

# **Fiscal Aggregates, Government Borrowing and Economic Growth in Ghana An error correction approach**

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## **Abstract**

The relationship between fiscal policy and economic growth has been the subject of running arguments and debates among economic theorists and researchers for a long time. Whilst some economists contend that fiscal policy inherently distracts growth, there are others who believe that it can spur growth. The objective of this paper is to examine and ascertain the nexus between fiscal policy and economic growth using the Ghanaian situation by employing a dynamic econometric approach and by so doing help in shaping up knowledge in this domain. The study adopted the explanatory research design and a quarterly data set was drawn from 1982 to 2014. The error correction model was used in two ways. The first approach was by using the co integrating relationships and the second was directly imposing long run homogeneity thus constructing the ECM without estimated parameters. The empirical analysis shows that there is a long run relationship between government expenditure and economic growth; in the short run however both domestic borrowing and external borrowing have negative effects on economic growth but growth in indirect taxes rather positively influences economic growth, going against the theoretical position that taxes have a distortionary effect on economic growth. The results also show that at least 14% of the innovations in economic growth can be attributed to movements in government expenditure. The dynamic effects of fiscal policy on growth from an error correction approach provide empirical evidence of reality especially during an era when there is a debate in the country on the use of and the effectiveness of fiscal policy.

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## 1 Introduction

Fiscal policy is undoubtedly one of the key pillars in the management of an economy and plays a pivotal role in engendering economic stability and growth. In the literature, it is usually argued that fiscal tools can be employed to create an impetus for growth through expansion in aggregate demand especially in periods of downturns. Conversely, it is suggested that it can be used in slowing down an economy in times when the economy is potentially on the trajectory towards overheating. Fiscal policy is usually operationalized through government expenditure and taxation with each having its unique effect on an economy. Indeed it is believed that by employing fiscal policy, governments can perform their roles of ensuring efficiency in resource allocation, regulating the markets, stabilizing economy and even creating social harmony all with the ultimate aim of promoting economic growth (M'Amanja & Morrissey, 2005) and in addition, ensuring an equitable distribution of income and wealth.

In contemporary times, the debate as to whether or not fiscal policy affects economic growth has occupied quite a chunk of the academic space. This appears to follow the preponderant re-emergence in the 1980s of a strong view against pervasive fiscal policy which for some time had been the prevailing orthodoxy and reinforced by the Washington Consensus which defined the basis upon which the International financial institutions related with developing countries. In the view of Shihab (2014), the global economic crisis that erupted in 2008 has rekindled interest in fiscal policy as an instrument for long term growth and development. In the literature generally, two group schools of thought with diametrically opposing views can be identified; those who argue that fiscal policy undermines growth and those who strongly believe that fiscal policy can spur and stimulate economic growth.

Flowing from the keen interest generated in this area over the two decades, different studies have concentrated on different aspects of the area; the first group concentrates on finding the impact of public expenditure on growth for example, Devarajan et al (1995), Amin (1998); Chletes and Rolljas (1995). The second strand of studies focuses on the size of government and economic growth- e.g. Al-Youssif (1998), Dalamagas (2000) and Ghali (2000). The third examines the effect of government spending and revenue mobilization activities on private investment Chhiber and Dailaimi (1990) whilst the last assesses the relative effects of public and private spending on economic growth for example, Khan and Reinhart (1990), Sarmad (1990) and Odedekun (1997).

Examining these studies closely, one would realize that they operated within the neoclassical framework and for that matter may have some empirical limitations

in the sense that these studies largely employed static analytical approaches oblivious of and ignoring the dynamic impacts of fiscal policy. The dynamic effects of fiscal policy are underlined in Cottarelli and Jaramillo (2012) when they argue that fiscal policy has a critical implication for economic growth both in the short and long run and assert that there are various feedback loops between fiscal policy and economic growth. Recent studies in the area have tended to re-direct attention to dynamic based approaches in examining the relationship between fiscal policy and economic growth. Some of the examples are M'Amanja and Morrissey (2005), M'Amanja, Lloyd and Morrissey (2005), Ezeabasili, Tsegba and Herbert (2012), Al-Khasawneh and Aleqa (2012), Mascagani and Timmis (2014) and Shihab (2014) all of which have brought some insights into this area of study. In Ghana, studies in this field are scarce. The most notable one Osei, Lloyd and Morrissey (2003) examined the fiscal response to foreign aid but did not concern itself with the growth related issues of fiscal policy. The purpose of this paper is fill that gap by attempting to look at the dynamic effects of fiscal policy on growth. The study becomes even more relevant at a time when there is a debate in the country on the use of and the effectiveness of fiscal policy. The present study has an advantage in the sense that it is able to draw on data spanning a long period.

### **1.1 Objectives of the study**

This study aims at the following;

- 1) Determining whether there is a long run relationship between government expenditure and economic growth and estimate that relationship if it exist.
- 2) Assessing the short run effect of each of the fiscal aggregates on economic growth.
- 3) Tracing out the effect of random shocks of government expenditure and economic growth on each other.
- 4) Quantifying the percentage in innovation in each endogenous attributable to the other.

## **2 Fiscal Policy direction in Ghana since independence**

From Ghana's perspective, the country has a chequered history during the post-independence era. Soon after independence, Ghana embarked on an ambitious programme of rapid growth and development using the big push approach. In line with this, massive expenditures were channeled into both social and economic infrastructures. Educational and health institutions were established and industrial concerns were also created across the country to produce goods which were being imported for local consumption whilst providing employment to teeming Ghanaians. These were however done against the background of falling world market prices of the major export products of Ghana-Cocoa, Gold, timber, other

natural resources and rising oil prices on the international markets making it inevitable for the government to draw down on the country's international reserves and also borrow from both domestic and external sources to finance development projects and programmes. Ghana begun to experience economic difficulties triggering off sharp slowdown in economic growth fuelling general discontent on which the military rode to power.

