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Implications of Macroeconomic Controls in Ghana

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IMPLICATIONS OF MACROECONOMIC CONTROLS IN GHANA

BY

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IMPLICATIONS OF MACROECONOMIC CONTROLS ON WEST AFRICAN MONETARY ZONE

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This thesis is approved as a creditable and independent investigation by a candidate for the Master of Science in Economics degree and is acceptable for meeting the thesis requirements for this degree. Acceptance of this does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

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This thesis is dedicated to Dorkey Daakpe, my Dad and Siblings.

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ABSTRACT

IMPLICATIONS OF MACROECONOMIC CONTROLS IN GHANA

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Ghana's desire to achieve sustainable economic growth with relatively stable price level pursue both monetary and fiscal policies that could lead to macroeconomic. This study examines the effects of fiscal and monetary policy on economic growth and determine the level of convergence of growth for Ghana using structural equation modeling (SEM) using time series data from 2008 to 2017. Both short run and long-run results revealed that the ratio of government spending to private investment was statistically significant and it exerted a positive impact on economic growth, an indication that government expenditure is a key channel through which we can achieve sustained economic growth. It was also revealed that real interest rate which is a monetary policy tool have a negative effect on economic growth in Ghana.

The impulse response of government spending on investment shows that government spending shocks decreases investment in Ghana, which results in crowding out of investment. The results of the Granger-Causality test suggested there is bi-directional causality between economic growth and real interest rate. To achieve higher and sustainable economic growth, government should embark on expansionary fiscal policies. Further, the central bank of Ghana must reduce lending rates so that firms and business sector can borrow at low rates to enhance growth and development of the economy.

CHAPTER 1: INTRODUCTION

1.1 Background to the Study

Macroeconomic policy indisputably plays a fundamental role in maintaining sustainable and satisfactory economic atmosphere to achieve faster, stable and sustainable growth. This fundamental role is conducted by the two leading instruments of macroeconomic policy in an economy namely fiscal and monetary policy. These policies are crucial for policy-makers and the government in both developed and developing countries. In this regard both monetary and fiscal policies are used as the main tools for macroeconomic stabilization and economic growth and development. Generally, monetary and fiscal policies have been pursued together to ensure that economic progress is achieved, and other macroeconomic challenges are addressed. Both policies have been dynamic and in accordance with global trends to be relevant (Quartey & Afful-Mensah, 2014).

Fiscal policy involves the use of government expenditure and taxation to influence the level of economic activity in an economy. The main objective of fiscal policy is to decrease unemployment by creating an enabling environment where all available resources are fully utilized to increase productivity (Adefeso & Mobolaji, 2010). During periods of economic slowdown, fiscal authorities spur growth of the economy by either increasing government spending or reducing taxes, however, when the economy is overheated, government spending is reduced, or taxes are raised. Fiscal policy outcomes are usually described in the context of the budget balance. These outcomes may be pro-cyclical, countercyclical or a-cyclical. According to Alesina, Campante, and Tabellini (2008), one

of the empirical regularities in economic literature is that fiscal policy is countercyclical in developed economies but tends to be more pro-cyclical in developing economies.

Monetary policy involves the use of money supply and cost of money in influencing the expected level of economic activity. The main objectives of any monetary policy may include price stability, maintenance of balance of payments equilibrium, creation of employment, output growth, exchange rate stability and sustainable development (Quartey & Afful-Mensah, 2014; Quartey, 2010). To achieve the objective of price stability, Bank of Ghana was granted operational independence to employ policy tools appropriate to stabilize inflation around the medium-term target. The Bank of Ghana's framework for conducting monetary policy is Inflation Targeting (IT), in which the central bank uses the Monetary Policy Rate (MPR) as the primary policy tool to set the monetary policy stance and anchor inflation expectations in the economy (Bank of Ghana, 2007). Each MPR decision provides a signal of tightening (increase), loosening (decrease) or maintaining (no change) the monetary policy stance.

Nevertheless, these two objectives are not mutually exclusive because the realization of one has implications for the realization of the other. Monetarists are of the view that monetary policy is a more powerful in promoting macroeconomic stabilization (Friedman & Meiselman, 1963: Elliot, 1975; Rahman, 2005 & Senbet, 2011). The fiscalists or Keynesian view, whose policy tool is government expenditure and tax changes believe that these tools will achieve macroeconomic stability than the monetary policy approach.

The effect of both monetary and fiscal policies, on the level of economic growth has remained undisputable among economists, however, the point of contention is the degree and relative importance of one of these policy measures over the other in influencing

economic activity. This motivates several researches on the relative importance of each of the policies in achieving economic stability. However, inconclusive results were obtained by bulk of empirical research concerning both the relative and individual effectiveness of the two policies with some specific country studies and multiple country studies. Studies such as Mansouri (2008) and Nurudeen and Usman (2010) as contributors along this line. This limits the generalization of the results across other countries.

1.2 Problem Statement

Ghana in its quest to achieve sustainable economic growth with relatively stable price level pursued both monetary and fiscal policies that could lead to macroeconomic convergence since these policies indisputably play a fundamental role in maintaining sustainable and satisfactory economic atmosphere. However, there is evidence of macroeconomic non-convergence resulting from the relative ineffectiveness of domestic monetary and fiscal policy coordination, which led to Ghana recording persistently high budget deficits, inflation and interest rates. According to Sargent and Wallace (1981), financing budgets through monetization will result in inflation in the economy.

Ghana witnessed an expansionary fiscal policy reflected in growing public expenditures in the period spanning the 1970s and early 1980s, which created sustained budget deficits primarily financed from the banking system (Loloh, 2011). In 1992, government spending reached 17% of GDP from about 14% of GDP a year earlier. The emerging spending spillage was compounded by unanticipated decline in revenue to only 12% of GDP from 15 percent in 1991, a situation attributable mainly to shortfall in donor budgetary support (Amoah, & Loloh, 2008).

Even though revenue collection improved considerably in the ensuing years, robust expenditure growth meant the budget deficit remained widened (Loloh, 2011). The fiscal problems were compounded by the collapse of commodity prices and the resulting worsened terms of trade coupled with significant shortfall in donor budgetary support. By this time the country's external debt position had become unsustainable above thresholds established by the IMF. The 2001 budget, the first by the new government, had introduced significant measures aimed at boosting government revenue while taming government spending to achieve fiscal consolidation (Amoah, & Loloh, 2008). One other characteristic of Ghana's fiscal policy has been the challenge of meeting fiscal targets, with fiscal outturn has mostly exceeded targets, in some years. Despite the periodic slip in Ghana's fiscal policy management, the country's economic growth averaged more than 5 percent over the last 25 years or so compared with an average growth of about 3% for sub-Saharan Africa (Loloh, 2011).

According to Economic Commission of West African State (ECOWAS) Macroeconomic Convergence Report, Ghana's overall fiscal balance posted a deficit of 11.8% of GDP in 2012 against 4.0% in 2011. Both public and domestic debt witnessed an increase in 2012. The macroeconomic convergence criteria adopted by Ghana, based on West African Monetary Zone (WAMZ) criteria requires that the ratio of budget deficit to GDP should not be more than 5 %. Financing these high deficits will cause inflationary spirals. To ensure the satisfactory achievement of the convergence criteria on fiscal deficit to GDP and inflation on sustainable basis, there is a need for more policy coordination between the monetary and fiscal authorities because individual policy instruments have an impact on more than one policy target. The interaction between both policies has an impact

on key macroeconomic variables, which creates interdependency in the pursuit of policy objectives. This can be realized from the fact that, fiscal policy influences price developments, real interest rates, exchange rates, aggregate demand and potential output, while monetary policy affects exchange rates, inflation expectations and short-term interest rates, which have a significant impact on debt serving and consequently increases government budget deficit.

Before 1980 the financial sectors in Ghana was generally described as underdeveloped, risk averse, highly concentrated in urban areas, offering a restricted range of financial services (Andrianaivo and Yartey, 2009). After 1980, Ghana adopted Economic Reform Program (ERP) and Structural Adjustment Programs (SAP) to strengthen the financial system and promoting monetary policy autonomy, and establishing central bank credibility (Ndikumana, 2001) which aimed at creating environments that are conducive to financial intermediation. Despite these noteworthy developments of Ghana's financial sector, there still exist challenges in this area. The financial systems remain small, in both absolute and relative terms. For example, Andrianaivo and Yartey (2009) postulate that while bank credit to the private sector is nearly 100 % in most developed economies, it is barely 15% in Ghana.

Although, there are several studies examining the relative effectiveness of monetary and fiscal policies, the empirical findings of these studies are highly mixed. Ali et al., (2008), Adesefo (2010), Senbet (2011), Havi and Enu (2014), found that monetary policy is more effective in promoting economic growth than fiscal policy. However, Chowdury (1986a), Olaloye and Ikhide (1995), found opposite result. In addition, cross-country studies yielded mixed results which this does not allow a generalization about the

relative effectiveness of monetary and fiscal policies in influencing economic growth. Some of the differences on the results are much attributed to variable choice and methodology approach employed in the analyses (Senbet, 2011). Despite the demonstrated efficacy of macroeconomic policy in other economies, both policies have not been sufficiently investigated in Ghana to determine the relative effectiveness of these policies on real output. Serious economic distortions can occur if proper investigation of the behavior of these policies in influencing growth is conducted.

To address this issue, the study investigates the effects of fiscal policies on output growth. For monetary policy, the study will analyze the effect of interest rates on output and provide policy recommendations. Since the impact of both policies on the level of economic growth in Ghana is inconclusive, this study introduces the ratio of government spending to private investment as a fiscal policy variable and interest rate as a monetary policy variable to investigate the impact of these policy instruments on economic growth to illustrate which policy variable is more effective in promoting growth in Ghana.

