Anaman, Emmanuel Atta

Article

Fiscal aggregates, private investments and economic growth in Ghana : an autoregressive framework

Academic journal of economic studies

Provided in Cooperation with:
Dimitrie Cantemir Christian University, Bucharest

Reference: Anaman, Emmanuel Atta (2019). Fiscal aggregates, private investments and economic growth in Ghana : an autoregressive framework. In: Academic journal of economic studies 5 (4), S. 21 - 35.

Academic Journal of Economic Studies
Vol. 5, No. 4, December 2019, pp. 21–35
ISSN 2393-4913, ISSN On-line 2457-5836

Fiscal Aggregates, Private Investments and Economic Growth in Ghana. An Autoregressive Framework

Emmanuel Atta Anaman

Department of Banking and Finance, School of Business, University of Education, Winneba, Ghana, E-mail: eaanaman@uew.edu.gh

Abstract

The role of the private sector in promoting economic growth has long been acknowledged by early classical economists. However since the emergence of the Keynesian interventionist philosophy, there have occurred vigorous debates and arguments from time to time around which of these two paradigms offers the most effective, promising and robust momentum to achieving economic growth. This study attempts to make a contribution to the discourse by assessing the linkages between fiscal policy and private investment and ultimately how these linkages impact on economic growth in Ghana. It adopts the positivist approach to research, employing the vector autoregressive (VAR) econometric method which enables researchers to uncover the various time-dependent relationships between the variables of interests as well as separate long run from short run relationships. The study employs a seven variable VAR based on the Cobb-Douglas production function encompassing private investment, fiscal aggregates and economic growth .The empirical analysis yields evidence to the fact that in this system developed, there are two long run relationships between economic growth and the other variables on one hand and government expenditure and the rest of the variables on the other. The long run estimates from the study suggests that private investments and government expenditure positively affect growth but both borrowing modes negatively influence economic growth. Again in the long run, growth in government expenditure is positively affected by the other variables. In the short run however, economic growth is negatively influenced by government expenditure but positively by private investments whilst private investments are negatively determined by government expenditure and domestic borrowing but influenced positively by external borrowing and indirect taxes. The main recommendation from the study is that government must thoughtfully reconsider the financing avenues in order not to constrain or undermine the development of the private investments as it would appear it has a critical role in driving growth in the Ghanaian economy.

Key words

Autoregressive, cointegration, fiscal policy, private investments, stationarity

JEL Codes: F43, E62

Received: 08 August 2019 **Revised: 20 September 2019** **Accepted: 30 September 2019**

1. Introduction

The role of private investment in promoting economic growth and development has taken center stage in contemporary economic discourses and discussions. This is because it now widely believed that the private sector constitutes the most potent force that can bring about dramatic and rapid economic growth and development as well as poverty reduction in the economies of both developed and developing countries. This view has become preponderant as result of the debacles which have characterized the economies of many developing countries which have basically employed the state-led approach to economic management. The state-led interventionist paradigm has its roots in the Keynesian philosophy which was of the firm conviction that tax policies, government spending and sometimes deficit financing were imperatives for economic growth and stability. From the 1980s however, developing countries have continued to experience severe economic difficulties marked by balance of payments problems, escalating debt situations as well as declining economic growth rates necessitating a change in economic management style from the pro-Keynesian approach to one which cuts back on the pervasive state intervention and makes the private sector the engine of growth. Indeed those who support the private sector led approach argue that through competition, this approach leads to greater efficiency and thus enhance economic growth and development. Their contention is that state intervention usually leads to the crowding out of the private sector. This position is underlined by Buiter (1977) and Ghali (1998).

In the literature, there are empirical studies that have demonstrated the obvious advantages that private sector led approach has over the public sector led one (Khan and Reinhart, 1990; Sarmad, 1990).There is however evidence also largely from the studies of endogenous growth theorists that show that different components of government spending particularly in the form of investments in human capital development, health and infrastructure positively affect economic growth (Ram Rati, 1986; Barro and Sala-i-Martin, 1992; Easterly and Rebelo, 1993; Fazzari, 1994). In the opinion of the latter researchers, government expenditure is critical for putting in place the infrastructure and economic overheads necessary for the private sector to thrive and flourish. Bahmani-Oskooee (1999) has also underscored the importance of

public investment spending as a way of stimulating private sector investments in an economy. It has to be stressed that there is yet another group who appear to articulate the Riccardian view that deficits run by governments by virtue of their increased expenditure are usually growth neutral.

Empirical studies have provided contradictory evidence as to how the use of fiscal tools impact on private investment and ultimately economic growth. There may be several factors responsible for this of affairs. Looking back at the various studies, one realizes differences in terms of methodology, country contexts and data. However one thing which appears common to most of them is their employment of neo-classical growth model as the basis for their analysis. In most of these studies, various aspects of the fiscal policy-private investment-economic growth nexus are highlighted. Little emphasis has however been placed on examining the dynamic interactions among the fiscal aggregates, private investments and economic growth. More precisely, the past studies in this area have not adequately addressed the issue of linkages between the fiscal channels- borrowing modes and the tax aggregates-direct and indirect taxes, private investments and economic growth. In particular, a clear missing link in the previous but related studies is that the differential effects of direct and indirect taxes on private investment have not adequately been emphasized. In addition, the effects of the different borrowing modes on private investments have not properly been assessed. Our firm conviction is that there is a possibility that these tax aggregates and the borrowing modes may influence private investments in different ways. Indeed the most recent study concerning Ghana by Soli *et al* (2008) incorporated elements of effects of taxes but did not consider the borrowing modes as critical components of an overall fiscal policy framework which can have profound implications on private sector activities. One would want ask, how do these fiscal aggregates affect private sector investment and economic growth in Ghana? How does private investment influence economic growth and the fiscal aggregates? How do the tax channels and the borrowing modes affect private investments? How do these respond to shocks in each other?

This paper therefore aims at addressing these critical issues which have been articulated above and by so doing, contribute to the debate on the role and impact of fiscal policy in the process of growth. It would attempt that by using the Ghanaian situation. This study therefore seeks to find the short and long run dynamic interlinks among the fiscal aggregates, private investments and economic growth in Ghana and thus estimate both the short and long run functions between them.

2. Literature review

Fiscal policy encompasses all actions, initiatives and policies which employ taxation and government expenditure mechanisms to influence the direction of an economy. McKay (2002) simply characterizes fiscal policy as the whole gamut of the various types of public expenditures and the different methods by which these are financed. Indeed it is widely acknowledged that fiscal policy plays a significant role in promoting economic growth. According to Abdon *et al.* (2014), fiscal policy in the short term, can help boost aggregate demand and economic growth especially during cycles of downturns. By the same token, it is very useful in preventing the explosion of an economy potentially on an unsustainable growth trajectory. The endogenous growth theorists emphasize the centrality of fiscal policy in the process of growth and have famously articulated the point that fiscal policy is an anchor which provides the much needed human capital, law and order, conducive environment as well as the critical social overheads and economic infrastructure needed to stimulate economic growth both in the short and long runs. This view is very well put across by Barro (1990), Barro and Sala-i-Martin (1992), Easterly and Rebelo (1993), Folster and Henrekson (2001) among others. Folster and Henrekson (2001) however observe that when government activities in the economy continue to expand they actually create fertile grounds for rent-seeking activities to flourish instead of providing support for productive activities. There is another view at the other end of the spectrum which however suggests that government interventions in an economy tend to be rather detrimental to economic growth (Ghali, 1998; Mitra, 2006).

In the perspective of these researchers, government machinery is naturally bureaucratic and not as efficient as desired. As a result it tends to undermine instead of stimulating growth. In addition to these they also argue that the government through the modes of financing its operations may end up supplanting the private sector reckoned to be more efficient than the public sector, in the financial markets by absorbing the credit available on the financial markets thereby preventing the private sector from providing the needed impetus for economic growth. From the work of the endogenous growth theorists, fiscal instruments can be compartmentalized into distortionary and non-distortionary taxes and productive and unproductive spending. Distortionary taxes are described as taxes which alter the incentive structure in favour of rent-seeking and unproductive sectors of the economy whilst non-distortionary taxes are those which do not undermine growth through reallocation of resources from these sectors. Productive expenditures in the view of Barro and Sala-i-Martin (1995) constitute all government expenditures on critical areas of the economy like education, health, roads, railways and airports, communication and other social amenities whilst unproductive expenditure are normally characterized as government consumption expenditures for example on emoluments, pegs and freebies on public sector workers.

Taxation as a fiscal policy tool is usually employed by governments the world over to manage and regulate the economic environment. The tax structure/system in a given country is therefore an important component of the overall incentive framework within the economy. It is argued that the design of tax system influences private investment decisions and through that impact on economic growth. According to Levine and Renelt (1993) and Landau (1983), taxation results in the suboptimal allocation of resources thereby undermining economic growth. Another channel through which government activity can negatively affect growth is borrowing. Gallaway and Vedder (1998) stress that government borrowing diverts resources from the private sector hence negatively impacting on private sector development and by extension, economic growth and development. This is especially true of domestic borrowing where government securities are seen as safe, high interest and risk –free means of earning returns on one's money. For external borrowing, the issue of concern is its tendency to lead to the accumulation of debts which affects future generations. In addition, certain external loan agreements may force the recipient country to open up its markets and liberalize the trade environment. This normally leads to private sector players being out-competed by foreign concerns.