Throughout the 1970s and the 1980s, Ghanaians bore the brunt of the inappropriate policies of the military rulers- restrictions on international trade, misalignment of the exchange rate, price controls and excessive printing of money to finance deficits. This led to the near collapse of the productive base of the country. As a result of these, for much of the period, Ghana experienced economic decline. By 1983, the growth rate had hit around -5.0%. With the inception of the Economic Recovery Programme (ERP) ,the government of Ghana introduced radical reforms – fiscal discipline in the country's finances, privatization of state enterprises and new attractive investment codes and as a result, Ghana regained the impetus for positive growth and ever since then has never witnessed the severe declines experienced in the 1970s.Growth rates have however oscillated around 5% with some few outliers -8.6%,7.3% and 14% in 1984,2008 and 2011 respectively.

In the post ERP period, expenditures have generally at most times outstripped revenues leading to the accumulation of both external and domestic debts. The occurrences of the fiscal deficits appear to follow pro-cyclical trend with election years. In 2001, the deficit was about 13.1% of GDP and in 2008, the deficit hit 11% .By 2012, another election year, it reached the 13% mark again. The worrying aspect of this phenomenon is the fact that the Bank of Ghana advances to central government has been significant and contributed to growth in money supply creating macroeconomic instability particularly fueling inflation and rapid and volatile swings in the exchange rate.

### **3 Review of related literature**

This section of the study provides a review of the underpinning theory of the study as well as the results of other researchers on the subject matter.

#### **3.1 Theoretical Framework**

The contemporary pioneering efforts at understanding the importance of fiscal policy within the context of growth and development can be attributed to the endogenous growth theorists- Skinner (1988), Barro (1990), Easterly and Rebelo(1993),Barro and Sala-i-Martin(1992),Kneller et al (1999). The general view of the endogenous theory is that promoting increased acquisition of knowledge and critical creation of human capital, scaling up research, improved and increased provision of infrastructure and creating the peaceful and conducive environment through government expenditure have ultimate implications for

economic growth. However in the literature, there is an opposing view which tends to characterize government intervention in an economy as creating bureaucracies which end up introducing inefficiencies and thereby undermining economic growth.

These two strands of arguments are both acknowledged and recognized by others who demonstrate that government activities may within certain contexts be inherently beneficial and productive but in others unproductive and harmful. This is underlined by Barro (1990) and Kneller et al (1999), Barro and Sala-i-Martin (1995). Lin (1994) has also asserted that there are negative impacts on economic growth associated with the government's revenue raising and transfer mechanisms. Again it has also been argued out that government activities can result in the crowding – out of private investment opportunities and in some cases have a distortionary effect on productivity and growth as a whole. This is however contested by Milesi-Ferretti (1995) who argues that this may not necessarily apply because under situations where governments are free to borrow or lend; taxes have no effect on growth in the long run. M'Amanja and Morrissey(2005) sum up the influence of taxation on economic growth by asserting that ultimately the way taxation can affect growth depends on the nature of the tax and how it has been designed.

### **3.2 Empirical Framework**

Over the period, a number of empirical studies have been conducted in the area but with respect to different aspects of the relationship. In their paper entitled modelling the Fiscal effects of Aid- An Impulse Response Analysis for Ghana, Osei, Morrissey and Lloyd (2003), had as their key objective the determination of the effect of aid on the fiscal aggregates in Ghana using the vector autoregressive (VAR) method. Co -integration test revealed in the long run domestic borrowing is negatively related to aid and tax revenue but positively related to government expenditure. The causality test showed that aid granger causes fiscal variables. M'Amanja and Morrissey (2005) authored the paper Fiscal Policy and Economic Growth in Kenya .The major focus of the study was to assess the effect of fiscal policy on growth in Kenya by employing a dynamic autoregressive distributed lag (ADL) model. Results from their long run analysis showed that the variables were co-integrated. In the short run, productive government expenditure was unexpectedly found to negatively affect growth whilst distortionary taxes rather were shown not to have any distortionary effect on growth.

Fiscal Aggregates, Aid and Growth in Kenya: A Vector Autoregressive (VAR) Analysis by M'Amanja, Lloyd and Morrissey (2005) sought to examine the effect of fiscal aggregates –government expenditure and tax revenues and external borrowing on growth using the VAR/VEC framework. Long run test revealed two cointegrating vectors in the series- one for growth and the other for external borrowing .Long run results showed that external grants and loans respectively have positive and negative effect on growth. However, taxes are found not to have

any retarding effect on growth. Cottarelli and Jaramillo (2012) in an IMF working paper entitled *Walking Hand -in – Hand: Fiscal Policy and Growth in Advanced Economies*, they set out to identify the relationships and the feedback loops between fiscal policy and growth in advanced countries both in the short and long run. The conclusion was that fiscal policy can affect growth in different ways through different channels.

Ezeabasili et al (2012) have also studied the relationship between Economic Growth and Fiscal Deficits using data from Nigeria. The study employed dynamic analysis and using the Engle-Granger two-step approach found a long run cointegrating relationship between economic growth and right-hand variables (fiscal deficits, trade balance and Government expenditure). The key finding that emerged from the study is that both fiscal deficits and Government consumption expenditure negatively impact on economic growth. Abdon et al (2014) have also contributed to the debate with their paper, *Fiscal Policy and Growth in Developing Asia*.

In the study, the major pre-occupation was to analyze the effects of changes in the composition of taxes and that of government expenditure on economic growth. From the empirical analysis, they showed that direct taxes have a more significant and observable negative impact on growth than property taxes whilst government expenditure on education has a positive effect on growth. Abu Shihab (2014) focused on the causal relationship between fiscal policy and economic growth in Jordan with the objective of determining the causal connection between fiscal policy and economic growth. Using a two equation autoregressive model for economic growth rate and budget deficits, he found that growth rate causes budget deficits but budget deficit does not Granger cause economic growth rate.