This study, therefore, examines the effects of fiscal and monetary policy on economic growth in Ghana and determines the level of convergence of growth for Ghana. This analysis is conducted using structural equation modeling (SEM) such as the Vector Autoregressive (VAR)/Vector Error Correction Model (VECM) and co-integration analyses on the selected data. The VAR/VECM model is appropriate for analyzing this study because its estimates are reliable and superior than time series when analyzing structural relationships. The cointegration analyses provide both short run and long run effects of policy variables on economic growth. The VECM helps determine the speed of adjustment when there is a shock to the system (time required to restore equilibrium). The

vector autoregressive (VAR) modeling technique provides impulse response functions of policy shocks to demonstrate convergence of output. Variance decomposition is also conducted to determine the relative contributions of each endogenous variable to the forecast error variance in the model. The rest of the study is organized as follows. In chapter 2, a review of both theoretical and empirical literature is presented. Next, we present the model in chapter 3. In chapter 4, empirical analysis of our model is presented, and a summary, conclusions and recommendations are presented in chapter 5.

1.3 Objectives of the Study

The general objective of the study is to examine macroeconomic controls in Ghana countries using a quarterly time series dataset from 2008 to 2017.

The specific objectives of the study are to:

1. establish the short run and long-run relationship between fiscal policy and economic growth in Ghana.
2. determine the short run and long-run relationship between monetary policy and economic growth in Ghana.
3. identify the direction of causality between policy variables and economic growth.
4. examine the relative importance of fiscal and monetary policy in explaining the forecast error variance of economic growth.
5. investigate the effect of government spending on investment (crowding out effects)

1.4 Hypotheses of the Study

1. H_0: there is no long-run relationship between fiscal policy and economic growth in Ghana.
2. H_0: there is no short-run relationship between fiscal policy and economic growth in Ghana.
3. H_0: there is no long-run relationship between interest rate and economic growth in Ghana.
4. H_0: there is no short-run relationship between interest rate and economic growth in Ghana.
5. H_0: there is no causality between policy variables and economic growth in Ghana.
6. H_0: fiscal policy and monetary policy are not important in explaining variations in economic growth.

CHAPTER 2: LITERATURE REVIEW

2.1 Conceptual Model

The question of whether an expansionary monetary policy and fiscal policy will help to raise output starts from the basic Keynesian model. According to Ajisafe and Folorunso (2002), either an increase in government expenditure or an expansionary monetary policy leading to an increase in investment via lower interest rate, will lead to an increase in output. Nevertheless, for many years, and to some extent and even now, there is the view that Keynesians ascribe that only fiscal policy can affect income and output, while monetarists argue that only monetary policy can have such an effect (Ajisafe & Folorunso, 2002).

The accounts of Keynesian theory concentrate on the liquidity trap as the extreme Keynesian special case. The important implication of the liquidity trap is that once the rate of interest has fallen to the level at which the liquidity trap occurs, an increase in the money supply will not reduce the interest rate any further. Therefore, if the level of investment which could occur at this minimum rate of interest is still not great enough to provide expenditure equal to full employment output, then monetary policy will not be able to increase investment, which restore full employment and income by this route. Based on Keynesian theory, in a liquidity trap, an increase in government expenditure will still increase output predicted by the multiplier because interest rates do not rise at all and there is no crowding out of private investment to offset any of the effects of the increase in government expenditure. Hence, the support for the fiscal action of the government to boost output

On the other hand, the monetarists point out the extreme unlikelihood of liquidity trap, and the lack of evidence that it has ever occurred, and they believed that most of Keynesians claim that monetary policy cannot raise income did not have liquidity trap in mind (Ajisafe & Folorunso, 2002). Instead they usually based their view on the other link between monetary policy and investment. If investment is completely insensitive to the rate of interest, then monetary policy will have no effect. It follows therefore that the general theoretical framework accepted by Keynesians indicated that provided that the economy was not in a liquidity trap and if there was some sensitivity of investment to interest rates, monetary policy would affect output. The opposing case, where monetary policy affect income is referred to as the monetarists' view is expressed by referring to the "Quantity Theory of Money" as in equation below:

$$MV = PY \tag{1}$$

where M stands for money stock; V, velocity of circulation; P, an index of the price level and Y, the income. The right-hand side of this equation is the value of nominal national income. If V is constant, the equation tells us that there is a one-to-one relationship between changes in the stock of money and changes in the value of national income.

$$M = kPY \tag{2}$$

In addition, if we keep the price level (P) fixed, then the only way that Y can change is if M changes. The implication is that any other change, such as a change in government expenditure will not affect the level of real income. Hence, fiscal policy must be powerless while monetary policy will affect real output. Considering equation (2) as a demand for

money which is not dependent at all on interest rates, one has the idea that there is one, and only one, level of national income which would lead to a demand for money balances which is equal to the exogenously given money supply. This suggests that if there is an increase in one of the components of desired expenditure, such as government expenditure, what will happen is that there will be an excess demand for funds which will drive up the interest rate in the financial markets. The process will only stop when enough investment has been crowded out by the rise interest rates to leave total expenditure back to its old level. The result of the dynamic process is however clear from the model in equation (3) below:

$$Y = C + I(r) + G \quad (3)$$

Where C is consumption, I is investment, r is interest rate and G is government spending. An increase in government expenditure will lead to a drop in private investment of the same magnitude leaving total expenditure and output unchanged. In terms of equation (3), the increase in government spending (G) will be matched by a fall in investment (I) and there is full crowding out. So, fiscal policy had no effect in the case where the demand for money is entirely unresponsive to interest rate.

2.2 Theoretical Literature Review

There exist a lot of theories which conclude that government spending to some extent crowds out private investment but there is debate over the degree and timing of crowding out due to assumptions and the modeling approach used by different schools of thought. Other theories conclude that government spending neither crowd out nor crowds in private investment. Usually, this debate occurs within the framework of the IS-LM model, which is the interaction between the goods market and money market.

According to traditional theory, government spending increases lead to decreases in investment. Government spending increases cause increases in demand which results in higher interest rates and lowers investment due to the increased cost of credit (Mankiw, 2002). If government spending is financed through borrowing, there is a reduction in national savings, and subsequently, the supply of loanable funds for investment shifts downward. To get loanable funds to return to equilibrium, interest rates must rise. Higher interest rates lead to fall in capital accumulation and future productive capacity of national income and eventually private investment is crowded out. Irrespective of the source of funding, traditional theory concludes crowding out will occur whether government spending is tax financed or deficit financed because they both act to increase the interest rate.

The ultrarationality theory concludes that increases in government spending can potentially result in complete crowding out. According to this model, households are ultrarational because they view the corporate and government sectors as an extension of themselves and incorporate these sectors' spending and saving decisions into their own budget decisions (David and Scadding, 1974). Given that households treat public and private sector investment interchangeably since they both stimulate consumption, government deficit expenditures displace private investment expenditures without changing the interest rate. This is called *ex ante* crowding out (David and Scadding, 1974). However, *ex post* crowding out occurs when the economy is not fully employed, and an increase in government borrowing drives up the rate of interest so that investment decreases by the increase in government borrowing. From an ultrarational perspective, crowding out

occurs because of federal purchases, despite whether the interest rate rises or remains the same.

The Ricardian Equivalence theory argues that government deficits do not crowd out private sector investment. According to this theory, because consumers are rational and forward looking, they perceive current deficits as future tax liability. Consumers offset any loss in public savings by increasing their private savings, expecting increases in taxes in the future leaving national savings unchanged. The Ricardian view states that budget deficits do not affect real interest rates (Barro, 1989) and therefore, do not change private investment. Ricardian Equivalence suggests that private savings is not affected, regardless of whether government spending is financed with taxes or borrowing.

Although these theories provide different explanations from varying schools of thought, economists predict federal purchases effects are dynamic and not limited to crowding out, including crowding in. Keynesian interpretation of expansionary fiscal policy asserts that debt financed government spending creates multiplicative effects which stimulate consumption and saving. Keynesian theorists postulate that government spending increases aggregate output in the short run and investment is positively affected (crowded in) rather than crowded out. Mankiw (1987) argues that a permanent increase in government purchases acts to decrease real interest rates. A permanent increase in government purchases causes an equal reduction in permanent income, which accelerates a reduction in demand and therefore, interest rates must fall to stimulate private spending (Mankiw, 1987).

According to this model, government purchases exhibit a net crowding out effect, but temporarily crowd in investment at the expense of consumption. Similarly, Friedman

(1978) argues that both crowding out and crowding in can occur; however, he discusses the effects of debt financing rather than government purchases. Friedman (1978) asserts that spending on the type of debt financing, government deficits may result in portfolio crowding out or crowding in. According to his analysis, short term financing causes crowding in because people view short term bonds as liquid substitutes for money, which stimulates the economy, whereas long term financing results in crowding out.

Ricardian Equivalence theorem assumes that there is equivalence between debt and taxes, and that consumers are forward looking. Consumers are also assumed to be fully aware of the government's intertemporal budget constraint, and recognize that a tax increase today, will be followed by lower taxes in the future imposed on their infinitely lived families. Consumers decrease their savings, in the knowledge that they will not have to pay more in the future (the debt will be less). The increase in taxes is associated with a decrease in savings. Permanent income, therefore, does not change because of the tax increase. This implies that an increase in government saving resulting from a tax increase, is fully offset by lower private saving, so that aggregate demand is not affected. Raising taxes will have no effect; the policy is totally unfulfilled, and the fiscal multiplier is zero. Similarly, a reduction in taxation in the present is seen as the prospect of future taxation (which is equivalent in present value terms) leaving the public no better off in wealth terms. The reduction in present taxation may stimulate consumer expenditure but the prospect of future taxation reduces consumer expenditure by an equivalent amount.

2.3 Endogenous Growth Theory

The development of endogenous growth theory has provided many new insights on the sources of economic growth. The importance of the new theory is that growth is a consequence of rational economic decisions. Firms make use of their resources on research and development to secure profitable innovations. Through the aggregation of these individual decisions the rate of growth becomes a variable of choice, and hence a variable that can be affected by the tax policies of governments (Lucas, 1988).

Grossman and Helpman (1991) and Lucas (1988) attempt to endogenize the growth process. This resulted from both the dependence of growth on exogenous technological progress in the neoclassical growth model and the seeming inconsistency of the "unconditional convergence" hypothesis. In other words, this new search led to alternative models that can generate economic growth endogenously. Endogenous growth theory stresses the fact that to increase productivity, the labor force must be constantly provided with more resources which in this case include physical capital, human capital and knowledge capital (technology).