Though the endogenous growth theorists emphasize the key role of private investments, they argue that increased investments may not necessarily enhance economic growth. The ultimate impact of investments on growth in their view depends on the quality of investment, its productivity, the amount of infrastructure available and even the nature of the economic environment (Artadi and Sala-i-Martin, 2003). At this point we examine the empirical evidence in similar studies found in the literature. Arin (2004) focused on Fiscal Policy, Private Investment and Economic growth: Evidence from G-7 countries. The purpose of the paper was to test the effect of fiscal policy on private investments and economic growth. Empirical tests showed that government expenditures negatively affect economic growth while income taxes and government expenditure also have a negative impact on private investments. In an IMF working paper, Poirson (1998) examined economic security, private investment and growth in developing countries. Adopting a cross country approach, he developed two-equation system with private investments and economic growth as the endogenous variables. The empirical analysis showed that the endogenous variables have positive effect on each other.

Ghali (1998) also employed the CVAR method to establish that private investment exerts a positive effect on growth whereas public investments tend to have the opposite effect. Foreign aid, Investment and economic growth in Kenya: A Time series Approach was the subject of the study by M'Amanja and Morrissey (2006).The study sought to assess the short and long run effects of foreign aid and private investments on economic growth using the dynamic error correction analysis. Tests showed yielded two long run cointegrating vectors; one for economic growth and the other for private investment. In the long run, the authors found that both public and private investments have a positive effect on economic growth. However, public investments have a negative effect on private investments whilst foreign aid impacts positively on economic growth. Fiscal policy, private investment and economic growth: the case of Ghana was authored by Soli *et al.,* (2008) and its main objective was to determine the relationship between fiscal policy variables, private investment and economic growth. Positing the study within a deductive framework, the authors formulated a time-dependent equation for private investment. Tests revealed that most of the variables were stationary after first differencing and that there existed a long run relationship between private investment and the right hand variables. The major findings which emerged from the study are that government expenditures and taxes are significant determinants of private investments in Ghana.

Hadiwibowo (2010) studied fiscal policy, investment and long-run economic growth in Indonesia. The main pre-occupation of the study was to examine the impact on private investment and economic growth employing a dynamic framework. Hadiwibowo (2010) found significant effects of government expenditure and revenues on private investments. Menjo and Kotut (2012) have also contributed to the debate on the fiscal policy-private investment-economic growth relationship. In their paper,' Effects of Fiscal Policy on Private Investment and Economic Growth in Kenya', they investigated the impacts of fiscal policy on private investment and economic growth in Kenya. To pursue the analysis, they employed a two-stage instrumental simultaneous system to estimate two equation model; one for private investment and the other for economic growth. Generally, the regressions showed that government consumption expenditure positively influences private investments .However the real interest rate, budget deficits and tax burden were found to impact negatively on private investments. The measured effects of exports and investments on economic growth were significant and positive.

Private investment and fiscal policy in Pakistan was the subject of the research by Malik (2013).The thrust of the paper was to determine the impact of the fiscal policy variables on private investment. Operating within a vector autoregressive model, it was established that there was a long run between private investments and the explanatory variables. The estimation also indicated that government debts in form of borrowing tend to undermine private sector investment. However, a fiscal surplus has positive effect on private investments. Anaman *et al.* (2017) ventured into examining the dynamic nexus between fiscal aggregates, government borrowing and economic growth employing the vector autoregressive /error correction method. The model in this study encompassed a two equation system with two endogenous variables-economic

growth and government expenditure and seven exogenous variables including private investment. Tests confirmed there is a long run relationship between government expenditure and economic growth. In the short run, growth in private investment is established to positively affect both economic growth and government expenditure. The Short run function for economic growth however shows that both domestic and external borrowing negatively impact on economic growth.

3. Fiscal policy framework and economic growth in Ghana

When the trajectory of the Ghanaian economy is examined one is left in no doubt that each government implemented policies which were conceptualized as the right frameworks for promoting the enhanced growth and well-being that citizens looked up to. Though all the frameworks targeted rapid growth and enhanced welfare of the citizenry, there were differences in the philosophical approaches in the way they were conceived and implemented. For example in the early stages of nationhood, government policies were influenced by the prevailing development thinking which prescribed the use of the state's financial power to engender rapid economic growth . Thus in this era, state capital rather than private capital was seen as more critical in the growth and development objectives of the country. In line with this big push strategy, the state became pervasively involved in real economic activities across the economic spectrum from agriculture to manufacturing. Though within this period, people attest to the transformation within the economic landscape, some economists argue that the transformation witnessed largely came without the needed growth crucial for sustaining any developments within the economy. This development paradigm was however jettisoned by the military rulers who overthrew the first republic and instituted a programme of economic liberalization which sought to de-emphasize the overarching role of the state in the Ghanaian economy. In line with the liberal views of the military regime and its succeeding civilian government, a lot of the state led production entities established by the Nkrumah-led government were privatized or earmarked for divestiture. And as it turned out, quite a good number of these were left unattended to as the government then was not interested .This and a host of other factors played into the hands of the military who toppled the government and began a process of reinstating some of the policies under President Nkrumah. Thus in a sense, the liberal reforms instituted during the period 1966-1972 never had any meaningful impact on the Ghanaian economy.

The succeeding Acheampong government brought into being a cocktail of policies which were predicated on elements of socialism and nationalism and thus encouraged Ghanaians to take commanding heights of the economy. The government in consonance with this philosophy imposed a system of pervasive controls which gave the state a considerably greater muscle in the economic affairs of the country. Some of the policies which were instituted are foreign exchange controls, import controls using import licensing regimes and quantitative restrictions and price controls. It is argued that these policies pursued during the period largely created a disincentive for real production and as a result, economic growth declined substantially especially in the latter period of the rule. The economic problems created appear to be exacerbated by poor fiscal and monetary policy management by the relevant agencies and further worsened by the decision of the government at the time to repudiate loans which had been contracted by previous governments especially the immediate past one leading to the blacklisting of the country on the international financial markets. Even though in the early part of the period, there were some gains in the agricultural and manufacturing sectors of the economy , things took a different turn in the latter part of the military rule, with the Ghanaian economy facing very serious challenges. Indeed by 1976,the incentive structure in the economy had deteriorated to the extent that a lot of business people moved or shied away from real productive activities to rent seeking and largely distribution oriented activities resulting in a systematic contraction of the Ghanaian economy .The problems were compounded by the collapsing infrastructure base of the economy leading to a severe drop in the capacity utilization of industrial concerns. It is actually asserted by some economists that during the period 1970-1980,the Ghanaian economy contracted by an average of about 1.5% per year.

The serious economic malaise which had afflicted the Ghanaian economy persisted even into the tenure of the civilian government voted in by 1979 and in 1981 they were overthrown by the PNDC, which declared what they called the holy war. In the early embers of the regime, the policies which were implemented were similar to those employed in early part of the Acheampong regime, with elements of controls and a preference for state-controlled economy. The posture and the policies of the authorities at the time did nothing to persuade the private sector to become robustly involved in the economy and therefore the economic outcomes within the period were still not good enough to take the country out of the quagmire.

With the realization that their policies were not yielding the desired results, the PNDC decided to embrace an IMF/World Bank programme of economic reforms and recovery in 1983.and key among the pillars of the reforms were the rolling back of the system of controls and the increased role of the market as a mechanism for allocating resources, the reduction of the state's involvement in the economy through a programme of divestiture of state owned companies/business ,especially the unprofitable ones and the institution of a liberalized economic environment, with far reaching implications for banking the system and international trade.

With these measures in place, the Ghanaian economy began to show signs of rebounding in the late 1980s when the economy started moving on a positive growth path. Aside of this, other macroeconomic indicators began to improve considerably. From that time, successive governments have continued to emphasize the central role of the private sector in the scheme of the country in terms of the country's growth objectives. Indeed, it has to be stated that since the inception of the Economic Recovery Programme (ERP), Ghana has never experienced a slide into an era of negative growth rates as witnessed in the 70s to the 80s.

4: Methodology of research

The starting point for our analysis of economic growth is the Cobb-Douglas production employed by Barro and Sala-i-Martin (1992 and 1995) which defines per capita income as a function of per capita private capital (k) and government provided goods and services (g).