## **4 Research Methodology**

The study adopted the explanatory research design because the study sought to discuss and provide an explanation of the fiscal aggregates, government borrowing and economic growth in Ghana. The data for the study was derived from secondary sources and are in quarterly forms. In particular most of our reference sources were the International Financial Statistics, Government Finance Statistics and Finance Yearbook which are all publications of the International Monetary Fund. In addition, the quarterly digest of statistics by the Statistical Service of Ghana, Bank of Ghana publications, The State of the Ghanaian Economy by ISSER (various editions), and CEPA's publications served as useful sources of references. The tax variables were obtained from the records of the Customs, Excise and Preventive Service, the Internal Revenue Service and Value Added Tax Secretariat. Data for the study spans from 1982 to 2014. The period of study was chosen because Ghana experienced some considerable political and economic turmoil and turbulence prior to 1982, and this it is believed may distort

or affect our analysis and besides the length of time is long enough to be able draw sound inferences

#### 4.1 Empirical Model

The empirical model is based on the work of Barro and Sala-i-Martin (1995), Bleaney et al (2000), Kneller et al (1999) and M'Amanja and Morrissey(2005 and 2006). We therefore start by modifying the formulation by M'Amanja and Morrissey (2005), M'Amanja and Morrissey (2005 and 2006) M'Amanja, Morrissey and Lloyd (2005) and hence specify an output function as

$$\text{GDP} = f(\text{Ip}, \text{G}^*, \text{X}, \text{M}) \quad (1)$$

where Ip, private investment; X defines exports M; imports and G\*government activity which we broadly defined to include government expenditure, taxing and borrowing activities.

That is  $\text{G}^* = f(\text{G}, \text{Tt}, \text{Gb})$  or  $\text{G}^* = f(\text{G}, \text{Dt}, \text{ID}, \text{Db}, \text{Fb})$  and

Deriving the theoretical basis from Barro (1990), Kneller et al (1999) and Bleaney et al (2000) and, M'Amanja and Morrissey (2005), M'Amanja and Morrissey (2005 and 2006) we have thus expanded the income/output function to encompass taxation and borrowing activities which may have a distortionary effect on output/income

$$\text{GDP} = f(\text{Ip}, \text{G}, \text{Dt}, \text{ID}, \text{Db}, \text{Fb}, \text{X}, \text{M}) \quad (2)$$

Where Ip is private investment; G is the government expenditure; Dt is direct taxes, ID is indirect taxes; Db is domestic borrowing, Fb is borrowing from abroad; whilst X and M represent exports and imports respectively.

Since we are interested in the effects of fiscal policy –tax policy, foreign and domestic borrowing on economic growth, we employ the above definition of income/output. However, because in our model, government expenditure becomes endogenously determined in the growth process, a separate function for government expenditure is specified thus;

$$\text{G} = f(\text{GR}, \text{Fb}, \text{Db}) \quad (3)$$

where

GR defines government revenue.

$$\text{But GR} = f(\text{GDP}, \text{Tt}, \text{Ip}, ) \quad (4)$$

From equation 3 government revenue is dependent upon income GDP, taxes Tt and private investment Ip.

Substituting (4) in (3) yields

$$G = f(GDP, Dt, ID, Fb, Db, Ip) \quad (5)$$

From the system, two main equations, (2) and (5) which are the reduced forms are derived. The system thus contains two endogenous variables- GDP and G and seven exogenous variables –Dt, ID, Db, Fb, Ip, X and M. Where Dt, ID, Fb, Db are the policy variables in the model since these are the variables normally employed by the government to determine or moderate its expenditure in the process of economic management. Equations (2) and (5) are converted into growth equations by introducing changes.

Hence (2) becomes

$$\Delta GDP = f(\Delta G, \Delta Ip, \Delta Dt, \Delta ID, \Delta Fb, \Delta Db, \Delta X, \Delta M) \quad (6)$$

Whilst (5) changes to

$$\Delta G = f(\Delta GDP, \Delta Dt, \Delta ID, \Delta Fb, \Delta Db, \Delta Ip) \quad (7)$$

Equations (6) and (7) are reformulated using the distributed autoregressive lag operation in order to obtain a two equation dynamic model applying the assumption by Rao (1994) that a Keynesian system essentially operates on a disequilibrium principle and that a change in any of the variables, particularly the endogenous ones does not result in an instantaneous equilibrium in the system.

Thus,

$$\Delta GDP_t = f(\Delta GDP_{t-k}, \Delta G_{t-k}, \Delta Ip, \Delta Dt, \Delta ID, \Delta Fb, \Delta Db, \Delta X, \Delta M) \quad (8)$$

$$\text{And } \Delta G_t = f(\Delta G_{t-k}, \Delta GDP_{t-k}, \Delta Dt, \Delta ID, \Delta Fb, \Delta Db, \Delta Ip) \quad (9)$$

In this model, a structural dummy D1 is imposed to test the effect of shift in fiscal policy direction on the endogenous variables as a result of the re-establishment of constitutionalism in Ghana. Our general autoregressive distributed lag model from above is defined in the form of  $X_t = A(L)X_t + V_t$  where  $X_t$  is a vector of fiscal and non-fiscal endogenous variables and  $A(L)$  is an  $n \times n$  polynomial matrix in the lag operator such that  $LX_t = X_{t-1}$

#### 4.2 Tests for Co integration – Johansen Approach

The basic test for co integration seeks to determine whether for the variables of interest, there exist a linear combination of the non-stationary series in the regression that yields a white noise or not. According to Thomas (1993) the whole idea of co integration assumes that for a given group of variables there exists an equilibrium relationship between them. Put in other words, co integration is the statistical implication of the existence of a long run equilibrium relationship

between economic variables. In conclusion it may generally be said that if there is a dynamic and continuous interaction between economic variables then there must exist a stable long run relationship between the given variables and in the words of Thomas (1993) for every group of co integrated variables there exists a linear combination of the variables which is stationary.

For the system of equations in our model we are unable to apply structural VAR approach because of the problem of identification. In this regard, we will represent the system by the reduced forms of the equations, do the estimation and from the results make structural inferences from the reduced form equations.

Our structural VAR model will be specified as

$$\Psi(L) X_t = U_t, \text{ where } I= 1, 2 \dots n \tag{11}$$

Where  $X_t$  is a  $m \times 1$  vector of jointly determined variables whilst the dimension of the  $\Psi(L)$  is  $m \times m$  and the  $U_t$ s are innovations on the  $X$  matrix such that they are normally distributed .