2.4 Government Spending and Economic Growth

A lot of attention has been given to the significant economic success of the newly developed countries. More often, this achievement is often attributed to the role government play in these countries. The main view among economists as well as public policy makers is that government can play a very important role in economic development, as fiscal policy is an important instrument which allows the government to intervene in the economy (Blanchard & Perotti, 2002). This intervention considered a short–run policy to

control, the fluctuation in the real gross domestic product and unemployment rate. In a simple Keynesian model context, an expansionary fiscal policy aims to stimulate the economy can be done either by an increase in the government expenditure or by a tax cut or both. But, if this policy failed to achieve the desired growth rate then the desired tax revenue collection to the government will realized which may help finance the government spending in the next period.

Holding all other things constant, government expenditure will increase GDP since it contributes to current demand. However, there is also a negative relationship since government expenditure needs to be financed. This is done by collecting taxes revenue or through borrowing from either internal or external sources. Increased taxes will lower disposable income for households and private consumption may fall. Public expenditure can have a crowding out effect on private investments because resources that could have being invested in the private sector instead go to the government sector.

The relationship between government expenditure and economic growth has continued to generate debate among scholars. Government performs two functions-protection (and security) and provisions of certain public goods. Protection function consists of the creation of rule of law and enforcement of property rights. It is argued that increases in government expenditure encourages economic growth. That is, government expenditure on infrastructure increases the productivity of labor and increase the growth of national output. Similarly, expenditure on infrastructure foster economic growth.

There are two major opposing theories in economics concerning the relationship between government expenditure and economic growth. Keynes views public expenditures as an exogenous factor which can be used as a policy instruments to promote economic

growth. The Keynesian macroeconomic theory assumed that increase in government spending leads to high aggregate demand which leads to rapid economic growth. Wagnerian theory, however, supports the opposite view that an increase in national income causes more government expenditure. Razin and Yuen (1996) argued that there is a positive relationship between the per capita income of the citizens in a country with government spending such that the income elasticity of government spending is usually greater than one.

2.5 The Impact of Government Purchases on Private Investment

Blackley (2014) provided new evidence concerning the effect on private investment of allocating resources to public consumption and investment. An autoregressive distributed lag model developed for cointegration-error correction analysis is estimated using data for the U.S. public sector for 1956Q1–2010Q2. It was found that there is no crowding out associated with the net effect of equal %age changes in government purchases of domestic consumption and investment in the long run. The results are generally consistent with post Keynesian views of fiscal policy and support those who argue that the 2009 stimulus package was not well-suited for generating a sustained recovery in the U.S. economy. It was found that the long-run net effects of domestic government purchases do not crowding out investment, but public investment contribute to crowding out of private investment. The results show that military spending partially crowds out investment. There is little support for the neoclassical view that aggregate domestic government purchases directly crowd out private investment. The positive effect of government investment on private investment is strong enough to more than offset the

partial crowding out estimated for public consumption, most of which is devoted to the compensation of employees.

Link (2006) conducted a study to determine whether federal government purchases negatively impact private investment using times series regression analysis. This study uses quarterly data from the years 1986 to 2004 to provide a relatively contemporary evaluation of the effects of federal purchases on private investment. The empirical results in this study reveal that increases in federal purchases, expressed as a % of GDP, act to reduce new investment, which provides further support for the theory that government expenditures crowd out private investment. The objective of this current investigation is to determine the relationship between federal purchases and new investment. This model provides further support for the theory that government expenditures crowd out private investment. These results imply that government purchases crowd out new investment regardless of whether the expenditure is funded through idle funds, tax receipts, or debt financing; all federal purchases act to negatively effect on private investment.

Cogan, et al. (2010) estimated old Keynesian government multipliers verses the new Keynesian government spending multipliers for U.S data. According to the authors, models currently being used in practice to evaluate fiscal policy stimulus proposals are not robust. They applied a contemporary empirical method to estimate government spending multipliers and compared these multipliers with those that have recently been used to analyze fiscal policy in the United States. They focused on an empirically estimated macroeconomic model and found that government spending multipliers from permanent increases in federal government purchases are much less in new-Keynesian models than in old-Keynesian models. The differences are wider for studies that estimates the impacts of

the actual path of government purchases in fiscal packages. The results indicated that the impact in the first year is very small and as government purchases decline in the later years of the simulation, the multipliers turn negative.

A study by Hemming (2002) explores the effectiveness of fiscal policy in responding to downturns in economic activity, particularly during recessions. Annual data for the 29 advanced economies over the period 1970-99 are derived from IMF databases and complemented by World Bank debt data. The econometric approach used involves estimating a system of two equations for the fiscal response and the depth of recession with most variables included in continuous form and dummy variables were used for the exchange rate regime (which is not continuous) and for expenditure-based fiscal policy (for which the corresponding continuous variable would be the fiscal response). The results indicated that short-term multipliers are positive, ranging from 0.1 to 3.1, with expenditure multipliers being in the range of 0.6 to 1.4, and tax multipliers in the range of 0.3–0.8. Long term multipliers are smaller than short term multipliers, reflecting some form of crowding out. The study concluded that there is little evidence of direct crowding out or crowding out through interest rates and the exchange rate.

Bairam and Ward (1993) estimated separate investment equations for twenty-five countries of the Organization for Economic Cooperation and Development (OECD) for 1950–88 and found significant crowding out by government expenditures in nineteen of twenty-five cases. Erenburg and Wohar (1995) assessed the causality between public and private equipment investment between 1954 and 1989. In a model using Tobin's *q*-ratio to measure expected profitability, they found that over a three-year period public investment had a significant negative effect on private investment, but a four-year lag had a strong

positive effect. The authors hypothesized that shorter-term lags may capture financial crowding out, while the significant fourth lag reflects greater equipment purchases once a public project is completed.

Based on annual data from 1956 to 1997, Pereira (2001) used impulse response functions from vector autoregressive (VAR) models to assess intertemporal linkages between private and public investment. He estimated an elasticity of 0.23 for private investment with respect to aggregate public investment and found that all types of public investment crowded in (increased) private investment, with the greatest effect for core infrastructure expenditures. Also, private investments in industrial and transportation equipment were the components most strongly related.

Ramirez (2000) assessed the effect of public investment's share of GDP on private investment's share for a pool of eight Latin American countries from 1980 to 1995. As in Pereira, but unlike most previous work, his estimates indicated a positive one-year elasticity of 0.2 for private investment's GDP share with respect to public investment's share. In the most comprehensive international assessment of the effects of disaggregation, Ahmed and Miller (2000) considered a pooled set of thirty-nine countries from 1975 to 1984 to estimate the relationship between investment's share of GDP and eight government spending components. Under debt-financing conditions, social security and welfare expenditures crowded out investment, while transportation and communication spending increased overall investment.

Dunne and Smith (2010) and Alptekin and Levine (2009) identified a trade-off between a positive short-run Keynesian stimulus and a long-run crowding-out effect. In their critique of Granger causality models, Dunne and Smith argued that without a

structural model, VAR analyses are not informative about the underlying relationship between defense spending and economic growth. Barro and Redlick (2011) found that changes in defense spending were not significantly related to changes in private investment using annual U.S. data for 1950–2006. But when the World War II years, with their large military spending were included, they estimated a significant crowding-out effect for defense.

2.6 Empirical Review of the Relative Effectiveness of Fiscal and Monetary Policy

Hassan (2006) uses structural Vector autoregressive model to study the effectiveness of fiscal policy in stabilizing the real GDP in Egypt using annual data covering 1981 to 2005.The study concluded that the relationship between the fiscal policy and economic activity is weak. The study also established that fiscal policy impacts on monetary policy strongly calling for policy coordination. This paper therefor revealed evidence against adopting fiscal policy to stabilize fluctuations.

Adefeso and Mobolaji (2010) reexamined the relative effectiveness of fiscal and monetary policy on economic growth in Nigeria using annual data from 1970-2007.They employed the error correction mechanism and cointegration technique to draw policy inference. Their findings suggested that monetary policy impact on real Output (real GDP) is much stronger than fiscal policy and the inclusion of trade openness did not alter the results. They concluded that, with regards to macroeconomic stabilization, monetary policy is more effective than fiscal policy.

According to Suleiman (2009) who investigated the long-run relationship between money supply (M2), public expenditure and economic growth in Pakistan using annual

data for the period between 1977-2007 using Johansen cointegration test to establish the existence of a long-run relationship between the study variables. The granger causality test was employed to determine whether the direction of causality was bilateral or unidirectional. Surprisingly the results of the study revealed that there exists a negative relationship between public expenditure and growth in the long-run while money supply (M2) impacts positively on economic growth in the long-run. The results suggest that monetary policy has unlimited impact on economic growth.

Jordan, Roland and Carter (1999) in their study of the effectiveness of monetary and fiscal policies in Caribbean countries using annual data revealed based on a VAR estimation that both policies have significant effect on GDP, but the coefficient of monetary policy was negative signifying that an expansion in the monetary policy contracts real output in the long-run. It was evident that the relative potency of the two policies remain a puzzle in the economics literature.

Senbet (2011) investigated the effect of fiscal and the monetary policy on output in USA using the VARs approach. The studies that use nominal GDP as the dependent variable could not address the question of how policy induced change is split between a change in real output and change in price. Thus, effectiveness should be measured in terms of impact on real variables and not nominal variables. To filter out the effect of price, real GDP should be used as the proxy for economic activity while real money stock and real actual government expenditure should be used as the proxies for monetary and fiscal policies respectively. Senbet (2011) found that monetary policy is relatively more effective than fiscal policy in affecting real output.

CHAPTER 3: ESTIMATION METHODS AND PROCEDURES

3.1 Introduction

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

3.2 Empirical Model Specification

Following Blanchard and Perotti (2002), our basic VAR model is specified as:

$$Z_t = A(L,q)\,Z_{t-1} + U_t \tag{4}$$

Where $Z_t \equiv [Y_t, GTI_t, IR_t, IG_t, RP_t]'$ is a six-dimensional vector in logarithm terms of economic growth (Y_t), government spending to private investment ratio (GTI_t), real interest rate (IR_t), inflation gap (IG_t) and risk premium (RP_t) . $U_t \equiv [y_t, gti_t, ir_t, ig_t, rp_t]$ is the corresponding vector of reduced-form errors which in general will have non-zero cross-correlation and $A(L,q)$ is distribute lag polynomial of the coefficients in the model.