Mathematically, $y= AK^{1-\alpha} g^{\alpha}$, $0<\alpha<1$ (1)

Where y defines per capita output and A technological parameter which captures productivity or efficiency. Barro and Sala-i-Martin assume that government imposes a proportional rate of tax on output(T)and lump sum taxes(L) and therefore set up a budget constraint granted that government balances the budget as:

$ng + C= L + Tny$ (2)

C represents government consumption defined to be unproductive and n is the number of producers in the economy. The theoretical position of Barro and Sala-i-Martin (1992) is that the proportional tax has the tendency to influence the incentive structure for private investment whilst the lump sum tax does not . According to Barro and Sala-i-Martin, when these interact with a specified utility function, a long run growth function of the form

$y = \lambda(1-T)(1-\alpha)A^{1/(1-\alpha)} (g/y)^{\alpha/(1-\alpha)}-\mu$ (3)

is obtained.

In equation (iii) λ and μ are parameters for the utility function referred to above. The conclusion therefore is that the growth rate decreases as the tax rate (T) increases but increases as productive government expenditure (g) increases. However non-distortionary taxes (L) and unproductive government expenditure(C) have no effect whatsoever on economic growth rate. The above premise of balanced budget in the view of Kneller *et al.* (1999) and Bleaney *et al.* (2000) is unrealistic in most economies but more particularly in developing countries. They therefore relax that condition to take care of situations where budgets are not balanced. They thus re formulate equation (iii) into

$ng + C+b = L + Tny$ (4)

Where b now takes care of budget deficit or surplus as the case may be.

Bleaney *et al.* (2000) explain that to the extent that the Riccardian equivalence does not hold, the b is important. In order to avoid the methodological problems associated with the use of static single and simultaneous equation models, we follow M'Amanja *et al.* (2005) by employing a vector autoregressive (VAR) model which they argue can better handle a system that has several endogenous variables and can isolate a number of cointegrating vectors as well as the ability to test for exogeneity. Charemza and Deadman (1997) underline another advantage of the VAR approach. In their view, it is very useful for studies involving fiscal variables which are co-determined since it does not *a priori* hypothesize causation in any direction among the endogenous variables.

Our VAR model generally encompasses fiscal variables- government expenditure, direct and indirect taxes and domestic and external borrowing and non-fiscal variables- private investments and economic growth. Consistent with the fact that the analysis of these dynamic models is best undertaken by employing hypothesis testing, we proceed to apply the positivists approach to research. We define our general autoregressive model 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*n polynomial matrix in the lag operator such that $LX_t=X_{t-1}$ where V_t represents a matrix of white noise stochastic disturbance terms.

Accordingly, the structural model we employ in the study is defined by

$\Delta PC_t= f (\Delta PC_{t-k},\Delta GE_{t-k},\Delta DT_{t-k},\Delta IT_{t-k},\Delta DB_{t-k},\Delta FB_{t-k},\Delta GDP_{t-k})$ (5)

$\Delta GDPt= f(\Delta GDP_{t-k} ,\Delta PC_{t-k},\Delta GE_{t-k},\Delta DT_{t-k},\Delta IT_{t-k},\Delta DB_{t-k},\Delta FB_{t-k})$ (6)

$\Delta GE_t = f(\Delta GE_{t-k}, \Delta GDP_{t-k} ,\Delta PC_{t-k} ,\Delta DT_{t-k},\Delta IT_{t-k}, \Delta DB_{t-k},\Delta FB_{t-k})$ (7)

$\Delta DT_t = f(\Delta DT_{t-k},\Delta GE_{t-k}, \Delta GDP_{t-k} ,\Delta PC_{t-k} , \Delta IT_{t-k}, \Delta DB_{t-k},\Delta FB_{t-k})$ (8)

$\Delta IT_t = f(\Delta IT_{t-k}, \Delta DT_{t-k}, \Delta GE_{t-k}, \Delta GDP_{t-k}, \Delta PCI_{t-k}, \Delta DB_{t-k}, \Delta FB_{t-k})$ (9)

$\Delta DB_t = f(\Delta DB_{t-k}, \Delta IT_{t-k}, \Delta DT_{t-k}, \Delta GE_{t-k}, \Delta GDP_{t-k}, \Delta PCI_{t-k}, \Delta FB_{t-k})$ (10)

$\Delta FB_t = f(\Delta FB_{t-k}, \Delta DB_{t-k}, \Delta IT_{t-k}, \Delta DT_{t-k}, \Delta GE_{t-k}, \Delta GDP_{t-k}, \Delta PC_{t-k})$ (11)

In the our system, PC defines private investments, GE represents government expenditure, DT stands for direct taxes; IT describes indirect taxes whilst DB, FB and GDP define domestic borrowing, external borrowing and economic growth respectively. In the model, each endogenous variable is defined as a function of its own innovations and that of the other endogenous variables. We are therefore able to examine the responses of any given endogenous variable to both the past and present values of itself and the other variables.

We begin our analysis by conducting a test for stationarity for all the variables. According to Thomas (1993),a variable is said to be stationary when it has stability in its time path that is to say that the series has a spectrum which is finite but non-zero at all frequencies. In the words of Granger and Newbold (1974), test for stationarity is important particularly for macroeconomic studies because it helps researchers avoid making spurious statistical inferences. To do this we employ the Augmented Dickey Fuller (ADF) and Phillip Perron (PP) tests. It has been argued by econometricians that macroeconomic variables are usually non-stationary and therefore need to be made stationary before they can properly be utilized in econometric analysis. The way to do this it is argued is by differencing them and the number of times a series has to be differenced to make it stationary is known as its order of integration (Granger, 1986).However, because most macroeconomic variables belong to the random walk series, they usually become stationary after the first differencing.

Next we test for cointegration in the series using the Johassen approach. This is because it has the ability to isolate a number of cointegrating vectors at the same time unlike the two-step Engle-Granger method. Cointegration in econometric simply means the existence of a long run stable equilibrium relationship among a group of variables. In other words it is the tendency of variables to move or drift together over time(Soli *et al.*, 2008).The cointegrating vector(s) obtained from the Johassen technique only specifies the long run relationship among a set of variables. However, to obtain both the long and short run properties of the relationships we employ the error correction of the VAR.

Generally our vector error correction model would be defined by: $\Delta Y_t = \Sigma \gamma i\, \Delta Y_{t-1} + \Sigma \alpha i X_{t-1} + \beta ECT_{t-1} + dt$

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 β, the coefficient of the error term shows how ΔY_t responds to the deviation from the long run equilibrium position.

In our specific case, we obtain an re parameterized error correction representation of our model in the form;

$\Delta X_t = \alpha + \pi X_t + T_1 \Delta X_{t-1} + \ldots + T_{k-1} \Delta X_{t-k+1} + \epsilon_t \qquad t = 1, 2, \ldots, k$

Where Xt represents the series private investment, direct taxes, indirect taxes, domestic borrowing, external borrowing, government expenditure and economic growth $T_i = -(A_{i+1} \ldots + A_k)$ i= 1, 2... K-1 and $\pi = -(I - A_1 - A_2 \ldots A_k)$.

In this approach Ts 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-efficient of matrix π capture the long-run information. The co-efficient of the lagged dependent variable represents inertia and as well provides information on the formation of expectations whilst the co-efficient of the other lagged endogenous variables show the pass-through effects. Additionally, we engage Granger causality tests to assess the direction of causation between each pair of endogenous variables. We do that by employing equations of the form

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

In the view of Osoro(1997),the idea behind this procedure is to find out if a given variable is better explained or predicted by using model of its own past values or by including past values of another variable. Following our derivation of the parsimonious solution for each endogenous variable, we further our dynamic analysis by using the forecast error variance decomposition to determine the percentage of the variance of the forecasted variable attributable to alternative right hand side variables at different time periods. This enables us to obtain information about the relative importance of the innovations to changes in each endogenous variable. In the words of Litterman (1985) this is important to the extent that causality tests are sometimes undermined by the fact that the right-hand side variables may not be orthogonal.

Finally the dynamic effects of shocks of variables on the other endogenous variables are examined using the moving average representation of the impulse response functions. Osei, Morrissey and Lloyd (2003) underline the relevance of the impulse response functions in a dynamic analysis by pointing to the fact that a shock to one variable may set off a chain of knock-on and feedback effects as it permeates through the system. Johnston and Di Nardo (1997) have characterized impulse response functions as the chain or knock –on effects from one standard deviation perturbation in each of the other innovations when no other shocks are in the system thereafter. The impulse response function will thus enable us to trace out how long it takes for a given variable to return to its equilibrium position after a shock in another variable is transmitted to it.

4.1. Data set

The data for this study is drawn largely from the World Bank and IMF databases and augmented with data from local sources specifically from the Ghana Statistical Service (GSS) and the Bank of Ghana (BOG). For the purposes of this study the data drawn are in annual forms and span from 1977 to 2017.

