARCH Test	F-statistic=0.397683 (0.5299) Obs*R-squared 0.404580 (0.5247)	There is no ARCH element in the residual
Breusch-Godfrey Serial Correlation LM Test	F-statistic 0.045518(0.9555) Obs*R-squared	No serial correlation

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0.169276 (0.9188)

Multivariate Normality	Jarque-Bera=0.639171	Residuals are normal
	p-value=0.726450	

Source: Computed Using Eviews version 9.0

The ARCH test also revealed that there is no ARCH element in the residual specified. Hence, heteroskedasticity is also not a problem since the probability value leads to the acceptance of the null hypothesis. Breusch-Godfrey Serial Correlation LM Test confirms that there is no serial correlation. Normality test was done to ensure the assumption of data being normally distributed. The normality test indicates that the residuals are normally distributed since the Jarque-Bera P value lead to the acceptance of the null hypothesis.

Stability Tests

The stability of the model and the parameters were also tested because the sample period is one during which both the economic systems and the economy changed dramatically. Unstable results would invalidate our estimation and they could also indicate that GDP does not maintain a consistent dynamic relationship with the several determinants.

The stability was tested using the recursive regression method, which does not require knowledge of the timing of possible breaks and is not restricted by the sample size. The results of tests for GDP based on recursive regressions are summarized in Appendix A. Appendix A presents the estimated values of the coefficients of the explanatory variables throughout the

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recursive period, as well as their corresponding standard errors with the bands of plus-or-minus standard errors.

The graph in the Appendix A show the recursive coefficients of the explanatory variables and their period lags for the exchange rate, interest rate, inflation rate and the error correcting term together with the bands of plus-or-minus two standard errors. The graph indicates substantial stability in all parameters, including the error correcting term as they lie within their two standard error bands.

Chapter Summary

This chapter targets itself empirically to test the relationship between exchange rate, interest rate, and inflation rate and GDP the Vector Autoregressive Model (VECM) to explore the long and short run relationship among variables. The results disclosed and discussed long run cointegration relationship as well as the short run estimates. Post-estimation test results and stability test was done to ensure the model estimated is in line assumptions of the fitted model.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Introduction

The chapter under discussion constitutes the summary of findings, the conclusions drawn from the findings and recommendations necessary. In addition, the limitations relating to this research and areas that may be important to consider for further research have also been discussed under this chapter. The summary of findings provides a brief insight into the research problem, the objective of the research and general findings. The conclusion focused on the overall outcome of the finding in relation to the hypothesis. Recommendation gives room for policy direction to Government and other stakeholders in the macroeconomy on how factors in the macroeconomy affect the GDP of the Country and hence its management. Another area to consider in this chapter are the limitations that this research was opposed to as well as suggested areas to be looked at for further research.

Summary

The study was carried out in order to examine the effects of Interest rates, Exchange rates and Inflation rates on GDP of Ghana. The objectives of the research were to examine the long and short-run effects of real effective exchange rate on GDP, the interest rate on GDP and Inflation rate on Ghana's GDP. This research captured a data span of 25 years, which was made up of quarterly data from 1990 to 2015. Quarterly time series data was adopted for the research and the major findings from the analyses are thereby summarized. From the Unit root test, most of the Variables tested were non-stationary at levels with the exception of Inflation rate (INF) and Gross Fixed Capital

formation (K_t). They, however, became stationary at 2nd Difference thus I (2) in table 3. The lag lengths of the variables involved were determined with the desired respective lags, selected for the determination of the model.

From the cointegration test results obtained, the researcher rejected the null hypothesis in favour of the Alternative that, there is cointegration among variables. This was evidenced in table seven (7) as trace statistics of 47.32 is greater than the critical value of 15.49. This was also confirmed in the Max-eigenvalue test, a test statistic value of 47.32 was greater than the critical of 14.26, which also rejects the null in favour of the alternative.

In determining the long-run effects on the Gross Domestic Product, the Vector Auto Correlation model (VECM) was used. From the results obtained, most of the variable were significant using the rule of the thumb [2] with the exception of foreign direct investment. It was revealed that a percentage increase in real effective exchange rate would lead to a reducing GDP by 0.4848 percent holding other variables constant. This phenomenon may be explained by the reasons that the exchange rate in Ghana is highly unstable hence the negative correlation between exchange rate and GDP. Similarly, using the IS-LM model, there was a reduction in GDP as a percentage increase in Interest rate by 0.007 percent. As Inflation of the country increases by one percent, the GDP also reduces by 0.0225 percent. An analysis of the long run also indicated that there was an increase in the economic growth of the country by 0.031 percent.