In this study, VAR/VECM is adopted rather than SVAR, because a) the model could be correctly specified and exactly identified, b) VECM allows for both short run and long run analysis and c) interpretation of results are simple, yet intuitive. Not adding co-integrating term would result in loss of efficiency. With VAR/VECM, cointegration restrictions need not be enforced unlike SVAR, which will only be valid if the cointegration restrictions are enforced. In SVARs, theory is used to place restrictions on the contemporaneous correlations and identification is obtain by placing restrictions on the

matrices. The VAR model is exactly identified; if we impose additional restrictions on the parameters, it would be an overidentified model.

Consistent with the objectives of the study and in accordance with the literature, the explicit VAR model can be expressed as:

$$Y_t = \beta_0 + \beta_1 Y_{t-k} + \beta_2 GTI_{t-k} + \beta_3 IR_{t-k} + \beta_4 IG_{t-k} + \beta_5 RP_{t-k} + \varepsilon_t \quad (5)$$

The corresponding short-run model for this study is given as:

$$\Delta Y_t = \beta_0 + \sum_{p=1}^{p} \beta_1 \Delta Y_{t-p} + \sum_{p=1}^{q} \beta_2 \Delta GTI_{t-p} + \sum_{p=1}^{r} \beta_3 \Delta IR_{t-p} + \sum_{p=1}^{s} \beta_4 \Delta IG_{t-p} + \sum_{p=1}^{t} \beta_5 \Delta RP_{t-p} + \psi ECT_{t-1} + \nu_t \quad (6)$$

Where Y_t is economic growth, GTI_t is ratio of government spending to private investment, IR_t is interest rate, I_t is inflation gap (US inflation minus Ghana Inflation), RP_t is the log of risk premium of Nigeria, Δ is difference operator and ECT_{t-1} is error correction term lagged one period. Since the focus off the study is on effects of fiscal and monetary policy on growth, we will present long run estimate for equation (5) and its corresponding short run model, equation (6). The coefficients $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ are the elasticities of the respective variables, with ψ showing the speed of adjustment, β_0 is the drift component, *t* denotes time and ν_t is the stochastic error term.

3.3 Variable Justification, Description and Measurement

Expansionary fiscal policy is generally associated with an increase in aggregate demand and triggers growth in output. This is because as government spends more to build infrastructure, it demands goods and services from the market and producers respond to this new demand by increasing production, which often requires more labor, which has a

multiple effect because, as producers hire new workers, the new workers begin to spend more by demanding for products and services and producers respond by providing more goods and services.

Interest rates, which is price of money, is one of the most significant economic indicators, among other things, gives signals to the economy that the banking authorities want to either spur investment or keep the currency strong. A strong currency usually attracts foreign capital and investor confidence on the stability of assets in the economy.

Economic Growth (Y):

Economic Growth is defined as the sustained increases in a country's gross domestic product overtime. The existing literature suggests that real gross domestic product can be used as an efficient measure of economic growth. Real GDP is an adjusted GDP measure that reflects the value of all goods and services produced in a given year expressed in the base year prices. Many researchers use GDP deflator and consumer price index (CPI) interchangeably to deflate nominal GDP as a measure of economic growth. The GDP deflator is considered to some extent more efficient than the CPI as a deflator because it considers both producer and consumer goods whereas the CPI covers both consumer goods and services. This study obtained real GDP growth from the CEIC website as a measure of economic growth and this measure has been widely used by other researchers.

Government Spending:

Government spending variable enters the model as a policy variable and to complete the components of output. Keran (1971) stated that changes in government spending affects total spending, corporate earnings and thereby affecting share prices. Government expenditure, according to the Keynesian proposition is expected to raise economic growth. It could, however, reduce economic growth because of the crowding out effect on private investment and the inflationary pressures (Allen & Ndikumana, 2000). Government spending is expected to drive economic growth without a crowding out effect on the private sector.

According to the Keynesian proposition, an increase in government expenditure, if bond financed, raises aggregate demand, which leads to an increasing demand for cash balance. Government expenditure is expected to propel economic growth without a crowding out effect on the private sector. This study follows the works of Easterly & Rebelo (1993) and Malla (1997) but it would be used as a policy variable for economic growth in this study since an increase in government expenditure especially in productive activities like road construction, provision of electricity can boost economic growth. Nonetheless, given that all other things remaining constant and following Keynesian proposition, we expect $\beta_2 > 0$.

Real Interest Rate (r)

Interest rates are important in the efficient allocation of resources intended at facilitating growth and development of an economy. It is a demand management strategy for achieving both internal and external balance with specific attention for deposit

mobilization and credit creation for enhanced economic development (Giovanni & Shambaugh, 2007). Interest rate can either have a positive or negative effect on economic growth. This implies that decreasing the interest rate stimulates the economic production, which leads to growth. On the other hand, slow economic growth which result from contractionary monetary policy through high interest rate can lead to a decline in economic growth. This study used treasury bill rates and we expect $\beta_3 < 0$.

Inflation Gap (IG):

Inflation gap used in the model is the difference between US inflation and Ghanaian inflation. It enters the model as an exogenous variable. Inflation gap reflects macroeconomic instability. Higher inflation rate is usually detrimental to growth because it raises the cost of borrowing, which lowers the rate of capital investment. However, at low levels of inflation, the likelihood of such a trade-off between inflation and growth is minimal. Inflation is therefore used as an indicator to capture macroeconomic instability (Asiedu & Lien, 2004) and (Asiedu, 2006). It is expected that $\beta_4 < 0$.

Risk Premium

Risk premium on lending is the interest rate charged by banks on loans to private sector customers minus the "risk free" treasury bill interest rate at which short-term government securities are issued or traded in the market. In some countries this spread may be negative, indicating that the market considers its best corporate clients to be lower risk than the government. The terms and conditions attached to lending rates differ by country, however,

limiting their comparability. In this study, we used risk premium of Nigeria as an exogenous variable. It is expected that $\beta_5 > 0$

3.4 Estimation Techniques

The empirical procedure involves the following steps. In the first step, the study investigated the time series properties of our data by using the Augmented Dickey–Fuller (ADF) and the Phillip-Perron (PP) unit root tests. Unit root test checks the stationarity properties of the variables. In the second step, the cointegration test was conducted using Johansen's multivariate approach. In the third step, we performed cointegration testing because the presence of cointegrated relationships has implications for the way in which causality testing is carried out. Finally, variance decomposition analysis and impulse response functions was conducted on the variables used in the study.

3.5 Unit Root Tests

It is very important to test for the statistical properties of variables when dealing with time series data. Time series data are rarely stationary in level forms. Regression involving non-stationary time series often lead to the problem of spurious regression. This occurs when the regression results reveal a high and statistically significant relationship among variables when in fact, no relationship exists. Moreover, Stock and Watson (1988) have also shown that the usual test statistics (t, F, DW, and R^2) will not possess standard distributions if some of the variables in the model have unit roots. A time series is stationary if its mean, variance and auto-covariance are independent of time. The study employed a variety of unit root tests. This was done to ensure reliable results of the test for stationarity

due to the inherent individual weaknesses of the various techniques. The study used both the PP and the ADF tests.

3.6 Cointegration Tests

An appropriate solution to a series which is non-stationary and contains unit root is first differencing. However, first differencing results in eliminating all the long-run information which the interest of economists. Granger (1986) found a relationship between non-stationary processes and the long-run equilibrium concept. Two or more variables are said to be cointegrated (there is a long-run equilibrium relationship), if they share a common trend. Cointegration exists when a linear combination of two or more non-stationary variables is stationary.

3.7 Johansen and Juselius Approach to Cointegration

When the variables are integrated of the same order, OLS is used to estimate the parameters of a cointegrating relationship. It has been shown that the application of OLS to $I(1)$ series yields super-consistent estimates (Johansen, 1988). That is, estimates converge on to their true values at a faster rate than the case if $I(0)$ or stationary variables are used in estimation. These parameter values are used to compute the errors. Cointegration tests are the test for stationarity of the errors by using DF and ADF tests. If the errors are stationary, there exists one cointegrating relationship among variables and it will rule out the possibility of the estimated relationship being “spurious”.

Johansen and Juselius (1992) developed multivariate method which uses the Vector Autoregressive (VAR) and the Vector Error Correction (VECM) framework for testing the

presence of cointegration and estimation of long-run and short-run relationships among non-stationary macroeconomic time series. The VAR and VECM deliver an important framework which is applicable to study the impact of unanticipated shocks (individual and system) on the endogenous variables (impulse response functions). Also, we can identify the relative importance of each variable in explaining the variations of endogenous variables (variance decomposition analysis). Moreover, both long-run (cointegration) relationships and short-run dynamics of the variables in the system can be established. correlation.

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. There are two tests to determine the number of cointegrating vectors namely, the trace test and the maximum Eigen value test.

3.8 Granger Causality Test

The study of causal relationships among economic variables is very useful for empirical econometrics. Engle and Granger (1991) asserted that cointegrated variables must have an error correction representation. According to Gujarati (2001), if non-stationary series are cointegrated, then one of the series must granger cause the other. To examine the direction of causality in the presence of cointegrating vectors, Granger causality is conducted based on the following:

$$\Delta Y_t = \delta_0 + \sum_{i=1}^{p} \beta_{1i} \Delta Y_{t-i} + \sum_{i=0}^{p} \phi_{1i} \Delta X_{t-i} + \omega_{1i} ECT_{t-1} + \nu_t \quad (7)$$

$$\Delta X_t = \delta_0 + \sum_{i=1}^{p} \beta_{2i} \Delta X_{t-i} + \sum_{i=0}^{p} \phi_{2i} \Delta Y_{t-i} + \omega_{2i} ECT_{t-1} + u_t \quad (8)$$

Where ΔY and ΔX are our non-stationary dependent and independent variables, ECT is the error correction term, ω_{1i} and ω_{2i} are the speed of adjustments. P is the optimal lag order while the subscripts t and t-i denote the current and lagged values. If the series are not cointegrated, the error correction terms will not appear in equations 7 and 8. To find out whether the independent variable (X) granger-causes the dependent variable (Y) in equation 7, we examine the joint significance of the lagged dynamic terms. Using the standard F-test or Wald statistic, four possibilities exist: First, rejection of the null hypothesis in equation (7) but failing to reject the null in equation (8) at the same time implies unidirectional causality running from X to Y. Second, a rejection of the null hypothesis in equation (8) but at the same time failing to reject the null in equation (8) implies unidirectional causality running from Y to X. Third, simultaneous rejection of the two null hypotheses indicates bi-directional causality. Fourth, simultaneous failure to reject the two null hypotheses indicates independence or no causality between the variables of interest.