5. Results of empirical analysis

Table 1. Unit roots tests

	Log levels of variables				First difference of logs of variables			
	ADF	Prob.	P.P.	Prob.	ADF	Prob.	P.P.	Prob.
Db	-2.341637	0.1646	0.325890	0.7748	-4.462562	0.0010	-4.513137	0.0000
Dt	-1.555208	0.4957	1.145874	0.9323	-6.595497	0.0000	-7.153517	0.0000
Fb	-0.603865	0.8584	3.120106	0.9993	-6.350953	0.0000	-5.433632	0.0000
GDP	-0.791299	0.8102	2.323781	0.9943	-6.200788	0.0000	-10.52737	0.0000
Ge	-0.782942	0.8131	6.715101	1.0000	-5.134609	0.0001	-2.356296	0.0196
Pc	-1.243969	0.6454	5.198959	1.0000	-7.204641	0.0000	-8.697750	0.0000
Lit	-0.509391	0.8212	0.792288	0.8801	-2.015552	0.0435	-8.372796	0.0000

From the test of stationarity, we fail to reject the null hypothesis that all the variables are non-stationary at levels but fail to accept the null hypothesis that all variables are non-stationary at first differences. We therefore conclude that all the variables in our model are integrated of order one at levels but zero at their first differences. In other words, in our system, all the variables achieve stationarity when they are differenced once and that makes it appropriate for the vector autoregressive model. To determine the appropriate or optimal lag of the model, we proceed to employ the lag selection criteria and present the results below.

Table 2. Lag Selection criteria

Included observations: 36

Lag	LogL	LR	FPE	AIC	SC	HQ
0	42.47277	NA	3.29e-10	-1.970709	-1.662803*	-1.863242
1	77.36396	54.27518	7.59e-10	-1.186886	1.276365	-0.327146
2	137.3104	69.93756	5.72e-10	-1.795024	2.823573	-0.183010
3	217.8731	62.65986	2.74e-10	-3.548506	3.225436	-1.184219
4	389.1647	66.61339*	5.73e-12*	-10.34248*	-1.413195	-7.225922*

* indicates lag order selected by the criterion

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

From the above, we conclude that the optimal lag length for our system is 4. Having selected the appropriate lag structure for the model we then proceed to test whether the variables are co integrated using the Johanssen approach. The results of the test are presented in the table below.

Table 3. Johanssen test for Co integration

Series: LGDP LGE LPC LDB LDT LFB LIT

Unrestricted Co integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**

None *	0.816387	177.0226	134.6780	0.0000
At most 1 *	0.605096	110.9206	103.8473	0.0157
At most 2	0.494004	74.68518	76.97277	0.0738
At most 3	0.429950	48.11737	54.07904	0.1529
At most 4	0.239585	26.19813	35.19275	0.3310
At most 5	0.231954	15.51638	20.26184	0.1982
At most 6	0.125366	5.224033	9.164546	0.2598

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The test results show that in our model, there are 2 co integrating equations and these are derived from the un-normalized co integrating coefficients below.

Table 4. Un-normalized Co integrating coefficients

Unrestricted Co integrating Coefficients (normalized by b'*S11*b=I):

LGDP	LGE	LPC	LDB	LDT	LFB	LIT	C
-3.881725	0.165258	2.756228	-0.666100	1.405297	-1.782109	-1.822401	69.97668
0.643610	-2.212954	2.343285	1.361575	5.570144	1.031691	2.801452	-61.52878
-2.477848	0.834952	-0.175131	0.047721	3.083110	-2.927447	-1.172893	109.3870
1.326666	0.150448	1.319849	3.080464	-3.501857	-2.835031	0.172574	-5.787106
0.598478	0.845974	-1.040533	2.598480	-1.445170	-2.425327	0.604201	36.30549
0.395221	0.146529	-0.262439	0.288586	3.091458	-0.197799	-4.969692	0.857148
-0.413916	0.450291	0.272010	-1.073526	1.253952	-1.935581	0.252652	41.01569

Since from the test for co integration, we have uncovered two co integrating vectors, we obtain these vectors by normalizing on the first two rows for economic growth and government expenditures respectively. From the first row, we derive the long run equation for economic growth expressed as:

LGDP	LGE	LPC	LDB	LDT	LFB	LIT	C
1.000000	-0.042573	-0.710052	0.171599	-0.362029	0.459102	0.469482	-18.02721
	(0.05414)	(0.08101)	(0.08812)	(0.17138)	(0.12037)	(0.13016)	(2.29938)

which can be rewritten as

LGDP=0.042573LGE + 0.710052LPC – 0.171599LDB + 0.362029LDT– 0.459102LFB – 0.469482LIT +18.02721.

From the above, we obtain the first error correction term

ECT1=LGDP-0.042573*LGE-0.710052*LPC+0.171599*LDB-0.362029*LDT+0.459102*LFB+ 0.469482*LIT+18.02721.

From the estimated long run equation, a 100% growth in government leads to about 4% economic growth whereas a 100% increase in private investment brings about a 71% growth in the GDP. The long run effects of domestic borrowing, direct taxes, external borrowing and indirect taxes on economic growth are respectively -17%, 36%, -46% and -47% when there is a 100% increase in each of them. This means that in the long run the variable which has the highest impact on economic growth is private investment, consistent with the neo-classical view that eventually and inevitably it is private sector activities which drive economic growth in economies. Surprisingly growth in government has a rather paltry long run impact on economic growth reinforcing the prevailing development view that state-led activities are inefficient at promoting growth.

From the second row, we normalize on growth in government expenditure and obtain the equation below;

LGDP	LGE	LPC	LDB	LDT	LFB	LIT	C
-0.290837	1.000000	-1.058887	-0.615275	-2.517063	-0.466205	-1.265933	27.80691

The error correction term of the above is therefore of the form

ECT2=LGE-0290837*LGDP-1.058887*LPC-0.615275*LDB-2.517063*LDT-0.466205*LFB -1.265933*LIT + 27.80691

In the equation above, a 100% increase in economic growth in the long run leads to 29% growth in government expenditure whilst a 100% growth in each of private investment, domestic borrowing, direct taxes external borrowing and indirect taxes precipitate 106%, 62%, 251%, 47% and 127% growth in government expenditure. This means that in the long run the

variable with the most impactful effect on growth in government is direct taxes. It is followed by growth in private investment also with over 100% increase.

5.1. The error correction models

In the preliminary analysis, we established that all the variables in our model are non-stationary in levels and found to drift together in two different linear combinations. This means that to correctly define their behaviours we have to specify their error correction forms which are able to capture both their short and long run movements. The error correction models are presented in the appendices. The vector autoregressive estimates obtained in the regressions thus enable us to properly outline the dynamic relationship between each endogenous variable and the other endogenous at different time horizons.

From the estimated results, we realize that the error correction terms of the economic growth and government expenditure equations have the correct signs and their estimated coefficients are also significant meaning that in these two equations, their movements are brought back to their equilibrium positions after sometime after they have deviated from their normal equilibrium time path. The results however show that the return of these systems to their equilibrium is very slow. More succinctly, the results indicate that in the growth equation, only about 0.000344% of the deviation from the equilibrium is corrected per period whilst in the case of the government expenditure function, the speed of adjustment from its position to the long run equilibrium is calculated to be 0.000246% which is even slower than that of the economic growth equation.

The short run time horizon oriented effects of each endogenous variable on the other endogenous variables are also presented. In the results, we find that the feedback in the growth equation is experienced only in the fourth period and in this period, a 100% increase in the previous growth leads to about 46% increase in current economic growth. The effect of government expenditure on economic growth is also significantly registered only in the first period. The estimated effect is negative implying that in the first period an increase in government expenditure by 100% triggers a decline in present period growth by 13%. This contrasts with Anaman *et al.* (2017) and Hadiwibowo (2010) who established a positive short run of government expenditure on economic growth.

In respect of private investment, the results also show that out of the four time horizons, its contemporaneous effect on economic growth is significantly felt in the second period. The estimated impact is however not very strong though it is positive in line with the expectation. This result is consistent with Ghali(1998) and M'Amanja and Morrissey (2006). In real terms a unit increase in past period private investment precipitates about 0.00000298 unit increase in current period economic growth. The effect of domestic borrowing on economic growth is mixed but though not significantly impactful in the 1st, 3rd and the 4th time horizons. This means that the only period within which domestic borrowing significantly affects the economic growth is in the 2nd period .In this period a 100% increase in domestic borrowing leads to a marginal increase of current economic growth by 0.000516%.This finding runs opposite to Malik (2013). The effect of direct taxes on economic growth however throughout the four period time horizon is insignificant meaning that in the entire time spectrum, a growth in direct taxes does not affect economic growth. This may well be because of the fact that the tax levels may not be that high to demotivate production units.

Again an estimated significant effect of external borrowing on economic growth is observed in the third time period .Here the impact is 1.38 units decline in current economic growth whenever external borrowing expands by 100%.In the first two periods, the impact of external borrowing is positive but not significant implying that growth in external borrowing takes time to exert a significant effect on current economic growth. The negative effect runs counter to Anaman *et al.* (2017). Finally from the results we also observe that the effect of growth in indirect taxes on economic growth is mixed. It is positive in the 1st and 3rd time periods but negative in the 2nd and the 4th periods. However, of these periods its significant effect is registered in the second period where a unit growth in indirect taxes precipitates a 0.000395% decline in economic growth.