Finally each of the endogenous variables can thus be expressed as a linear combination of its own innovations and the lagged innovations of the other endogenous variable.

$$\text{Hence } X_t = [\Psi(L)]^{-1} U_t \tag{12}$$

Following Johansen (1988) and Juselius (1990, 1992), the standard vector autoregressive VAR model is expressed in the reduced form from the structural form in (11) as

$$X_t = A_1 X_{t-1} + A_2 X_{t-2} + \dots + A_k X_{t-k} + \epsilon_t \quad t = 1, 2, \dots, k \tag{13}$$

Where  $X_t$  is a  $M \times 1$  vector of macroeconomic variables of interest and  $A$  is a matrix of constants and  $\epsilon_t$  is the error term. Assuming  $X_t$  contains integrated series of order  $I(1)$  and  $K$  shows the lag length of the series then equation (13) can be re-parameterized into an error correction representation as

$$\Delta X_t = \alpha + \pi X_t + T_1 \Delta X_{t-1} + \dots + T_{k-1} \Delta X_{t-k+1} + \epsilon_t \quad t = 1, 2, \dots, k \tag{14}$$

where  $T_i = -(A_{i+1} \dots + A_k) \quad i = 1, 2, \dots, K-1$

And  $\pi = -(I - A_1 - A_2 \dots - A_k)$

In this approach  $T$ s are used to represent the matrices of co-efficients of the first difference variables that provide information on the short-run dynamics whilst the co-efficients of matrix  $\pi$  capture the long-run information. The co-efficient of the lagged dependent variable represents inertia and as well provide information on

the formation of expectations whilst the co-efficient of the other lagged endogenous variables show the pass-through effect.

Now since  $E_t$  is stationary we use the rank  $P(\pi)$  to determine how many linear combinations of  $X_t$  are stationary in other words, how many co integrating vectors exist in the model. We can thus test for the hypothesis that if  $r$  is the rank of  $\pi$  then

(O  $< r < m$ ) where  $m$  is the full rank

From above three cases can be distinguished.

Ho: Rank  $(\pi) = m = r$

(b) Ho: Rank  $(\pi) = 0 = r$

(c) Ho: Rank  $(\pi) = r < m$

If (a) is accepted, the matrix has full rank implying that  $X_t$  is a stationary series.

However if (b) is accepted, the implication is that the  $\pi$  matrix is null and that implies that there is no stationary long-run relationship existing among the variables. Hence the VAR model in (13) is to be used. On the other hand if (C) is accepted, it means  $r$  yields a distinct number of co integrating vectors linking variables in the VAR. In this scenarios, the Johansen approach can allow us to explicitly test for the number of co integrating vectors without relying on arbitrary normalization. In case some of the variables turn out to be non-stationary but co integrated, their dynamic relationship will be correctly specified using an error correction representation from the co integration regressions (Bhasin,2004).

#### 4.4 The Error Correction Model (ECM)

Usually to circumvent the problem of spurious regression results researchers apply differencing of non-stationary series. However, Hafer and Jansen (1991) have shown that this approach takes away much of the information on the long run characteristics of the data. A way out for researchers it has been said is to use the error correction representation of the model to capture both the short and long run information. According to Engle and Granger (1987), if two variables are co integrated then an equilibrium relationship between the variables can be represented by an error-correction model (ECM). In the view of Granger(1988), once there is an established equilibrium, any deviation will ultimately be corrected and hence that equilibrium restored. Soydan (2001) alludes to the fact that the VECM formulation contains information on both the short and long run properties of the model with disequilibrium as a process of adjustment to the long-run model.

The error correction model can set up in two ways. The first approach is by using the co integrating relationships. The second is by directly imposing long run homogeneity thus constructing the ECM without estimated parameters.

Generally, the error correction model can be defined mathematically as

$$\Delta Y_t = \sum \gamma_i \Delta Y_{t-1} + \sum \alpha_i X_{t-1} + \beta ECT_{t-1} + dt \quad (15)$$

Where the series  $Y_t$  and  $X_t$  are co integrated variables and  $ECT_{t-1}$  is error term lagged one time period obtained from the co integrating relation whilst  $dt$  captures the deviation from the long run steady state relationship among the variables and  $\beta$ , the coefficient of the error term shows how  $\Delta Y_t$  responds to the deviation from the long run equilibrium.

In deriving the ECM the appropriate lag structures of the variables are determined arbitrarily or by applying the tests for lag structures of the variables.

In furtherance of the objective of obtaining information about the short run characteristics of the model as well, we will also examine the effect of the exogenous variables on the endogenous variables. In the words of Scarfe (1979), once the model involves standard endogenous variables and the time derivatives of the exogenous variables the short run analysis implies determining the time-paths followed by the endogenous variables as they respond to shifts in the exogenous variables.

By using the simultaneous FIML estimation technique, the general or the over parameterized model for each of the endogenous variables will be used to arrive at the parsimonious or the most preferred model.

#### 4.5 Granger Causality/Non-Causality Analysis

A common phenomenon in macroeconomics is where one variable drives or explains the time path of another. This concept is predicated on the philosophy of Granger(1988) that the cause precedes the effect. Osoro (1997) outlines the philosophy behind the Granger causality test that a series  $X_t$  is said to cause  $Y_t$  if  $Y_t$  is predicted by a model using the past values of  $X$  and  $Y$  than by a model using  $Y$  alone.

For example, to test whether  $X$  drives  $Y$ , we first test the null hypothesis that  $X$  does not drive  $Y$  by running two regressions.

$$Y = \sum_{i=1}^k \alpha Y_{t-i} + \sum_{i=1}^m \beta_i X_{t-i} + E_t \quad (16)$$

$$Y = \sum_{i=1}^m \alpha Y_{t-i} + E_t \quad (17)$$

Using the sum of squared residuals from the regressions we can calculate an  $F$  value and determine whether the group of coefficients like  $\beta_1, \beta_2, \beta_3$  are significantly different from zero. If that is the case, we reject the null hypothesis that  $X$  does not drive  $Y$ . In general, between two variables, if there is established a cause from one to the other only, we talk of uni-directional causality but where the causality moves in both directions, it is characterized as feedback or bi-directional causality.