3.9 Variance Decomposition

Variance decomposition or the forecast error variance decomposition helps in the interpretation of a VAR model once it has been fitted. It indicates the amount of information each variable contributes to the dependent variable in the model. That is, it reveals the proportion of movements in the dependent variable resulting from own shock, and other identified shocks (Enders, 2004). Therefore, variance decomposition provides information about the relative importance of each variable in explaining the variations in the endogenous variables in the VAR. To assign variance shares to the different variables,

the errors in the equations must be orthogonalized. Therefore, the study will apply the Cholesky decomposition method.

3.10 Impulse Response Functions

Impulse response function gives the response of one variable, to an impulse in another variable in a system that may involve several other variables as well. It is useful in analyzing the impact of unanticipated shocks resulting from other variables in the VAR model to one endogenous variable. The impulse response function traces the effect of each shock on each variable in the VAR over a given time horizon. According to Enders (2004), a shock to the i^{th} variable directly affects the i^{th} variable and is also transmitted to all the endogenous variables through the dynamic structure of the model. This information will help policy makers to predict the consequences of unanticipated shocks so that they can better react to these changes in future.

3.11 Data Analysis

The study employed both descriptive and quantitative analysis. Charts such as graphs and tables were employed to aid in the descriptive analysis. Unit root tests were carried out on all variables to ascertain their order of integration. The study implemented the Johansen's maximum likelihood econometric methodology for cointegration introduced and popularized by Johansen (1988), Johansen and Juselius (1990) and Johansen (1991). This approach helps to find both the short and long-run estimates of the variables in the VAR model. All estimations were carried out using Econometric views (Eviews) 8.0 package.

3.12 Sources of Data

The study employed secondary quarterly time series data collected from CEIC website on Ghana. The variables of interest include GDP growth rate, tax revenue, government spending, growth rate of money supply, interest rate, consumer price index, exchange rate, US federal fund rate, and risk premium of Nigeria. The quarterly dataset covers the period between 2008 to 2017, making a total 40 datapoints for all variables above. The choice of the data coverage was informed by the fact that it was extremely challenging getting quarterly data on some of the variables prior to 2008, the start date used in the study.

3.13 Limitations of the study

The main limitation of the study typical of such studies in developing nations had to do with the limited availability of quarterly data on some key variables used in the study. To produce highly reliable estimates especially with cointegration analysis, long span of annual time series data of all the variables was needed. However, converting annual series into quarterly series will not pose danger to the reliability of the results.

Also, there is limitation with Johansen's approach to cointegration employed in this study in that it is based on VAR methodology which is inherently over parameterized and sensitive to both model specification and lag length selection. The selected lag length has implications for the outcome of the cointegration, variance decomposition and causality test. Nevertheless, the cointegration, variance decomposition and causality test produced consistent results. Our choice of the optimal lag length was based on the standard model selection criteria (AIC, SIC, HQ, FPE and LR) that ensured white noise errors.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter seeks to present and analyze the results of the functions in the model specification. As indicated earlier, this study seeks to investigate the long-run and short-run relationship effects of fiscal and monetary policy on economic growth. This chapter presents a thorough analysis and discussion of the results of the study. The chapter is divided into sections. The first section examines the time series properties of the variables where the results of both Augmented Dicky Fuller (ADF) and Philips Perron (PP) unit root tests are presented. The second section present lag length criteria for both long-run and short run estimates. The results of Johansen's approach to co-integration are presented in the third section. Section four presents and discusses the results of the estimated long-run and short-run growth model using VAR approach. The final section presents and discusses variance decomposition and impulse response analyses.

4.2 Results of Unit Root Test

Before applying the Johansen's multivariate approach to co-integration, unit root test was conducted to investigate the stationarity properties of the variables. All the variables were examined by first inspecting their trends. All the variables appear to be non-stationary at levels. However, all the variables in their first differences exhibit some stationary**.** Furthermore, the Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) tests were applied to all variables in levels and in first difference to formally establish their order of integration. The Schwartz-Bayesian Criterion (SBC) and Akaike Information Criterion (AIC) were used to determine the optimal number of lags included in the test.

The study presented and used the P-values for making the unit root decision which arrived at similar conclusion with the critical values. The results of both tests for unit root for all the variables at their levels with intercept and trend and their first difference are presented in Table 1 and 2.

Table 1: Unit Root Test for the Order of Integration (ADF and Philips Perron): At levels with (Intercept and Trend)

VARIABLES	ADF STATS	P-VALUE	PP STATS	PROB
Economic Growth	-2.32460	(0.4167)	-2.02617	(0.6056)
Government Spending to Private Investment	-2.37778	(0.3888)	-2.56476	(0.2974)
Inflation Gap	-2.18095	(0.8927)	1.161100	(0.9124)
Interest Rate	-2.16477	(0.5041)	-2.32490	(0.4167)
Risk Premium (Nigeria)	2.21034	(0.3287)	2.48490	(0.3125)

Source: Computed using Eviews 8.0 Package

From the results of unit root test in Table 1, the null hypothesis of unit root for all the variables cannot be rejected at levels. This means that all the variables are not stationary at level since their p-values for both ADF and PP tests are not significant at all conventional level of significance.

Table 2: Unit Root Test for Order of Integration: (ADF and Philips Perron)

At first Difference with (Intercept and Trend)

VARIABLES	ADF STATS	PVALUE	*OI*	PP STATS	PROB	*OI*
D (Economic Growth)	-5.6964	(0.00)***	*I*(1)	-6.2685	(0.000)***	*I*(1)
D (Government Spending to Private Investment)	-9.1762	(0.00)***	*I*(1)	-9.3973	(0.000)***	*I*(1)
D (Inflation Gap)	-4.14834	(0.00)***	*I*(1)	-5.8508	(0.000)***	*I*(1)
D (Interest Rate)	-5.7627	(0.00)***	*I*(1)	-14.948	(0.000)***	*I*(1)
D (Risk Premium Nigeria)	-9.3567	(0.00)***	*I*(1)	-8.2760	(0.00)***	*I*(1)

Note: *IO* represents order of integration and D denotes first difference. *** represent significance at the 1%.

Source: Computed using Eviews 8.0 Package.

However, Table 2 shows that, at first difference all the variables are stationary, and we reject the null hypothesis of the existence of unit root. We reject the null hypothesis of the existence of unit root in all variables at the 1% level of significance. From the above analysis, one can therefore conclude that all variables are integrated of order one *I*(1) and in order to avoid spurious regression the first difference of all the variables must be employed in the estimation of the short run equation.

4.3 VAR Lag Length Selection

The estimation of VAR models requires the selection of an appropriate lag length. The lag length plays a vital role in diagnostic tests as well as in the estimation of VAR models for co-integration, impulse response and variance decomposition (Bhasin, 2004). Appropriate lag length (p) is chosen using standard model selection criteria (AIC and SBC)

that ensure normally distributed white noise errors with no serial correlation. The results of the VAR lag selection criteria are presented in Table 3.

Table 3: VAR Lag Order Selection Criteria.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-111.1950	NA	2.71e-05	6.510831	6.774751	6.602946
1	98.59275	337.9913	1.79e-09	-3.144042	-1.296603*	-2.499236
2	146.0065	60.58418*	1.13e-09*	-3.778136	-0.347179	-2.580640
3	169.3357	22.03316	3.79e-09	-3.074204	1.940272	-1.324018
4	242.5184	44.72280	1.65e-09	-5.139913*	1.458082	-2.837036*

Source: Conducted using Eviews 8.0 package.

* indicates lag order selected by the criterion

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

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

It can be observed from the VAR lag selection criteria presented in Table 3 that there are asterisks attached to some statistics of the five lag selection criteria (AIC, LR, SC, HQ and FPE). Tracing Table 3 above, lag 2 has the maximum asterisks. This implies that the appropriate lag length chosen is 2.

4.4 Granger Causality Test

To find out the direction of causality between economic growth and the selected macroeconomic variables, the study conducts a pair wise Granger causality test using lag 2 and the results are presented in Table 4.

Table 4: Granger Causality Wald Tests

Equation	Excluded	chi2	df	Prob > chi2
Economic growth	Real interest rate	8.8108	2	0.012
Economic growth	All	8.8108	2	0.012
Real interest rate	Economic growth	7.8577	2	0.020
Real interest rate	All	7.8577	2	0.020

Source: Conducted using Stata 13 package.
***, **represent significance at the 1% and 5% respectively.

The results of the Granger causality test in Table 4 shows that interest rate Granger causes economic growth at 5 % level of significance. This means that that real interest rate predicts economic growth in Ghana, implying the existence of a causality through real interest rate to economic growth. This indicates that real interest rate is a critical variable in achieving economic growth. Also, all other variables in the economic growth equation shows causality with economic growth at 5 % level of significance.

With regards to interest rate equation, there is evidence of causality between economic growth and real interest rate. It can be seen from the table that economic growth granger cause interest rate at 5 % level of significances and it passes from interest rate to economic growth. Also, all other variables in the real interest rate equation shows causality with interest rate at 5 % level of significance.