The estimated equation for growth in government expenditure is very interesting. This is because in three out of four time horizons-1St, 2nd and 3rd periods, the effect of economic growth on government expenditure is very significant whereas feedback in government expenditure is felt only in the first time horizon. Whilst in the first two periods the effect of the economic growth on government expenditure is positive, its impact turns negative in the final time period.This result seems similar to the findings of Anaman *et al.* (2017.) More specifically, in the first two time periods, a unit increase in economic growth brings forth an increase in government expenditure by 0.182940 and 0.175532 units respectively in the 1st and 2nd time periods respectively but in the 3rd period, a 100% increase in economic growth results in a more than proportionate decline in government expenditure. The measured effect of growth in private investment on government expenditure is recognizable and significant only in the second horizon .In the this time period, a 100% increase in private investments in the short run leads to 23% decline in growth in government expenditure.

The response of government expenditure to expansion in domestic borrowing is estimated to be positive. The results show that a 100% increase in domestic borrowing tends to have about 39% expansionary effect on government expenditure in the first period. In the subsequent periods the impact of domestic borrowing government expenditure is rather insignificant. The measured impact of direct taxes on government expenditure is mixed but only significant in the 3rd and the 4th periods causing about 1.44 units decline and 1.53 units increase respectively in government expenditure in the short run .Similarly the effect of external borrowing on government expenditure is mixed but significant in the last two time horizons .It is negative in the third period but positive in the last time period. The contemporaneous effects are -39% and 55% response respectively from government expenditure with a 100% increase in external borrowing. The impact of indirect taxes on government according to the estimation results last for three out of the four time periods -1st ,3rd and 4th horizons. Whilst in the 3rd period, a 100% increase in indirect taxes draws a 73% expansion in government expenditure in the short run, the same 100% increase in indirect taxes triggers about 81% decline in government expenditure. In the short run, current private investment is influenced by past values of economic growth, growth in government expenditure, private investments, domestic borrowing, direct taxes, external borrowing and indirect taxes at different time horizons. The effect of economic growth on growth in private investment is significantly registered in the last time period where a 100% increase in economic growth elicits about 94% increase in private investments.

The impact of government expenditure on growth in private investments appears pronounced but significant in the 2nd, 3rd and the 4th time horizons. Its estimated effects are 42%,-97% and 62% changes in private investments respectively with corresponding 100% increase in government expenditure. The net impact of government expenditure on private investment established here confirm the findings of Soli et al(2008) The negative effect experienced in the 3rd time period may indicate a situation where government may not really be spending resources in the right areas of the economy which may stimulate private sector activities. Feedbacks from past levels of private investments are mixed but register significant impacts in the 3rd and the 4th time periods. Whilst in the 3rd period the magnitude of the feedback is about -32%, in the 4th period, the effect is positive at 29%. The response of private investment to expansion in domestic borrowing is expected in the 1st ,3rd and the 4th time horizons. However the effect of domestic borrowing is only significant in the final time period meaning that it takes time for the effect of domestic borrowing to be transmitted to private investments. In actual terms, a 100% increase in domestic borrowing leads to about 60% decline in private investments. Again, estimates show that the effect of growth in direct taxes is significant but has a distortionary effect on private investment which finding coincides with the that of Menjo and Kotut (2012). Thus in the 2nd time period, a 100% increase in direct taxes leads to 83% decline in private investments which may probably be because of the decrease in the incentive for engaging private sector activities. The estimated impact of external borrowing is significant in the 1st period only. In that period, a 100% increase in external borrowing precipitates a 58% increase in private investment. The respective impact of increased indirect taxes on private investment is rather positive which is surprising since in the literature, taxes are said to undermine the incentive to engage in private sector activities. One rationalization may be that private sector agents are easily able to pass on indirect taxes and so do not really feel the impact of such increases.

In the short run equation for domestic borrowing, the effect of economic growth is strongly felt throughout all the time horizons. Its contemporaneous effects are positive in the first two periods but negative in the last two time horizons. Thus in these periods, a 100% increase in economic growth results in about 21% and 17% corresponding increases in domestic borrowing. This may be interpreted to mean that in the early stages of growth, domestic borrowing is needed as an additional source of financing for government. However in the late stages, economic growth may be generating additional financing resources which then reflect in the decline in domestic borrowing in the last two time horizons. This is why in the estimated equation, a 100% increase in economic growth triggers about 77% and 60% respective decline in domestic borrowing in the 3rd and the 4th periods. Again the effect of growth in government expenditure on domestic borrowing also appears to be consistent with the prevalent view in the literature throughout the entire time horizon though its impact is only significant in the 2nd period. Then importantly growth in private investment triggers significant responses from domestic borrowing along the entire time horizon. In the first two periods, as private investment expands, domestic borrowing declines whilst in the 3rd and 4th periods, an increase in private investment rather leads to a an increase in domestic borrowing.

The estimated short run equation for domestic borrowing also indicates that the feedback is transient and is significantly felt in the 3rd period. The short run effect of expansion in direct taxes on domestic borrowing is negative and this is registered in the 3rd and the 4th time periods. In the 3rd period, a unit increase in direct taxes leads to a more than proportionate decline in domestic borrowing specifically reducing by 1.05 units whilst in the 4th period, a 100% increase in direct taxes precipitates about 89% decline in domestic borrowing which is in line with our expectation. With respect to external borrowing, its impact is significantly felt in only one of the four time periods. More accurately a 100% increase in external borrowing surprisingly also triggers an increased domestic borrowing of 37% in the 3rd period which finding is not in line with M'Amanja and

Morrissey (2006) The effect of growth in indirect taxes on domestic borrowing is mixed. It is negative in the first time horizons but ultimately positive in the last period. In the first period, a 100% increase in indirect taxes results in about 96% decline in domestic borrowing whilst in the 2nd period, a 100% increase in indirect taxes leads to 147% decline in domestic borrowing. In the final period however, a 100% increase in indirect taxes triggers about 35% increase in domestic borrowing. The short run equation for direct taxes is defined by growth in private investments, domestic borrowing and its own feedback. From the results obtained, a 100% increase in private investment in the 1st period leads to about 22% increase in direct taxes whilst the estimated effect of domestic borrowing on direct taxes is negative in the 2nd period. Specifically, a 100% increase in domestic borrowing triggers about 38% decline in direct taxes. The feedback occurs in the 3rd period and it shows that a 100% increase in direct taxes causes a decline in current level of direct taxes by about 94%.

An important observation in respect of the short run equation for external borrowing is that throughout the time horizon, it is not significantly influenced by private investment though it is influenced significantly by growth in government expenditure, its own feedback and to some extent domestic borrowing. Finally, in short run function for indirect taxes, economic growth is not influential implying that a change in economic growth does not significantly lead to any change in indirect taxes in any of the time periods. However, in the 2nd period, a 100% expansion in private investment significantly triggers about 34% increase in indirect taxes. Growth in domestic borrowing from the estimated equation in the 2nd period exerts a negative effect on indirect taxes. The measured impact is about 51% decline in indirect taxes when domestic borrowing expands by 100%.Similarly the impact of growth in direct taxes on indirect taxes in found to be negative in the 2nd time period where a unit expansion in direct taxes draws about 82% decrease in indirect taxes. The effect of external borrowing on growth in indirect taxes is also negative. More accurately, a unit expansion in external borrowing would draw about 30% decline in indirect taxes whilst a positive feedback is realized in the 2nd time period.

5.2. Causality tests

Gleaning the results of the Granger causality tests (see appendix), there is evidence that in most of the cases in which causality is affirmed are cases of unidirectional causation. In the results we record causation from domestic borrowing to economic growth at less than 5% significance level whilst the results show that causation from government expenditure to private investment is very strong at less than 1%.The causation between growth in indirect taxes and government expenditure is estimated at less than 10% significance level. The other situations which prove unidirectional causation in the model are causality from domestic borrowing to private investment and from private investment to direct taxes; these are measured at 10% and 1% level of significance respectively. In the causality analysis, we uncovered two cases of bidirectional causation. These are found between growth in indirect taxes and private investment at less than 10% and 1% significance and growth in indirect taxes and government expenditure at less than 10% level of significance. Surprisingly however, we are unable to establish causality between economic growth and private investments in any direction.

5.3. Forecast error variance decomposition analysis

In line with the objectives of the study, we examine the results of the variance decomposition to understand the type of innovation most important in the trajectory of a given endogenous variable. From the results (see the appendix), it is observed that in the entire time horizon, economic growth is driven by own innovations. It is also substantially influenced by innovations from government expenditure and external borrowing. Innovations from private investment constitute only a small percentage of the driving factors of economic growth at alternate periods. In fact the influence of growth in private investment on the movements of economic growth from the estimates is at its maximum responsible for just under 5% of the innovations affecting economic growth. The variance decomposition of government expenditure reveals that it is most prominently driven by economic growth along the 10- period time horizon. From over 53% in period one, its influence increases to about 87%. Own innovations are the next most important but movements in the government expenditure variable due to innovations from private investments form only contribute less than 1% along the greater part of the time horizon. The maximum it takes is about 4% in the 3rd period.