#### 4.6 Forecast Error Decomposition and Impulse Response Functions

Though the Granger non causality/Causality tests seem to be able to predict the influence of one variable on the other, it may be undermined by the fact that the right-hand side variables are not usually orthogonal (Litterman 1985). For this reason, researchers sometimes use forecast error variance decomposition as a way of measuring the percentage of the variance of the forecasted variable attributable to alternative right hand side variables at different time periods. The variance decomposition of the VAR thus normally provides information about the relative importance of the random innovations. In other words we are interested in finding out the proportion of movement in the endogenous variables which are due to own shocks as opposed to shocks in other variables. In order to preserve consistency and because it is believed that variance decomposition is sensitive to the order in which the variables are presented Nd'ungu (1999), we will maintain the order of the endogenous variables in the way they were presented in the co integration tests.

We also employ the impulse response functions to trace out how each endogenous variable reacts to shocks in the other endogenous variable at each period over the entire time horizon.

## 5 Empirical Analysis

The first stage in our data analysis is determining the stationarity status of the variables in our empirical model. We therefore employ the Augmented Dickey Fuller (ADF) and the Phillip Perron (PP) tests.

Table 1: Unit root tests of log levels of variables and the order of integration of variables

Sample	Variable	ADF Value	PP Value	Lag Length	Order of Integration
136	LGDP	-1.353988	-1.917881	4	I(1)
"	LG	-0.217503	-0.370381	4	I(1)
"	LDT	-0.905124	0.194503	4	I(1)
"	LID	-0.278260	-0.725761	4	I(1)
"	LFB	-2.546954	-4.130674	4	I(1)
"	LDB	-2.747533	-3.699343	4	I(1)
"	LX	-0.161302	-0.288882	4	I(1)
"	LM	-0.862259	-1.021976	4	I(1)
"	LIP	0.046046	-0.022125	4	I(1)

ADF Critical Value at 1% is -3.4811

ADF Critical Value at 5% is -2.8835

PP Critical Value at 1% is -3.4796

PP Critical Value at 5% is -2.8830

Table 2: Order of integration of first differences of variables

Sample Size	Variable	ADF Values	PP Values	Lag Length	Order of Integration
136	DLGDP	-4.98533	-9.6550	4	I(0)
“	DLG	-7.17316	-26.5943	4	I(0)
“	DLDT	-6.60769	-19.3638	4	I(0)
“	DLID	-7.73772	-27.5698	4	I(0)
“	DLFB	-7.59710	-14.6769	4	I(0)
“	DLDB	-7.40038	-13.0308	4	I(0)
“	DLX	-6.76630	-17.8866	4	I(0)
“	DLM	-5.53478	-18.7242	4	I(0)
“	DLIP	-6.46373	-15.0243	4	I(0)
ADF Critical Value at 1% is		-3.4815			
ADF Critical Value at 5% is		-2.8837			
PP Critical Value at 1% is		-3.4800			
PP Critical Value at 5% is		-2.8830			

From the tables 1 and 2 above, we test the hypothesis that there is the presence of unit roots in all the variables and from the results we accept the null hypothesis in the case of table 1 but reject the null hypothesis in table 2. We therefore conclude that all the variables are integrated of order 1 in levels and zero in first differences. In other words all the variables –both endogenous and exogenous are not stationary in levels but become stationary after first differencing. We present the results of the cointegration test using the Johansson method

Table 3: Series: LG LGDP

Eigenvalue	Likelihood Ratio	5% Critical	1% Critical	Hypothesized No. of CE(S)
0.150216	28.01064	19.96	24.60	None**
0.049767	6.687356	9.24	12.97	At most 1

Source: Derived from E-views analysis.

\*(\*\*) denotes rejection of hypothesis at 5% (1%) significance level.LR test indicates 1 co integrating equation at 5% significance level.

From the likelihood ratio test, we conclude that there is one linear combination of the endogenous variables which is stationary. The un-normalized and normalized coefficients are thus obtained from the output function.

Un-normalized Co-integrating Coefficients

LG	LGDP	C
-0.047790	0.042827	0.175829
-0.223870	0.244761	-0.659876

Normalized Co integrating equation

LG	LGDP	C
-1.115886	1.0000	4.105553
LOG LIKELIHOOD RATIO	99.86233	

From the normalized cointegrating equation, the long run relationship between government expenditure and economic growth is defined as

$LGDP = 1.115886LG - 4.1005553 C$  which can be interpreted to mean that in the long run, a 100% increase in government expenditure leads to about 112% growth in the economy. Using this long run equation, we are able to obtain an expression for the error correction term in the form;

$$Ef = LGDP - 1.115886*LG.$$

To ascertain the short run impacts of the exogenous variables on the endogenous variables, we employed the Full Information Maximum Likelihood (FIML) estimation in PC-Give Econometric software to derive general and subsequently parsimonious solutions for both government expenditure and economic growth models. The most preferred or parsimonious which are the models of interest to us are presented below.

FIML Estimated Parsimonious VEC Model for Economic Growth.  
Table 4: Sample: 1982 (2) To 2014 (4)

Variable	Coefficient	Standard Error	T-Value	T-Prob
DLGDP_1	0.283076	0.098978	2.86	0.005
DLGDP_2	0.137462	0.060556	2.27	0.026
DLG_4	0.277453	0.1067127	2.60	0.011
DLFB	-0.049866	0.0117887	-4.23	0.000
DLDB	-2.260742	0.569456	-3.97	0.000
DLID	0.116025	0.043455	2.67	0.009
DLIP	0.1197661	0.037727	3.20	0.002
DLM	0.074789	0.032517	2.30	0.024
D1	-0.120864	0.0339506	-3.56	0.000
EF_1	-0.015659	0.00623865	-2.51	0.014
Constant	0.091204	0.036776	2.48	0.015

### Diagnostics

Vector Portmanteau (12): 48.9379

Vector EGE-AR 1-5 Test:  $F(20, 214) = 1.0707(0.3824)$

Vector Normality test:  $\chi^2(4) = 157.90(0.0000)$

Vector hetero test:  $F(69, 275) = 0.88464(0.7246)$

Vector hetero- X:  $F(267, 78) = 7.6449(0.0000)$

Source: PC-Give FIML estimation

Gleaning the model above, it is obvious that the feedback of economic growth is felt in the first two periods of the time horizon whilst the contemporaneous effect of growth in government expenditure on economic growth only registers significantly in the fourth period. Precisely speaking in the short run, a 100% growth in government expenditure triggers about 28% increase in economic

growth, of the policy variables, external and domestic borrowing are both negatively related to economic growth in the short run though the effect of the former is unexpected and surprising. Again growth in direct and indirect taxes are found not to be distortionary as predicted by some theorists but rather on the contrary positively influence economic growth albeit through small amount.