4.5 Test for Cointegration of Economic Growth

This section presents the results on the Johansen cointegration analysis. Considering non-stationary series with a unit root, first differencing appears to provide the appropriate solution to the problems. But, first differencing will eliminate all the long-run

information which is of interest to economists. Johansen (1991) asserted that cointegration can be used to establish the existence of a linear long-term economic relationship among variables. In the same vein, Pesaran and Smith (1995) added that cointegration enable researchers to determine whether there exists disequilibrium in various markets. Johansen (1991) further stated that cointegration allows us to specify a process of dynamic adjustment among the cointegrated variables in disequilibrated markets. Given that the series are *I* (1), the cointegration of the series is a necessary condition for the existence of a long run relationship. Under the assumption of linear trend in the data, an intercept and trend in the co-integration equation, the results of both the trace and maximum-Eigen value statistic test are presented in Tables 5 and 6.

Table 5: Johansen's Cointegration Test (Trace) Results

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.317364	152.4947	125.6154	0.0004
At most 1 *	0.297980	107.8249	95.75366	0.0057
At most 2	0.207483	66.43117	69.81889	0.0904
At most 3	0.140722	39.22381	47.85613	0.2515
At most 4	0.106706	21.47921	29.79707	0.3284
At most 5	0.068176	8.276945	15.49471	0.4363
At most 6	0.000132	0.015409	3.841466	0.9011

Source: Computed Using Eviews 8.0 Package.
Trace test indicates 2 cointegrating equation(s) at 5% level of significance
Note: * denotes rejection of the hypothesis at the 5% significance level

Table 6: Johansen's Cointegration Test (Maximum Eigen Value) Results.

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None*	0.317364	46.23142	44.66976	0.0072
At most 1 *	0.297980	41.39376	40.07757	0.0353
At most 2	0.207483	27.20736	33.87687	0.2524
At most 3	0.140722	17.74460	27.58434	0.5165
At most 4	0.106706	13.20227	21.13162	0.4338
At most 5	0.068176	8.261536	14.26460	0.3527
At most 6	0.000132	0.015409	3.841466	0.9011

Source: Computed Using Eviews 8.0 Package.

Eigen value test indicates 2 cointegrating equation(s) at 5% level of significance

Note: * denotes rejection of the hypothesis at the 5% significance level

It can be seen from Tables 5 and 6 that both the trace statistic and the maximum-Eigen value statistic indicate the presence of cointegration among the variables. The null hypothesis of no cointegrating relationship or vector (r = 0) is rejected since the computed values of the trace and the maximum-Eigen value statistics of 152.4947and 46.23142 are greater than their respective critical values of 125.6154 (5%) and 44.66976 (5%) respectively. Also, the null hypothesis of at most 1 cointegrating relationship or vector (r = 1) is rejected since the probability value for Trace (0.0057) and Max-Eigen (0.0353) is less than 0.05 level of significance. But, we failed to reject the null hypothesis of at most 2 cointegrating relationship or vector (r = 2) at 5% level of significance, since both trace and max-eigen shows a probability value of more than 5% level of significance. Hence applying the Johansen test to the quarterly series spanning from 2008: Q1 to 2017: Q4 (40 observations) leads to conclusion that there exits at most two cointegrating relationships. This confirms the existence of a stable long-run relationship among the variables in the model.

4.6 Long-Run Estimates of Economic Growth Model and Real Interest Rate Model

The result of the VAR Estimates for both economic growth model and real interest rate model is presented in Table 7 below.

Table 7: Long Run VAR Estimates of Economic Growth

Variables	Coefficient	Standard Error	T-statistics	Prob
Economic growth (-1)	0.892	0.154	5.81	0.001***
Economic growth (-2)	0.067	0.027	2.50	0.030***
Real interest rate (-1)	-0.055	0.019	-2.94	0.029**
Real interest rate (-2)	0.047	0.018	2.54	0.015**
Government spending/private investment (-1)	0.448	0.219	2.04	0.027**
Inflation gap (-1)	0.043	0.022	1.99	0.042**
Risk Premium (-1)	0.191	0.051	3.73	0.008***
Constant	0.024	0.006	3.70	0.005***

Source: Computed Using Stata 13 Package.

The result from economic growth equation shows that the ratio of government spending to private investment which served as a fiscal policy variable was statistically significant and it exerted a positive impact on economic growth. This implies that 1 % increase in the ratio of government spending to private investment would lead to approximately 0.448 % increase in economic growth in the long-run. This is an indication that government expenditure is a key channel through which we can achieve sustained economic growth in Ghana.

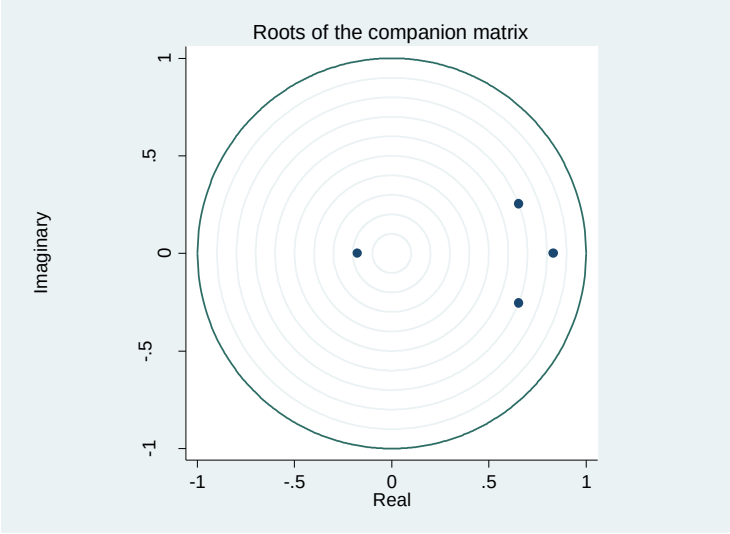
Interest rate with a coefficient of -0.055 has a negative and significant impact on economic growth. Specifically, a one % increase in interest rate will decrease economic

growth by 0.05 % in the long run. However, two previous period interest rate shows a positive effect on economic growth. A higher level of interest rate represents distortion of any economy. If Least Developing Countries (LDCs) are streamlining their investment regulatory framework and implementing policies which promote macroeconomic stability and improve infrastructure, they can achieve a higher level of economic growth (Asiedu, 2002; Asiedu, 2006).

Inflation gap exert a negative and statistically significant effect on economic growth. The results show that, 1% increase in inflation gap will cause economic growth to increase by 0.043%. The Risk Premium of Nigeria is significant and exert a positive effect on Ghana's economic growth. From the result, 1% increase in Nigeria's risk premium leads to 0.191 % increase in Ghana's economic growth. This is because a high risk-premium will deter investors from coming to Nigeria and rather choose Ghana, which have a lower risk premium.

Figure 1: Stability of the VAR Estimates

Eigenvalue stability condition shows that all the eigenvalues lie inside the unit circle.



Source: Conducted using Stata 13 package.

Table 8: Long Run VAR Estimates of Real Interest Rate

Variables	Coefficient	Standard Error	T-statistics	Prob
Economic growth (-1)	-1.209	1.174	-1.03	0.164
Economic growth (-2)	1.893	1.040	1.82	0.102
Real interest rate (-1)	1.067	0.143	7.42	0.000**
Real interest rate (-2)	-0.245	0.140	-1.75	0.105
Government spending/private investment (-1)	2.373	0.985	2.41	0.021**
Inflation gap (-1)	-0.263	0.164	-1.60	0.149
Risk Premium (-1)	0.083	0.026	3.25	0.012**
Constant	-0.142	0.947	-0.15	0.185

Source: Computed Using Stata 13 Package

4.7 Short Run Dynamics (Vector Error Correction Model)

Engle and Granger (1991) argued that 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 combined to capture both the short-run and long-run relationships. It is expected to be statistically significant with a negative sign. The negative sign implies that any shock that occurs in the short-run will be corrected in the long-run. If the error correction term is greater in absolute value, the rate of convergence to equilibrium will be faster.

Given that our variables are non-stationary but cointegrated, the estimation of the VECM, which included a first differenced VAR with one period, lagged error correction term yielded an over-parameterized model. As the values of the variables are stationary,

the model was estimated using the ordinary least squares (OLS). The approach of general-to-specific (GTS) modeling was employed to arrive at a more parsimonious model, where insignificant lagged variables were deleted using the t-ratios. Rutayisire (2010) argued that this process of moving from the general to the specific brings about a simplification of the model that makes estimations more reliable and increases the power of the tests. The results from the vector error correction model are displayed in Table 9 and suggest that the ultimate effect of the previous period's values of economic growth on current values of economic growth in the short-run is positive and significant at lag 2.

Table 9: Results of Vector Error-Correction Model (VECM) of Economic Growth

Variables	Coefficient	Standard Error	T-statistics	Prob
ECT (-1)	-0.338	0.076	-4.41	0.001***
D (Economic growth (-2))	0.272	0.106	2.56	0.020**
D (Real interest rate (-2))	-0.076	0.017	-4.54	0.005**
D Government spending private investment (-1)	0.568	0.233	2.40	0.027**
D (Inflation Gap (-2))	-0.025	0.029	-0.85	0.621
D (Risk Premium (-2))	-0.255	0.122	-2.09	0.038**
Constant	-0.022	0.009	-2.30	0.034**

Source: Conducted using Stata 13 package.

From the economic growth equation, the result shows that the estimated coefficient of the error correction term (ECT) has the expected sign and it is significant. This is an indication of joint significance of the long-run coefficients. According to Kremers et al. (1992) and Bahmani-Oskooee (2001), a relatively more efficient way of establishing

cointegration is through the error correction term. From the results in Table 8, the estimated coefficient of the error correction term is -0.338 which implies that that the speed of adjustment is approximately 33.8 % per quarter.

This negative and significant coefficient is an indication that cointegrating relationship exists among the variables. The coefficient on the error correction term (ECT) shows that about 33.8 % of the disequilibrium in economic growth caused by previous years' shocks converges back to the long-run equilibrium in the next quarter. From the study, the variables in the model show evidence of moderate response to equilibrium when shocked in the short-run. It is theoretically argued that a genuine error correction mechanism exists whenever there is a cointegrating relationship among two or more variables. The rule of thumb is that, the larger the error correction coefficient (in absolute term), the faster the variables equilibrate in the long-run when shocked (Acheampong, 2007). However, the magnitude of the coefficient in this study suggests that the speed of adjusting to long-run changes is slow.