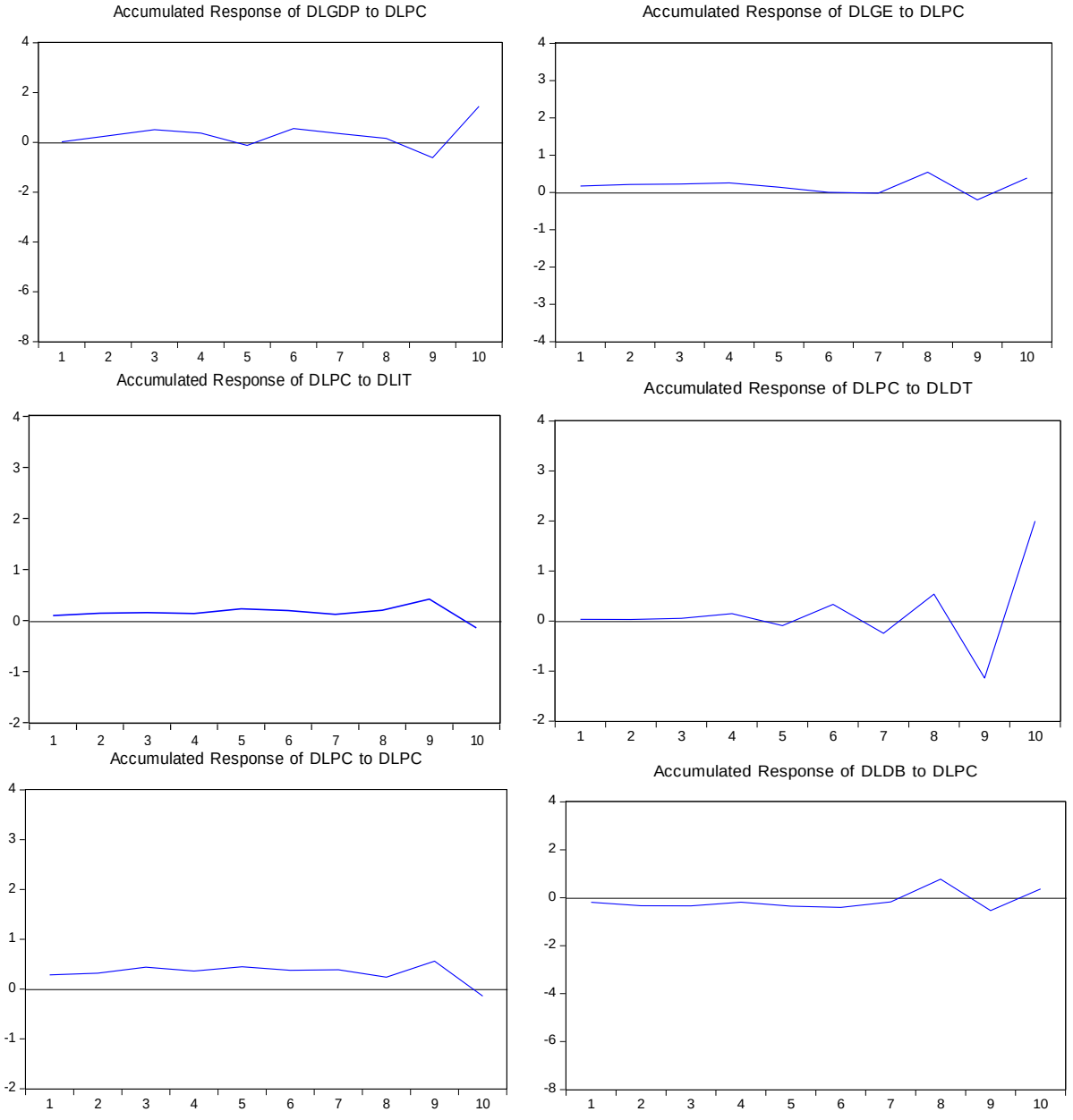
In respect of the private investment variable, the results indicate that in the first five periods, its movements are dominated by innovations from the government expenditure variable. However, from the 6th to the 10th period, economic growth becomes the most important variable accounting for over 47% to 87% of the movements in private investments. The effect of innovations from domestic borrowing only constitutes about 7% in the 4th period but pales into a paltry figure about 3% in the 10th period. The decomposition of domestic borrowing is quite interesting. In the first three periods , the most dominant innovations that drive movements in domestic borrowing come from growth in government expenditure ,followed by own innovations and that which emanates from private investments. Movements from the 4th to the 10th periods are largely due to innovations from economic growth. This means that in the short term, the most important variable which can be used to influence domestic borrowing is government expenditure but in the long run it is supplanted by economic growth.

In the decomposition of direct taxes, we realize that from the 1st to the 7th period, the private investments account for 5% to 1% from the 1st to the 7th period. It is driven predominantly by economic growth along the entire time horizon. The effect of own innovations reduces from over 42% in the 1st period to less than 1% in the 1st period implying that in short to the long term economic growth is the most influential variable that can be used to achieve direct tax objectives.

Considering the variance decomposition of external borrowing and indirect taxes, the fact which becomes obvious is that innovations from private investments appear prominent in the short to medium term but pales into relative insignificance from the medium to the long term. In respect of external borrowing, innovations affecting it are dominated by that from economic growth contributing 28% to 19% in the short term but 52% to 86% in the medium to long periods. However, for indirect taxes , short term innovations are controlled by external borrowing with 40% to just over 23% from the 1st to the 3rd time periods .However ,from the 4th to the 10th periods , the dominant influencing innovations come from economic growth contributing over 85% of the all innovations which affect indirect taxes.

5.4. Impulse response functions

We proceed to analyze the behaviours of the variables in our model as they react to shocks emanating from other variables. We are particularly interested in the responses of growth in private investment to shocks from other endogenous variables and those of other variables to shocks in private investment. Below are some selected impulse response function.



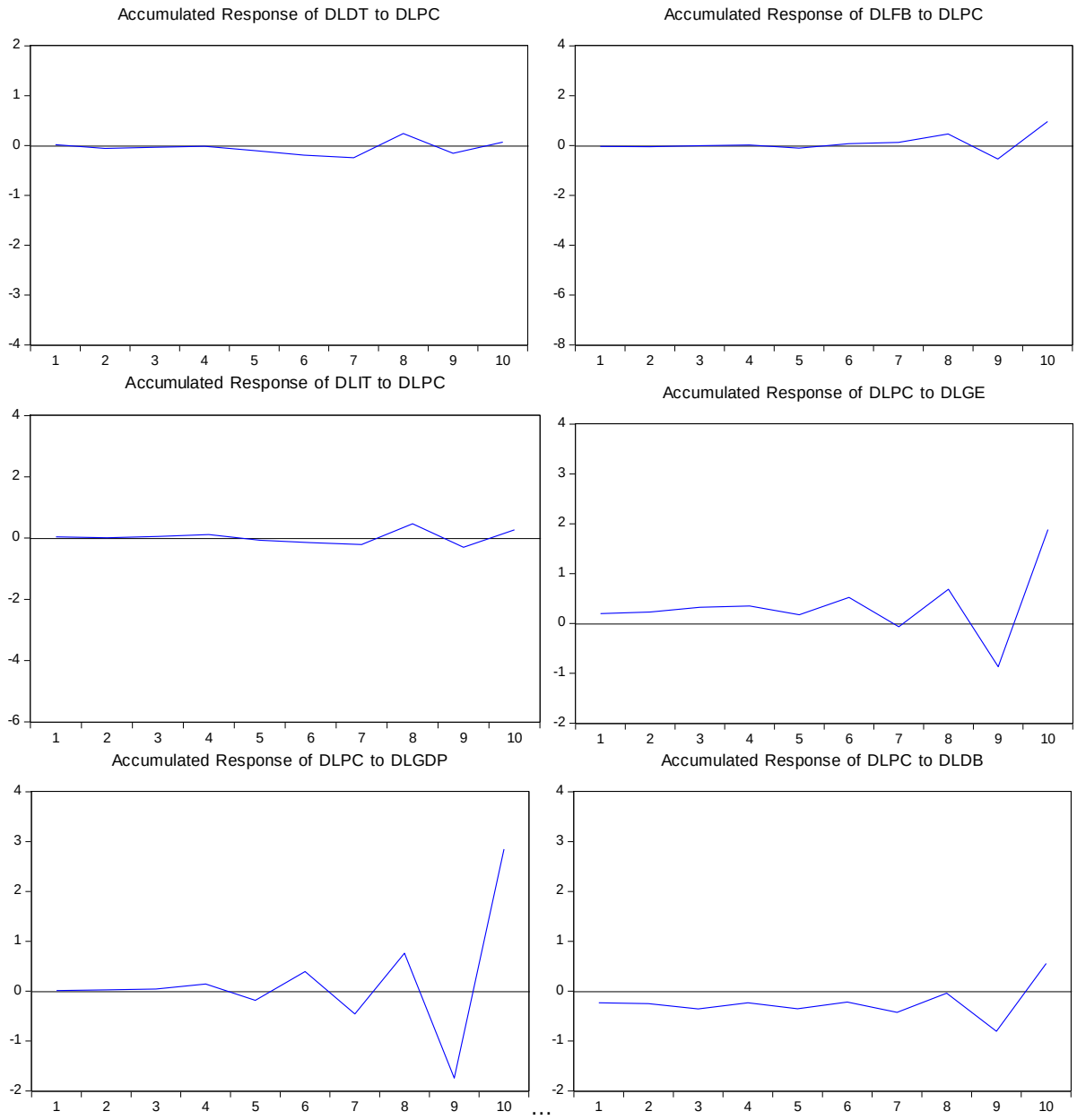


Figure 1. Selected Impulse response functions derived from the reduced form VAR

From the graphs displayed above, we observe that the reactions of economic growth and growth in government expenditure to shocks in private investments like similar in the sense that in the early stages of the transmission of the shocks, the trajectories of economic growth and government expenditure are not as ruffled as seen in the latter part of the time horizon when the shocks appear to drift their movements away from the long run time paths. In a sense shocks to these variables cannot in the long be stabilized. However own shocks transmitted to private investments are eventually stabilized in the 10th time period. Again from the graphs, a shock in private investments when transmitted to domestic borrowing causes substantial trepidation its time path particularly in the latter part of the time horizon.