From the results of the analyses run to determine a short-run relationship, it was found out that, there are both positive and negative effects of Exchange rate on GDP with the exception of the fourth quarter, which was

not significant. All other variables obtained a significant level of 1 percent significance.

The results from the table indicated that Real Interest Rate showed a positive relationship on GDP, which is explained in the third, fifth, seventh, and eight lags. In addition, the inflation rate showed a positive significant relationship for the 1st, 2nd and 3rd Lags achieving a significance of 1 percent, except for the fourth quarter. This explains the phenomenon that Inflation does have at the time a positive effect or impact on GDP.

Conclusion

Overall, this research has made in providing empirical estimates of the relationships that exist of the exchange rate, inflation rate and interest rate all on the Gross Domestic Product in Ghana. The finding of this research shows clearly that, there is a statistically significant relationship between the major variables, thus inflation, interest rate and exchange rate on GDP of Ghana. The positive change or increase in the above-mentioned analysis affirms the fact in the Keynesian aggregate model, which shows that there exists a positive relationship between private consumption and output. On the other hand, the analysis of the short-run analysis of results shows that there is a significant impact of variables on GDP, thus namely; exchange rate, interest rate and inflation.

Recommendations

Institutions responsible for the formulation of Monetary policies and regulatory bodies such as the Ministry of Finance and Economic Planning, Ghana Stock Exchange, Bank of Ghana, etc. will need to further assess and

consider the interrelationship of all the variables that come to play and their effect on GDP of Ghana.

All stakeholders in policy formulation and decision-making would have to consider the collective impact of economic variables on the Gross Domestic Product (GDP) of Ghana, rather than only concentrating on their independent effect since the variables interrelate with each other. For example, the single digit targeting of inflation by the Bank of Ghana, as a measure of positive GDP growth, might not be the best approach since, other variables such as exchange rate, interest rate have similar effects on GDP as well.

From the above findings, formulators of monetary and fiscal policy are advised to take a clue in order to deduce appropriate strategies for the efficient regulation of these microeconomic indicators to aid economic growth.

REFERENCES

Addison, T. and R. Osei (2001) *'Taxation and Fiscal Reform in Ghana'*, WIDER Discussion Paper 2001/97, UNU/WIDER: Helsinki.

Adebiyi, M.A & Dauda, R.O.S (2009). *Trade Liberalization policy and Industrialization Growth performance in Nigeria*: An Error Correction Mechanism Technique. Paper 2009, Abuja

African Economic Report. (2015). *Power people planet: seizing Africa's energy*
and climate opportunities: Africa progress report

Agalega, E., & Antwi, S. (2013). The impact of macroeconomic variables on gross domestic product: Empirical evidence from Ghana. *International Business Research*, *6*(5), 108.

Agbodeka, F. (1992). *Economic history of Ghana from the earliest times*. Ghana Universities Press.

Aidam, P. W., & Anaman, K. A. (2014). Export Earnings Instability and Investment in Ghana, 1981 to 2011. *Modern Economy*, *624*.

Al Bataineh, I. M. (2012). The impact of government expenditures on economic growth in Jordan. *Interdisciplinary Journal of Contemporary Research in Business*, *4*(6), 1320-1338.

Alesina, A., & Tabellini, G. (1990). A positive theory of fiscal deficits and government debt. *The Review of Economic Studies*, *57*(3), 403–414.

Alhassan, A. L., & Fiador, V. (2014). Insurance-growth nexus in Ghana: An autoregressive distributed lag bounds cointegration approach. *Review of Development Finance*, *4*(2), 83-96.

Amo-Yartey, C. (2014). Improving Fiscal Management in Ghana: The Role of Fiscal Policy Rules. *IEA*, *37* (IEA MONOGRAPH).

Aryeetey, E., Harrigan, J., & Nissanke, M. (2000). *Economic reforms in Ghana: The Miracle and the Mirage*. Africa World Press.

Asafu-Adjaye, J. (2005). *Environmental economics for non-economists: techniques and policies for sustainable development*. World Scientific Publishing Co Inc.

Asiama, J., Akosah, N., & Owusu-Afriyie, E. (2014). An assessment of fiscal sustainability in Ghana. Bank of Ghana Working Paper WP/BOG-2014/09

Azeez, B. A., Kolapo, F. T., & Ajayi, L. B. (2012). Effect of exchange rate volatility on macroeconomic performance in Nigeria. *Interdisciplinary Journal of Contemporary Research in Business*, *4*(1), 149-155.