It is also instructive to note that of the control variables, growth in private investment positively affects economic growth. This affirms M'Amanja and Morrissey(2006) and Menjo and Kotut(2012). We also present the FIML preferred solution for growth in government expenditure.

Table 5: Estimated Parsimonious Model for Growth in Government Expenditure

Variable	Coefficient	Standard Error	T-Value	T-Prob
DLGDP_1	1.023675	0.40947	2.50	0.015
DLGDP_4	-1.38206	0.548437	-2.52	0.014
DLG_1	-0.36469	0.102441	-3.56	0.000
DLG_2	-0.239308	0.1058885	-2.26	0.026
DLG_4	0.273761	0.094727	2.89	0.004
DLFB	-0.170468	0.0546372	-3.12	0.002
DLDB	8.70054	2.423549	3.59	0.000
DLID	0.78476	0.3177166	2.47	0.016
DLIP	0.230918	0.1049627	2.20	0.030
DLX	0.393486	0.1249162	3.15	0.001
DLM	-0.713694	0.1633167	-4.37	0.000
D1	-0.38479	0.1557854	-2.47	0.016
EF_1	0.203769	0.0885952	2.30	0.024

Source: Derived from PC-Give FIML estimation.

From the FIML estimates, economic growth has significant effect on growth in government expenditure in the first and the fourth periods. Its effect in the first period is positive but turns negative in the fourth period. Feedback from growth in government is manifest in the 1<sup>st</sup>, 2<sup>nd</sup> and the 4<sup>th</sup> period. In the first two periods, the feedback is negative and positive in the fourth.

The short run effects of the policy variables are interesting. Growth in external borrowing rather has a dampening effect on government expenditure which is a surprising deviation from the general trend in the literature. Expectedly, growth in domestic borrowing positively influences growth in government expenditure. Its contemporaneous effect is very huge. Growth in direct and indirect taxes exert positive effects on growth in government expenditure though not as strong as expected. This is consistent with M'Amanja et al(2005), Looking at the effects of the control variables, growth in private investment and exports both have a positive effect on government expenditure whilst growth in imports has a negative effect.

Table 6: Selected Results from Causality Tests

Test	F-statistic	Probability
DLGDP→DLID	16.9733	1.3E-08
DLGDP →DLDB	3.76749	0.00986
DLIP → DLGDP	2.92093	0.02998
DLGDP →DLX	3.03719	0.0264
DLID→DLG	5.90050	0.00022
DLDB→DLIP	2.89972	0.02286
DLG→DLDB	3.78838	0.00612
DLG →DLFB	2.48317	0.04721

The causality tests reveal that economic growth causes growth in indirect taxes, domestic borrowing and growth in exports. However growth in private investment causes economic growth meaning that private investment is a critical condition for growth in Ghana.

Also, growth in government expenditure Granger causes growth in both domestic revenue and external borrowing whilst growth in domestic borrowing causes growth in government expenditure .This implies that a change in domestic borrowing triggers a movement in the level of private investment in the Ghanaian economy.

To gain further insights in our dynamic analysis, we embarked on Variance Decomposition to assess the relative importance of the random shocks in the system. Selected results of the analysis are presented below;

Table 7: A Selected Variance Decomposition of Growth in Government Expenditure (%) Over 20 Quarters

PERIOD	S.E	DLG	DLGDP
2	0.552939	99.85407	0.145934
4	0.554185	99.8.0014	0.199862
8	0.579820	99.72340	0.276603
12	0.582150	99.71950	0.280502
16	0.582362	99.71922	0.280797
20	0.582381	99.71920	0.280787

Source: E-Views output generated by author

From the results of our forecast error variance decomposition, we observe that over the entire time horizon , changes in government expenditure are largely due to own innovation .In each period of the time span under consideration, own innovations accounted for over 99% of changes due it. This means that in our system, the most important variable that explains the behaviour of growth in government expenditure is itself .In other words innovations due to economic growth account for a small percentage in the movements of growth in expenditure

Table 8: Selected Forecast Error Variance Decomposition of Economic Growth  
Time Horizon: Twenty Quarters

PERIOD	S.ERROR	DLG	DLGDP
2	0.06757	14.17700	85.82300
4	0.068482	14.34209	85.95239
8	0.068791	15.08543	84.91457
12	0.068813	15.13942	84.86058
16	0.068814	15.14368	84.85632
20	0.068814	15.14401	84.85599

Source: E-Views output generated by authors

From the analysis above, we infer that movements in government expenditure represent roughly about 15% of the innovations due economic growth. Thus a shock in government transmits about 15% of the innovations due economic growth. The largest chunk of movements in economic growth however comes from its own innovations.

We reinforce our dynamic analysis by examining the impulse responses from each of the endogenous variables as result of shock in own and the other innovations.