The graphs indicate that with respect to growth in private investment, it experiences its most profound instability when shocks emanating from economic growth, growth in government expenditure and direct taxes are transmitted to it. Indeed the graphs show that as a result of these shocks cannot be stabilized after the 5th period. Similarly the time path of private investments becomes destabilized virtually along entire time horizon when affected by shocks emerging from domestic borrowing.

6. Conclusions and policy implications

This study has largely been motivated and driven by the desire to add to the existing knowledge in relation to the nexus among the fiscal aggregates, the different government borrowing modes and economic growth, specifically attempting to

move the frontiers of knowledge forward by arguing that the prevailing previous approach of lumping together the two tax streams; direct and indirect taxes is problematic and on that basis incorporating these tax streams as separate variables in order to be able to distinguish the effects of each one of them on private investment and economic growth. The study adopted a typical VAR model as the most effective way of establishing the relevant dynamic relationships among the fiscal aggregates, the various borrowing modes and private investments.

In the analysis we established that there are two linear combinations of our variables which are stationary, similar to results of M'Amanja and Morrissey (2006).These define the long run relationship between economic growth and the other endogenous variables and then growth in government expenditure and the rest of the endogenous variables. This from the policy perspective means that a change in any of the other variables will cause economic growth or government expenditure to drift away from their time paths. From the long run estimates, we observe that growth in private investment leads to the expansion of the economy and government expenditure. The implication of this finding is that all the needed mechanisms which are relevant for propping up private sector activities have to be instituted in the economy for private sector investment to continue to have the desired impact. However, our estimated long run equation indicates that domestic borrowing, external borrowing and growth in indirect taxes tend to undermine economic growth which suggests that these sources of funding government expenditure would have to be relooked at. It may well be that they are not being utilized as effectively as they should to be able to generate the necessary growth from their deployment. Against this background it is suggested that government creates the right frameworks and monitoring mechanisms to pragmatically oversee how funds from these sources could be made more impactful on growth. It is also evident that though government expenditure positively impacts on growth, its effect is not as profound as private investment has and this must therefore prick government to move to support private sector better than before.

The long run impact of private investment on government expenditure is also positive from the estimations. This also seems to underline and reinforce the importance of private investment in the economic story of Ghana in the study period though the short run result is momentarily in the opposite direction. The short run impact of private investment on economic growth is consistent with its effect in the long run. However, the short run impact of government expenditure runs opposite to its long run effect .This may probably signal that government may not be spending in the right areas of the economy which could generate expected returns. It is always argued that the most potent way in which government expenditure can promote growth is when they are channeled especially into infrastructure which then creates the grounds and environment for people to engage in economic activities. Thus to reap the growth objectives of government spending, government would do well to consciously devote a greater part of its outlay on providing the required infrastructure.

Our short run analysis also show that an expansion in the economy leads to an expansion in private sector activities implying that economic growth incentivizes private sector players. It is therefore important for government to strive to keep the economy on a positive growth trajectory to be able motivate strong private sector activities. Again In the short run results, we discover that domestic borrowing and direct taxes impact negatively on private investments but external borrowing and indirect taxes rather have a positive effect meaning that financing government expenditure in the short run using indirect tax and external borrowing streams is a better option since they do not distort private sector growth. Government would do well to take a cue from this to shape up its finance raising goals in the short run.

Another finding which is worthy of note is that our estimations show that private investment positively affects both direct and indirect taxes .The implication is that government must seriously consider how it would design a policy framework which would promote the private sector because that is a sure avenue for enhanced tax mobilization. From impulse response analysis, we have shown that shocks in the system cause a considerable level of instability. Most importantly shocks emanating from private investments are able shift both economic growth and government to move from their time paths. This amplifies the relevance of the private sector in the growth of the Ghanaian econmy. In looking into the future, we suggest that a study that examines the interaction between fiscal and monetary policies and how this affects private investments and economic growth may be helpful in advancing knowledge in this field.

References

Abdon, A., Estrada, G., B., Lee, M., & Park, D. (2014). Fiscal policy and growth in developing Asia: Asian Development Bank (ADB). *Economics Working Paper*, 412.

Anaman, E., A., Gadzo, S., G., Gatsi, J., G., & Pobbi, M. (2017). Fiscal aggregates government borrowing and economic growth in Ghana: an error correction approach. *Advances in Management and Applied Economics*, 7 (2), 83-104.

Arin, P. (2004). Fiscal policy, private investment and economic growth: evidence from G-7 countries. *European Journal of Political Economy*, 23 (4), 885-902.

Artadi, E., V., & Sala-i-Martin, X. (2003). The economic tragedy of the XXth century: growth in Africa. *NBER Working Paper Series WP9865*, Cambridge MA.

Bahmani-Oskooee, M. (1999). Do federal deficits crowd out or crowd-in private investment. *Journal of Policy Modelling*, 21, 633-640.

Barro, R.J.(1990) Government spending in a simple model of endogenous growth. *Journal of Political Economy*, Vol 98

Barro, R., J., & Sala-i-Martin, X. (1995). *Economic growth*. New York: McGraw Hill.

Barro,R., J., & Sala-i-Martin, X. (1992). Public finance in models of economic growth. *Review of Economic Studies*, 59 (2), 645-61.

Bleaney, M., F., & Gemmell, N., and Kneller, R. (2000). Testing the endogenous growth model: public expenditure, taxation and growth over the long run. *University of Nottingham Discussion Paper*, 00/25.

Buiter, H. (1977). Crowding out and effectiveness of fiscal policy. *Journal of Public Economics*, 7, 309-328.

Charemza, W., C., & Deadman, D., F. (1997). *New directions in econometrics practice: general to specific modelling: cointegration and vector autoregression*. (2 ed.). United Kingdom: Edward Elgar Publishing Limited.

Easterly, W., & Rebelo, S. (1993). Fiscal policy and economic growth: an empirical investigation. *Journal of Monetary Economics*, 32 (2), 975-987.

Fazzari, S., M. (1994). Why doubt the effectiveness of Keynesian fiscal policy? *Journal of Post Keynesian Economics*, 17, 231-24.

Folster, S., & Henrekson, M. (2001). Growth effects of government expenditure and taxation in rich countries. *European Journal of Political Economy*, 45 (8), 1501-1520.

Gallaway, L., & Veder, R. (1998). Government size and economic growth. *Joint Economic Committee*, Washington DC.

Ghali, K., H. (1998). Government size and economic growth: evidence from a multivariate analysis. *Applied Economics*, 31, 975-987.

Granger, C.W.J. and Newbold, P.(1974).Spurious Regressions in Econometrics. *Journal of Econometrics,*2:111-120

Granger, C.,W.,J. (1986). Developments in the study of integrated economic variables. *Oxford Bulletin of Economics and Statistics*, 48 (2), 213-228.

Hadiwibowo, Y. (2010). Fiscal policy, investment and long run economic growth: evidence from Indonesia. *Asian Social Science Journal*, 6 (9).

Johnston, J.,& Di-Nardo, J. (1997). Econometric regressions in econometrics. *Journal of Econometrics*, 2, 111-120.

Khan, M.S.,& Reinhart, C.M. (1990). Private investment and economic growth in developing countries. *World Development*, 18 (18), 19-27.

Kneller, R., Bleaney, M..F. & Gemmell, N. (1999). Fiscal policy and growth: evidence from OECD countries. *Journal of Public Economics*, 74 (2), 171-190.

Landau,D. (1983). Government expenditure and economic growth: a cross country study. *Southern Economic Journal*, 49 (3), 783-792.

Levine, R., & Renelt, D. (1992). A sensitivity analysis of cross-country growth regressions. *American Economic Review*, 82 (4), 942-963.