Boyd, J. H., Levine, R., & Smith, B. D. (2001). The impact of inflation on financial sector performance. *Journal of Monetary Economics*, *47*(2), 221-248.

Brown, R. L., Durbin, J., & Evans, J. M. (1975). Techniques for testing the constancy of regression relationships over time. *Journal of the Royal Statistical Society. Series B (Methodological)*, 149–192.

Cushman, D. O. (1985). Real exchange rate risk, expectations, and the level of direct investment. *The Review of Economics and Statistics*, 297-308.

Di Giovanni, J., & Shambaugh, J. C. (2008). The Impact of Foreing Interest Rates on the Economy: the Role of the Exchange Rate Regime.

Journal of International Economics, *74*(2), 341–361. https://doi.org/10.3386/w13467

Economic Thought (Book 73) – Kluwer Academic Publishers – 2000

Engle, R., & Granger, C. (1991). *Long-run Economic Relationships: Readings in Cointegration*. Oxford University Press.

Fasanya, I. O., Onakoya, A. B., & Agboluaje, M. A. (2013). Does monetary policy influence economic growth in Nigeria?. *Asian Economic and Financial Review*, *3*(5), 635.

Fischer, S. (1993). The role of macroeconomic factors in growth. *Journal of Monetary Economics*, *32*(3), 485-512.

Frankel, J., & Saravelos, G. (2012). Can leading indicators assess country vulnerability? Evidence from the 2008–09 global financial crisis. *Journal of International Economics*, *87*(2), 216-231.

Frimpong, J. M. and Oteng-Abayie, E. F. (2010), "When is Inflation Harmful? Estimating the Threshold Effect for Ghana", *American Journal of Economics and Business Administration,* Vol. 2, No. 3, pp. 232-239.

Gandolfo, G., Martinengo, G., & Padoan, P. C. (1981). *Qualitative analysis and econometric estimation of continuous time dynamic models* (Vol. 136). North-Holland Amsterdam.

Ghosh, A. and S. Phillips (1998), "Warning: Inflation may be Harmful to your Growth", IMF Staff Papers, 45 (4)

Graham, J. R., Leary, M. T., & Roberts, M. R. (2015). A century of capital structure: The leveraging of corporate America. *Journal of Financial Economics*, *118*(3), 658-683.

Granger, C. W. (1986). Developments in the study of cointegrated economic variables. *Oxford Bulletin of Economics and Statistics*, *48*(3), 213–228.

Greene, J., & Villanueva, D. (1991). Private investment in developing countries: an empirical analysis. *Staff Papers*, *38*(1), 33-58.

Gyimah-Brempon, K., & Gyapong, A. O. (1993). Exchange rate distortion and economic growth in Ghana. *International Economic Journal*, *7*(4), 59-74.

Hatane S. (2014) *Analysis Of The Effect Of Inflation, Interest Rates, And Exchange Rates On Gross Domestic Product (GDP) In Indonesia.* In: Conference On Global Business, Economics, Finance And Social Sciences , 20-11- 2014 - 21-01-2015, Bangkok - Thailand.

Hausmann, R., Rodrik, D., & Velasco, A. (2008). Growth diagnostics. *The Washington Consensus Reconsidered: Towards a New Global Governance*, 324-355.

Hasanov, F. (2010). "The impact of real oil price on real effective exchange rate: The case of Azerbaijin" 33493, University Library of Munich, Germany

Hoover, K. D., & Perez, S. J. (2004). Truth and robustness in cross-country growth regressions. *Oxford bulletin of Economics and Statistics*, *66*(5), 765-798.

Institute of Statistical Social and Economic Research (ISSER). (2013). The State of the Ghanaian Economy in 2012. *ISSER*. University of Ghana, Accra.

IS-LM and Modern Macroeconomics edited by Warren Young & Ben-Zion Zilberfarb – Recent

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, *12*(2), 231–254.

Johansen, S. (1991). Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models. *Econometrica: Journal of the Econometric Society*, 1551–1580.

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration—with applications to the demand for money. *Oxford Bulletin of Economics and Statistics*, *52*(2), 169–210.

Killick, T. (2010). *Development Economics in Action Second Edition: A Study of Economic Policies in Ghana*. Routledge.

MacKinnon, J. G., Haug, A. A., & Michelis, L. (1999). Numerical distribution functions of likelihood ratio tests for cointegration. *Journal of Applied Econometrics*, *14*(5), 563–577.