Table 9: Selected impulse responses of growth in government expenditure

PERIOD	DLG	DLGDP
2	-0.304000	-0.0043220
4	0.019628	0.016158
8	-0.001496	-0.000841
12	9.19E-05	3.52E-05
16	-5.24E-06	-1.51E-06
20	2.80-07	5.99E-08

Table 10: Impulse Responses of Economic Growth To Innovations  
Over a twenty Period Time Horizon

PERIOD	DLG	DLGDP
2	0.003844	0.011086
4	0.000581	0.001720
8	1.53E-05	2.35E-05
12	5.59E-08	5.12-07
16	3.00E-09	-7.02E-10
20	2.21E-10	3.93E-10

Source: Generated by E-Views,

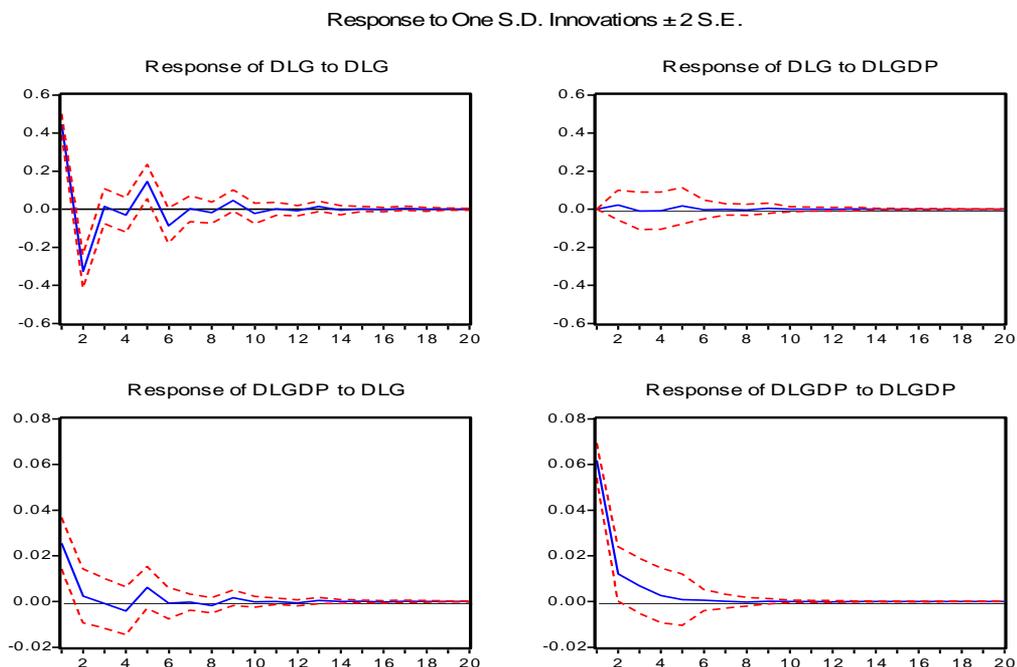


Figure 1. Graphs showing impulse responses between endogenous variables.  
(Generated from E-Views)

We observe that shocks to growth in government expenditure transmit intense trepidation in the time path of growth in government expenditure in the short to medium term. The effect of the shocks appear to fizzle /fade out around the tenth quarter .Thus after the tenth period, growth in government expenditure converges to the long run equilibrium values and attains stability in time path.

From the function and graph of the effect of shock in economic growth to growth in government expenditure, it is obvious that shocks initially results in an irregular time path of growth in about the long run convergent points .Stability in the time path is achieved after the eighth quarter.

The response function of economic growth to shocks in itself and growth in government expenditure illustrates that innovations to growth in government expenditure traces a time path that converges and achieve stability from above. The result clearly shows stability is attained again after the eighth period.

The reaction of economic growth to shocks in its own innovation appears to follow a pattern similar to the one above, the only difference is that the short run values are greater in the first six quarters .From the response function and graph, we realize that stability and convergence of the short term values the long run equilibrium points is achieved only after the 8<sup>th</sup> period .In sum, after the eighth period, the effect of the shocks are minimized and subsequently fades out completely.

## 6 Conclusions

From the empirical analysis, there is evidence to show that financing deficits from both external and domestic sources undermine economic growth. However, that financing expenditure from domestic sources tends to have a more deleterious effect on economic growth. The tax channels however surprisingly do not impede economic growth hence are better means of financing government expenditure in order to promote economic growth. Government must therefore develop ways of increasing tax revenues so as to avoid the temptation of having to augment revenues by borrowing. If government has to borrow at all then external borrowing is preferable because it has been proven from our empirical analysis that it is less distortionary than domestic borrowing. In doing so government would be freeing resources for private sector investment which would then serve a dual purpose of enhancing government revenue whilst at the same time promoting economic growth. The other major issue which is brought to the fore by the analysis is the critical need for fiscal prudence and discipline on the part of the government of Ghana in order to as much as possible reduce or avoid borrowing.

## References

- [1] Abdon, A., Estrada, G.B., Lee, M and Park, D. (2014). Fiscal Policy and Growth in Developing Asia. Asian Development Bank (ADB) *Economics Working Paper Series* No. 412.
- [2] Al-Khasawneh, M and Aleqa, A.K. (2012). The Relationship between Fiscal Policy and Economic Growth rates: A case study of Jordan (2004-2011). *Interdisciplinary Journal in Contemporary Research in Business*. 23(2), 45-89
- [3] Al-Youssif, Y. K. (2000). Does Government Expenditure Inhibit or Promote Economic Growth? Some Empirical Evidence from Saudi Arabia. Department of Economics, College of Administration and Economics. United Arab Emirates University.
- [4] Amin, A. (1998). Cameroon's Fiscal Policy and Economic Growth. Africa Economic Research Consortium (AERC) Paper 85, Nairobi, Kenya.
- [5] Barro, R.J. (1990). Government spending in a simple model of endogenous growth. *Journal of Political Economy*, 98(2), 103-125
- [6] Barro, R. J., and Sala-i-Martin, X (1992). Public Finance in Models of Economic Growth *Review of Economic Studies* 59(2), 645-661.
- [7] Bhasin, V. K. (2004). Dynamic Interlinks among Exchange Rate, Price level and Terms of trade in a managed floating exchange system: A case study of Ghana. African Economic Research Economic Consortium (AERC) Paper 141, AERC, Nairobi, Kenya.