The current value of economic growth is affected by the past quarter values of economic growth. Specifically, economic growth at lag one is significant with a coefficient of 0.272. This is expected because previous year growth and expansion of the economy serves as an indication of prosperity and may attract more investment leading to more growth. Also, the ratio of government spending to private investment exert a positive and significant effect on economic growth at lag 1. Thus, 1% increase in the ratio of government spending to private investment in the previous year will cause growth in economic growth to rise by 0.568 %.

Furthermore, real interest rate exerts a negative and significant effect on economic growth, which confirms the results from the long-run estimation. One % increase in real interest rate in the short run would decrease economic growth by 0.076 %. This result concurs with findings by Jalil and Ma (2008). The risk premium of Nigeria is significant and exert a positive effect on Ghana's economic growth in the short run. The inflation gap, which is the difference between US inflation rate and Ghana's inflation rate show a statistical an insignificance effect on Ghana's economic growth in the short run. This implies that inflation gap does not influence economic growth of Ghana in the short run.

Table 10: Results of Error-Correction Model (VECM) of Real Interest Rate

Variables	Coefficient	Standard Error	T-statistics	Prob
ECT (-1)	-0.280	0.105	-2.65	0.013**
D (Economic growth (-2))	0.713	0.492	0.69	0.259
D (Real interest rate (-1))	0.410	0.167	2.46	0.024**
D Government spending/private investment (-1)	-2.980	1.307	-2.28	0.027**
D (Inflation Gap (-2))	-0.077	0.285	-0.27	0.621
D (Risk Premium (-2))	0.687	0.150	4.58	0.038**
Constant	0.020	0.087	0.23	0.794

Source: Conducted using Stata 13 package.

From the interest rate equation in Table 10, the estimated coefficient of the error correction term is -0.28 which implies that that the speed of adjustment is approximately 28 % per quarter. This is an indication that cointegrating relationship exists among the variables and denotes that about 28 % of the disequilibrium in interest rate caused by

previous years' shocks converges back to the long-run equilibrium in the next quarter. This is a moderate response to equilibrium when shocked in the short-run.

From the analysis, the previous period interest rate helps in predicting the current value of real interest rate value. Specifically, real interest rate lag 1 exerts a positive effect on the current real interest rate with a coefficient of 0.410. The ratio of government spending to private investment exerts a negative and significant effect on economic growth at lag 1. Thus, one % increase in the ratio of government spending to private investment in the previous year will cause economic growth to fall by 0.298 %. This confirms crowding out in the Ghanaian economy, where excessive government spending increases interest rates, which decreases private investment and economic growth. Risk Premium of Nigeria and inflation gap are insignificant in the real interest rate equation

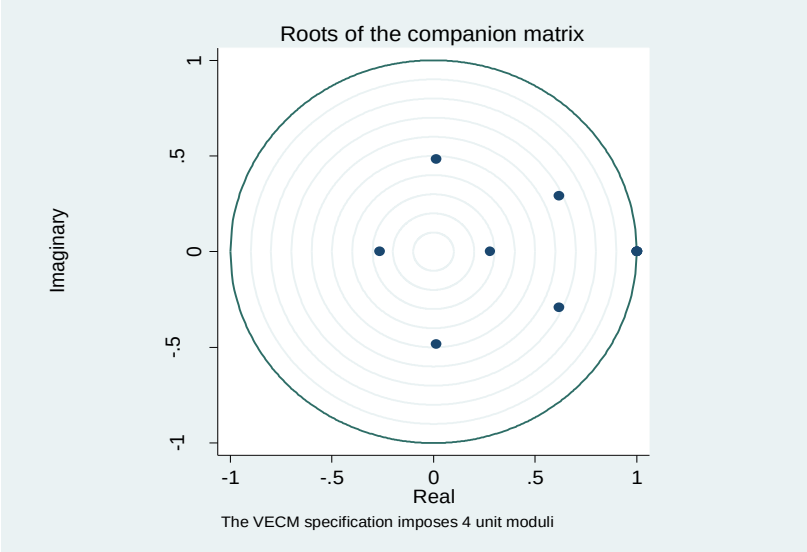
4.8 Evaluation of the Models

Table 11: Diagnostic Test for the Model

Diagnostic	Statistic	Conclusion
Ramsey Reset Test	F-statistic = 0.10632 (0.48603) Log likelihood ratio=0.32185 (0.58913)	Equation is correctly specified
ARCH Test	F-statistic 0.23067(0.79350)	There is no ARCH element in the residual.
Breusch-Godfrey Serial Correlation LM Test	F-statistic 3.76587(0.31245)	No serial correlation
Multivariate Normality	Jackque-Bera Test=2.62131 p-value = 0.67233	Residuals are normal

Source: Conducted using Stata 13 package

Figure 2: Stability of the VECM Estimates



Source: Conducted using Stata 13 package.

The inverse AR graph in Figure 1 shows that all the parameters in the model are stable. This is because all roots are lying inside the unit circle.

4.9 Impulse response functions

It is generally argued that unanticipated shocks in the real sector that arise from fiscal and monetary policies or other sources can lead to disturbances in the real sector of the economy. The effect of these unanticipated shocks on the stability of the economy (deviation of the short-run equilibrium values from the long-run equilibrium values) can be ascertained from the impulse response functions from a VAR model. If the response is such that the short-run values converge to the long-run values, then it can be deduced that stability can be achieved in the future (Bhasin, 2004). The conclusion from the short-run estimates that no adjustment to equilibrium will occur in the long-run can, therefore, be ascertained from the results of the impulse response analysis. The impulse responses of the

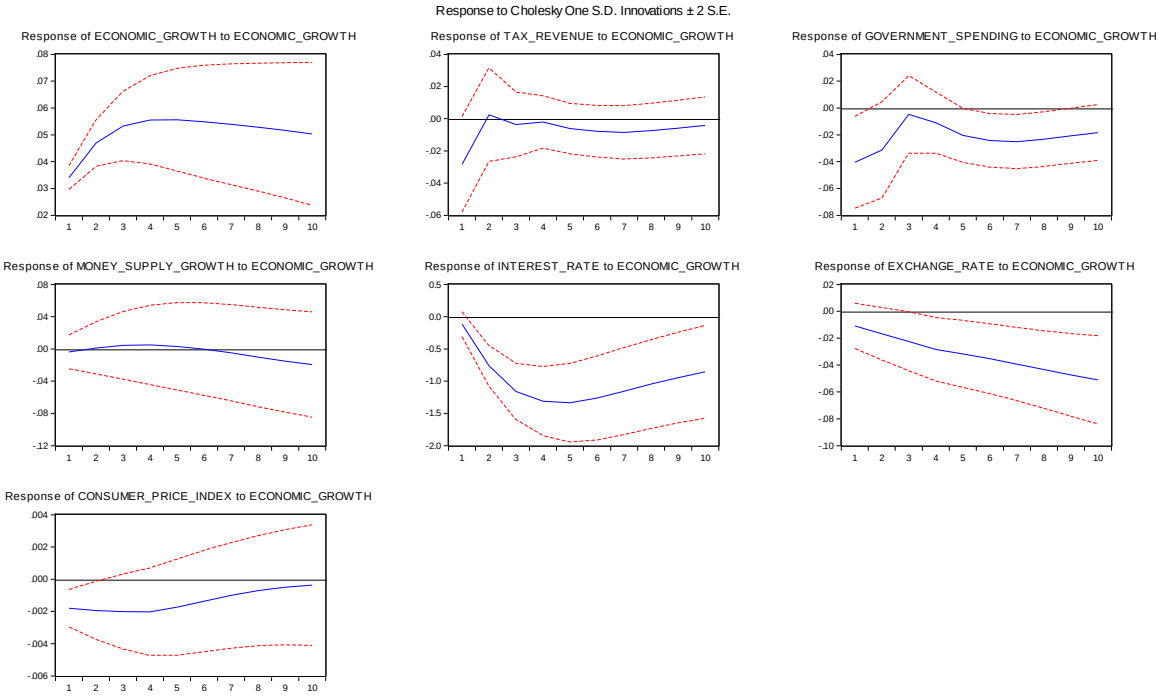
economic growth owing to one standard deviation shock in the innovations of the government spending, investment, interest rate, money supply and CPI extracted from the complete results are presented in Figure 3. The functions are discussed as they appear in the figure.

Considering the response of economic growth to government spending, it is evident from Figure 3 that any unanticipated increase in government spending will increase the deviation between the short-run equilibrium values of the economic growth and its long-run equilibrium values in the short-term horizon and after the tenth period. The deviation seems to be closing up, implying there will be adjustment to equilibrium after government spending shock. Tax revenue also shows that the short run deviations from unanticipated shock to the real sector will converge to its long run values, hence there is a sign of adjustment to equilibrium after tax revenue shock. Also, any unanticipated increase in money supply decrease deviation of the short-run equilibrium value of the economic growth and its long-run equilibrium value and thereafter maintains a constant deviation and show signs of convergence to equilibrium.

It was evident that the response of economic growth to money supply in Figure 3 that any unanticipated increase in money supply will increase the deviation between the short-run equilibrium values of the economic growth and its long-run equilibrium values to the third period and later decrease from fourth period to the tenth period. And the deviation seems to be closing, hence there is a sign of adjustment to equilibrium (convergence) after money supply shock. For interest rate and exchange rate, an unanticipated shock increases deviation of the short-run equilibrium value of economic growth and its long-run equilibrium value and show no signs of convergence to

equilibrium. It is also evident that any unanticipated increase in CPI will decrease deviation initially between the short-run equilibrium values of the economic growth and its long-run equilibrium values in the short-term horizon to the third period and increase thereafter from the fourth period to the tenth period. The deviation shows sign of adjustment to equilibrium after CPI shock.