Macroeconomics for Managers by Michael K. Evans – Blackwell Publishing Ltd. – 2004

Mendoza, E. G. (1995). The terms of trade, the real exchange rate, and economic fluctuations. *International Economic Review*, 101-137.

Nsiah, C., Fayissa, B., & Wu, C. (2016). The spatial effects on the rate of economic growth: Evidence from Sub-Saharan Africa. *The Journal of Developing Areas*, *50*(1), 275-288.

Obansa, S. A. J., Okoroafor, O. K. D., Aluko, O. O., and Millicent Eze (2013). Percieved Relationship between Exchange Rate, Interest Rate and Economic Growth in Nigeria: 1970- 2010. American Journal of Humanities and Social Sciences: 1(3), 116-124.

Odhiambo, M. (2009). Interest Rate Liberalization and Economic Growth in Zambia: A Dynamic Linkage. *African Development Review,* 3, 541-557.

Odusola, A.F. & Akinlo, A.E. (2001). Output, Inflation, and Exchange Rate in Developing Countries: An Application to Nigeria‟‟. The Developing Economies, June.

Ogun, O (2006). Real Exchange Rate Behaviour and Non-oil export Growth in Nigeria. *African Journal of Economic Policy,* 11(1), June.Rodric,

Osei, R. D., & Telli, H. (2017). Sixty Years of Fiscal Policy in Ghana. *The Economy of Ghana Sixty Years After Independence*, 66.

Osei, R. D., & Telli, H. (2017). Sixty Years of Fiscal Policy in Ghana. *The Economy of Ghana Sixty Years After Independence*, 66.

Rethinking Multipliers in a Globalized World by Raj Nallari & Leopold Engozogo – Policy Research Working Paper 5277 – The World Bank – April 2010

Saymeh, A. A. F. and Orabi, M. M. A. (2013). The Effect of Interest Rate, Inflation Rate, GDP, on Real Economic Growth Rate in Jordan. *Asian Economic and Financial Review*, 3(3), 341-354.

Shim, J. K., & Siegel, J. G. (1995). *Dictionary of economics*. Wiley.
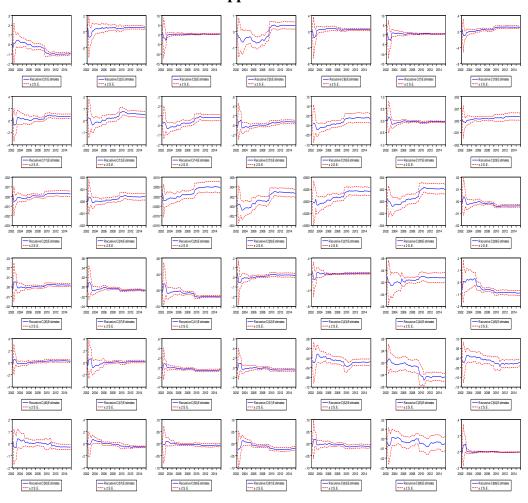
Sims, C. A. (1980). Macroeconomics and reality. *Econometrica: Journal of the Econometric Society*, 1–48.

Sowa, N. K. (1994). Fiscal deficits, output growth and inflation targets in Ghana. *World Development*, *22*(8), 1105–1117.

Stock, J. H., & Watson, M. W. (1988). Testing for common trends. *Journal of the American Statistical Association*, *83*(404), 1097–1107.

Summers, R., & Heston, A. (1991). The Penn World Table (Mark 5): an expanded set of international comparisons, 1950–1988. *The Quarterly Journal of Economics*, *106*(2), 327-368.

Tang, S., Selvanathan, E. A., & Selvanathan, S. (2008). Foreign direct investment, domestic investment and economic growth in China: A time series analysis. *The World Economy*, *31*(10), 1292-1309.

Tang, T. C. (2006). New evidence on export expansion, economic growth and causality in China. *Applied Economics Letters*, *13*(12), 801–803.

Taylor, J. B. (1993, December). Discretion versus policy rules in practice. In *Carnegie-Rochester conference series on public policy* (Vol. 39, pp. 195-214). North-Holland.

The Economics of Money, Banking, and Financial Markets (Ninth Edition) by Frederic S. Mishkin – Prentice Hall – July 2009

Web.mit.edu/Krugman/www/trioshrt.html

World Bank Development indicators, 2014

www.investopedia.com/terms/i/islmmodel.asp

Appendix A

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