- [8] Bleaney, M. Gemmell, N. and Kneller, R. (2000). Testing the Endogenous Growth Model: Public Expenditure, Taxation and Growth over the long run. Discussion Paper No 00/25, University of Nottingham, UK
- [9] Chlestos, M. and Rolljas, T. (1995). Defence Spending and Economic Growth in Greece 1970-90: Some Econometric Results. *Applied Economics*, 27(2), 35-78.
- [10] Chhiber, A. & Dailaimi, M. (1990). Fiscal policy and private investment in developing countries-recent evidence on key selected issues. World Bank PPR Working Paper
- [11] Cottarelli, C. & Jaramillo, L (2012). Walking Hand-in –Hand:Fiscal Policy and Growth in Advanced Economies. International Monetary Fund (IMF) Working Paper WP/12/137
- [12] Devarajan, S., Swarup V and Heng-Fu, Z. (1996). The Composition of Expenditure and Economic Growth. *Journal of Monetary Economics*. 37(2), 313-344.
- [13] Dalamagas. B. (2000). Public Sector and Economic Growth-The Greek Experience. *Applied Economics*. 32(1), 277-288.
- [14] Downs, H. (1957). *An Economic Theory of Democracy*. Harper Row. New York
- [15] Easterly, W. and Rebelo, S. (1993). Fiscal Policy and Economic Growth: An Empirical Investigation. *Journal of Monetary Economics*. 32(2), 975-987.
- [16] Engle, R.F. and Granger, C.W.J (1987). Co integration and Error Correction.: Representation, Estimation and Testing. *Econometrica* 55(4), 251-276.
- [17] Ezeabasili, V. Tsegba, I. N. and Ezi-Hubert, T. (2012). Economic Growth and Fiscal Deficits: Empirical Evidence from Nigeria. *Economics and Finance Review*. 2(6), 85-96.
- [18] Ghali. K.H.(1998). Government Size and Economic Growth: Evidence from a Multivariate Analysis. *Applied Economics* 31,975-987
- [19] Granger, C.W.J.(1986). Developments on the Study of Co integrated Economic Variables. *Oxford Bulletin of Economics and Statistics*. 48 (3), 23-78.
- [20] Johanssen, S. (1988). Statistical Analysis of Co-integrating Vectors. *Journal of Economics Dynamics and Control*. 12(1), 231-255.
- [21] Khan, M. S. and Reinhart, C. M. (1990). Private Investment and Economic Growth in Developing Countries. *World Development* .18(18), 19-27.
- [22] Kneller, R. Bleaney ,M.F. and Gemmell, N. (1999). Fiscal Policy and Growth: Evidence from OECD Countries. *Journal of Public Economics*. 74(2), 171-190.
- [23] Landau, D. (1983). Government Expenditure and Economic Growth: A Cross country study, *Southern Economic Journal*. 49(2), 783-792.
- [24] Levine, R. and Renelt, D. (1992). A Sensitivity Analysis of Cross Country Regressions. *American Economic Review* 82(4), 942-963.

- [25] Li & Cao (2001). The Long-run Causality between Government size and Economic Growth-A comparative study of Four Asian Countries over a period of Industrialization and Post-industrialization
- [26] Lin, S. (1994). Government Spending and Economic Growth. *Applied Economics*. 26(3), 83-94.
- [27] Litterman, R.B. (1985). Forecasting and Policy Analysis with Bayesian Vector Autoregressive Models. *Quarterly Review of Federal Reserve Bank of Minneapolis*. 8(2), 30-41.
- [28] M'Amanja, D., Lloyd, T. and Morrissey, O. (2005). Fiscal Aggregates, Aid and Growth in Kenya: A Vector Autoregressive (VAR) Analysis. CREDIT Research Paper 05/07, University of Nottingham, UK.
- [29] M'Amanja, D and Morrissey, O (2005). Fiscal Policy and Economic Growth in Kenya, CREDIT Research Paper 05/06, University of Nottingham, UK.
- [30] Mascagni, G. & Timmis, E. (2014). Fiscal effects of aid in Ethiopia: Evidence from CVAR applications. CREDIT Research Paper 14/06, University of Nottingham, UK.
- [31] Milesi-Ferreti, G. M. and Roubini, N. (1995). Growth effects and consumption taxes: Positive and normative analysis." NBER Working Paper Series. WP No 5317
- [32] Nd'ungu, N. (1997). Price and Exchange Rate Dynamics in Kenya: An Empirical Investigation (1970-1993). African Economic Research Consortium (AERC) Research Paper 58, AERC, Nairobi, Kenya.
- [33] Odedekun, M. O. (1997). Relative Effects of Public versus Private Investment on Economic Growth in Developing Countries. *Applied Economics*. 29, 1325-1336.
- [34] Olson, M. (1984). "Ideology and Economic Growth" in Hutton, C.R. and Sawmill, V. (eds). "The legacy of Ergonomics: Prospects for Long term Growth", Washington DC Urban Institute Press.
- [35] Osei, R., Morrissey, O., & Lloyd, T. (2003). Modelling the fiscal effects of aid: An impulse response analysis for Ghana. CREDIT Research Paper 03/10, University of Nottingham, UK.
- [36] Osoro, N. (1997). Public spending, taxation and deficits: What is the evidence? African Economic Research Consortium (AERC) Research Paper 62, Nairobi, Kenya.
- [37] Rao, B. (1994). Introduction to Co integration for the Applied Economist. New York, St Martin's Press Inc.
- [38] Sarmad, K. (1990). Public and private investment and economic growth. Institute of Social Studies (ISS) Working Paper Subseries on Money, Finance and Development No 34
- [39] Scarfe, B. L. (1977). Cycles, growth and inflation: A contemporary macro dynamics. McGraw Hill Inc.
- [40] Shihab, R.A. (2014). The causal relationship between fiscal policy and economic growth in Jordan. *International Journal of Business and Social Science*. 5(3), 203-208.

- [41] Skinner, A. (1988). Taxation and Output Growth in Africa. World Bank Research Working Paper
- [42] Soydan, A. (2001). Do Budget Deficits Cause Inflation? A Co integrating VAR Analysis.
- [43] Thomas, R. L. (1993). Introductory econometrics: Theory of applications. 2nd Edition Longman, London.
- [44] Tullock, G. (1959). Some problems with majority voting. *Journal of Political Economy*. 67(2), 571-579