Figure 3: Impulse Response Analysis of Economic Growth



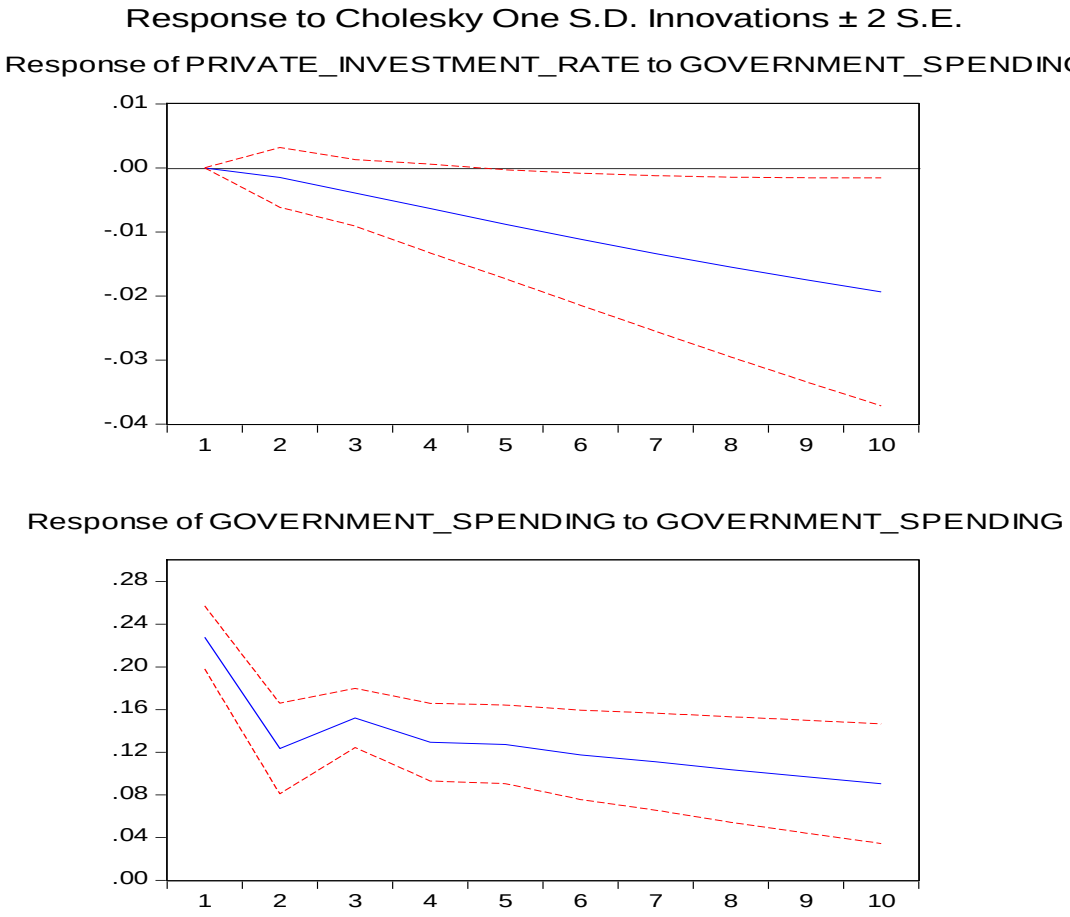
Source: Conducted using Eviews 8.0 package.

4.10 Impulse Response Analysis of Investment

In Figure 4 below, the study presented impulse response analysis of investment (GFCF). This is necessary to determine whether government spending crowds out or crowds in investment in Ghana. It can be observed from Figure 4 that unanticipated increase in government spending initially increases the deviation between the short-run

equilibrium values of the Economic growth and its long-run equilibrium values between the first and second period, but the deviation decreases from third to tenth period and there is no sign of adjustment to equilibrium afterwards. This phenomenon implies that government spending shocks decreases investment, a situation which results in crowding out of investment since increase in government spending means more borrow from domestic economy to finance it expenditure. This results in increase in interest rate and subsequently reduction in investment.

Fig 4: Impulse Response Analysis of Investment



Source: Conducted using Eviews 8.0 package.

4.11 Variance Decomposition Analysis

Following the VAR estimation, the study decomposed the forecast error variance by employing Sim's Recursive Cholesky decomposition method. The forecast error variance decomposition provides complementary information for a better understanding of the relationships between the variables of a VAR model. It tells us the proportion of the movements in a sequence due to its own shock, and other identified shocks (Enders, 2004). Thus, the variance decomposition analysis will enable us to identify the most effective instrument for each targeted variable based on the share of the variables to the forecast error variance of a targeted variable. The results of the forecast error variance decomposition of the endogenous variables, at various quarters are shown in Table 12.

Table 12: Result of Variance Decomposition of Economic Growth

Period	Economic Growth	Tax Revenue	Government Spending	Private Investment	Exchange Rate	Interest Rate	Risk Premium
2	97.87909	0.735238	0.626092	0.016530	0.290009	0.078020	0.075995
4	91.85011	2.369703	2.652989	0.230349	1.411201	0.227256	0.139486
6	86.70337	3.453401	3.028248	0.327343	3.214313	0.288254	1.177969
8	81.14025	3.925608	2.919542	0.273061	5.248830	0.313659	3.749906
10	74.92364	4.107468	2.682669	0.297409	7.142416	0.310906	7.553521
12	68.52864	4.159772	2.433060	0.369699	8.687634	0.291529	12.12623
14	62.48295	4.151119	2.207116	0.427425	9.756436	0.265643	17.03985
16	57.18548	4.105470	2.017217	0.454836	10.30182	0.242334	21.88221
18	52.87551	4.031321	1.865090	0.456463	10.37361	0.233229	26.28209
20	49.64336	3.932132	1.745285	0.441027	10.09679	0.252271	29.94824

Source: Computed Using Eviews 8.0 Package

Table 12 shows that the largest source of variations in economic growth forecast error is attributed to its own shocks. The innovations of government spending, tax revenue,

interest rate, money supply, CPI and exchange rate and risk premium are important sources of forecast error variance in economic growth. Interest rate, CPI, and investment contributed least to the forecast error variance of Ghana's economic growth. The decomposition suggests that all the variables play important part in economic growth with the most effective variable being tax revenue and government spending. The least important variable from the forecast error variance is real interest rate.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This concluding chapter presents the summary, conclusions and recommendations. Whereas the summary presents a brief overview of the research problem, objective, methodology and findings, the conclusions capture the overall outcomes regarding the findings of the study. Recommendations also present specific remedies to be implemented.

5.2 Summary

Ghana in their quest to achieve sustainable economic growth with relatively stable price level pursue both monetary and fiscal policies that could lead to macroeconomic convergence since these policies indisputably plays a fundamental role in maintaining sustainable and satisfactory economic atmosphere. But, there is evidence of macroeconomic non-convergence in Ghana resulting from the relative ineffectiveness of domestic monetary and fiscal policy coordination which led to Ghana recording persistently high budget deficits, inflation and interest rates. This study, therefore, examines the effects of fiscal and monetary policy on economic growth and determine the level of convergence of growth for Ghana using structural equation modeling (SEM) using time series data. To address the issue of ineffectiveness of fiscal policies in Ghana, the study investigates the effects of government spending on output growth and investment (crowding out effects).

In the application of this methodology, time series properties of the data were analyzed with formal tests for stationarity. The stationarity properties of the variable were tested using the Augmented-Dickey Fuller (ADF) and Phillips-Perron (PP) test statistics.

The unit roots results suggest that all the variables were stationary after taking first difference.

From the long-run model, the ratio of government spending to private investment, which served as a fiscal policy variable was statistically significant and it exerted a positive impact on economic growth, an indication that government expenditure is a key channel through which we can achieve sustained economic growth. It was revealed that real interest rate which is a monetary policy tool have a negative effect on economic growth in Ghana.

The short-run results revealed that model the ratio of government spending to private investment has a positive effect on economic growth. Short run estimates of both real interest rate have a negative impact on economic growth. The study found the existence of a long-run relationship among economic growth, the ratio of government spending to private investment, real interest rate, inflation gap and risk premium of Nigeria. This was further confirmed by a negative and statistically significant coefficient on the lagged error correction term.

Impulse response analyses show that any unanticipated increase in government spending will increase the deviation between the short-run equilibrium values of the real GDP and its long-run equilibrium. Also, any unanticipated increase in the investment initially decrease deviation of the short-run equilibrium value of the real GDP and its long-run equilibrium, but later increase and thereafter remains constant with no signs of convergence to equilibrium. But the deviation of money supply seems to be closing up, hence there is a sign of adjustment to equilibrium (convergence) after money supply shock. Similarly, interest rate shock initially increases deviations but converges later. The impulse

response of government spending on investment shows that government spending shocks decreases investment in Ghana, which results in crowding out of investment.

The evidence from the forecast error variance decomposition suggests that the most important variable that influenced economic growth was tax revenue and the least important variable was interest rate. The results of the Granger-causality test suggested there is causality between economic growth and real interest rate. The study also found causality between economic growth and all the variables included in the model. Same was realized for the real interest rate equation.

5.3 Conclusions

It can be concluded from the study that both the long-run and short-run results found statistically significant positive effects of the ratio of government spending to private investment on economic growth. Similarly, both the long-run and short-run results shows real interest rate is significant in both models. Thus, the study found that the modern endogenous growth model which argued that the ratio of government spending to private investment and real interest rate affects economic growth is valid in both the long-run and short-run in Ghana.

The results of the forecast error variance decomposition show that the most important variable is government expenditure and the least important variable is interest rate. This implies that fiscal policy is relatively more effective in achieving economic growth than monetary policy in Ghana. The Granger causality test results revealed causality between real interest rate and economic growth. Also, impulse response analysis revealed that government spending crowds out investment in Ghana.

5.4 Recommendations

Based on the findings from the study, the following recommendations are proposed. Firstly, government needs to improve its revenue mobilization to help finance its expenditure in undertaking infrastructural development. This can be done by improving efficiency in tax administration by strengthening and modernizing customs administration and the streamlining of tax exemptions. This will resolve the crowding out issue arising from excessive government borrowing to finance its expenditure.

Also, to achieve higher and sustainable economic growth, government should embark on expansionary fiscal policies in the form of an increase in government spending in the key sectors of the economy such as the infrastructural, manufacturing and services sectors to increase output. In addition, as a way of expansionary fiscal policy, the government should reduce taxes on imported items intended for production. This will encourage the private sectors to come on board in complementing government's effort to achieving economic growth. Further, with respect to financial market, central bank of Ghana need to reduce lending rates so that the financial institution can borrow to firms and business sector at low rates to enhance growth and development of the economy.

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