Litterman, R., B. (1985). Forecasting and policy analysis with Bayesian autoregressive models. *Quarterly Review of Federal Reserve Bank of Minneapolis*, 8 (2), 30-41.

M'Amanja, D.,& Morrissey, O. (2006). Foreign aid, investment and economic growth in Kenya: a time series approach. *University of Nottingham CREDIT Research Paper*, 6 (5).

M'Amanja, D., Lloyd, T.,& Morrissey, O. (2005). Fiscal aggregates, aid and growth in Kenya: a Vector Autoregressive (VAR) analysis. *CREDIT Research Paper*, 5 (7).

Malik, A. (2013). Private investment and fiscal policy in Pakistan. *Journal of Economic Development*, 38 (1), 83-109.

McKay, A. (2002). Assessing the impact of fiscal policy on poverty. *WIDER Working Paper Series 043*, *World Institute for Development Economic Research (UNU-WIDER)*.

Menjo, K., I., & Kotut, C., S. (2012). Effects of fiscal policy on private investment and economic growth in Kenya. *Journal of Economics and Sustainable Development*, 3 (7).

Mitra, P. (2006). Has government investment crowded out private investment in India? *America Economic Review*, 96, 337-341.

Osei, R, Morrissey,O., & Lloyd, T. (2003). Modelling the fiscal effects of aid: an impulse response analysis for Ghana. *University of Nottingham CREDIT Research Paper*, 03/10.

Osoro, N. (1997). Public spending, taxation and deficits: what is the evidence? *African Economic Research Consortium (AERC) Research Paper*, 62, Nairobi, Kenya.

Poirson, H. (1998). Economic security, private investment and growth in developing countries. *IMF Working Paper WP*, 98/4.

Ram, R. (1986). Government size and economic growth: a new framework and some evidence from cross-section and time-series data. *The American Economic Review*, 7 (1), 191-203.

Sarmad, K. (1990). Public and private investment and economic growth. *Institute of Social Studies (ISS) Working Paper Subseries on Money, Finance and Development*, 340.

Soli, V., O., Kwadzogah, S., & Hagan, H., E. (2008). Fiscal policy, private investment and economic growth: the case of Ghana. *Studies in Economics and Finance*, 25, 112-130.

Thomas, R., L. (1993). *Introductory econometrics: theory of applications*. (2nd ed.). London: Longman Press.

APPENDIX

SHORT RUN /ERROR CORRECTION ESTIMATES

	DLGDP	DLGE	DLPC	DLDB	DLDT	DLFB	DLIT
DLGDP(-1)	1.04E-06	0.182940	0.071209	0.210344	0.044862	-0.036097	-0.168299
	(1.3E-06)	(0.07648)	(0.10215)	(0.06051)	(0.10156)	(0.12255)	(0.11736)
	[0.79115]	[2.39195]	[0.69713]	[3.47591]	[0.44172]	[-0.29455]	[-1.43399]
DLGDP(-2)	5.72E-07	0.365385	0.175532	0.166250	0.090089	-0.061702	-0.010566
	(1.3E-06)	(0.07830)	(0.10458)	(0.06196)	(0.10398)	(0.12547)	(0.12016)
	[0.42619]	[4.66627]	[1.67844]	[2.68334]	[0.86639]	[-0.49177]	[-0.08793]
DLGDP(-3)	2.86E-06	-1.129164	0.046875	-0.769513	-0.061540	-0.322812	-0.429796
	(4.4E-06)	(0.25440)	(0.33977)	(0.20129)	(0.33783)	(0.40764)	(0.39039)
	[0.65429]	[-4.43849]	[0.13796]	[-3.82286]	[-0.18216]	[-0.79191]	[-1.10094]
DLGDP(-4)	0.458363	0.475324	0.944950	-0.597679	-0.065942	0.921793	0.420055
	(0.21665)	(0.32761)	(0.43755)	(0.25922)	(0.43505)	(0.52494)	(0.50274)
	[2.11564]	[1.45086]	[2.15962]	[-2.30568]	[-0.15157]	[1.75598]	[0.83554]
DLGE(-1)	-0.134650	0.347338	-0.048171	0.137662	0.114995	0.030668	0.164862
	(0.06922)	(0.16422)	(0.21933)	(0.12994)	(0.21808)	(0.26314)	(0.25201)
	[-1.97187]	[2.11502]	[-0.21962]	[1.05942]	[0.52731]	[0.11655]	[0.65419]
DLGE(-2)	-1.92E-06	0.055852	0.418368	0.290565	-0.166762	0.736282	-0.080769
	(2.7E-06)	(0.15800)	(0.21102)	(0.12502)	(0.20982)	(0.25317)	(0.24246)
	[-0.70815]	[0.35349]	[1.98257]	[2.32421]	[-0.79480]	[2.90825]	[-0.33312]
DLGE(-3)	3.10E-06	0.275132	-0.972147	0.266412	0.259374	-1.060840	-0.070743
	(4.1E-06)	(0.23937)	(0.31969)	(0.18940)	(0.31786)	(0.38354)	(0.36732)
	[0.75525]	[1.14941]	[-3.04088]	[1.40664]	[0.81599]	[-2.76589]	[-0.19259]
DLGE(-4)	-2.06E-06	0.222296	0.619981	0.126025	0.127611	0.430354	-0.003646
	(3.1E-06)	(0.18260)	(0.24388)	(0.14448)	(0.24248)	(0.29259)	(0.28021)
	[-0.65806]	[1.21738]	[2.54217]	[0.87226]	[0.52627]	[1.47086]	[-0.01301]
DLPC(-1)	1.24E-06	0.040808	0.219754	-0.557328	0.216135	0.344252	0.100135
	(2.8E-06)	(0.16470)	(0.21997)	(0.13031)	(0.10871)	(0.26390)	(0.25274)
	[0.44015]	[0.24777]	[0.99903]	[-4.27678]	[1.98823]	[1.30448]	[0.39620]
DLPC(-2)	2.98E-06	-0.228361	-0.079918	-0.198146	0.104432	-0.073596	0.339617
	(1.50E-06)	(0.11243)	(0.15016)	(0.08896)	(0.14930)	(0.18015)	(0.17253)
	[1.98659]	[-2.03113]	[-0.53222]	[-2.22738]	[0.69947]	[-0.40852]	[1.96846]
DLPC(-3)	1.23E-06	-0.098555	-0.318279	0.218695	-0.153182	0.052479	-0.214818
	(1.7E-06)	(0.09921)	(0.13251)	(0.07850)	(0.13175)	(0.15897)	(0.15225)
	[0.72092]	[-0.99336]	[-2.40195]	[2.78586]	[-1.16267]	[0.33011]	[-1.41098]
DLPC(-4)	1.90E-06	-0.201159	0.292414	0.237166	-0.160644	-0.201069	-0.219414
	(1.9E-06)	(0.10811)	(0.14438)	(0.08554)	(0.14356)	(0.17322)	(0.16589)
	[1.02660]	[-1.86075]	[2.02524]	[2.77265]	[-1.11901]	[-1.16076]	[-1.32262]
DLDB(-1)	-2.04E-06	0.390620	-0.104121	-0.036511	0.216947	-0.092983	0.363120
	(3.6E-06)	(0.19945)	(0.28071)	(0.16630)	(0.27910)	(0.33677)	(0.32253)
	[-0.56620]	[1.95852]	[-0.37092]	[-0.21955]	[0.77730]	[-0.27610]	[1.12586]
DLDB(-2)	5.16E-06	0.168964	0.002530	0.123968	-0.379238	0.275790	-0.507332
	(2.6E-06)	(0.17155)	(0.22912)	(0.13574)	(0.14232)	(0.27488)	(0.26325)

	[1.95202]	[0.98491]	[0.01104]	[0.91328]	[-2.66470]	[1.00330]	[-1.92716]
DLDB(-3)	3.87E-07	-0.145587	-0.317895	-0.330628	0.294354	-0.686229	0.121161
	(3.8E-06)	(0.22398)	(0.29914)	(0.16820)	(0.29743)	(0.35889)	(0.34371)
	[0.10063]	[-0.65000]	[-1.06269]	[-1.96563]	[0.98965]	[-1.91209]	[0.35252]
DLDB(-4)	-2.19E-06	-0.368138	-0.595571	-0.277772	-0.059286	0.660088	-0.075043
	(4.6E-06)	(0.26777)	(0.30304)	(0.21187)	(0.35558)	(0.42905)	(0.41090)
	[-0.47600]	[-1.37483]	[-1.96534]	[-1.31105]	[-0.16673]	[1.53847]	[-0.18263]
DLDT(-1)	-9.27E-06	0.460371	-0.099259	-0.110426	0.794419	-0.099655	0.925359
	(6.3E-06)	(0.36871)	(0.49244)	(0.29174)	(0.48963)	(0.59079)	(0.56580)
	[-1.46570]	[1.24860]	[-0.20157]	[-0.37851]	[1.62251]	[-0.16868]	[1.63549]
DLDT(-2)	4.64E-06	0.006979	-0.829084	0.349577	0.051926	-0.131834	-0.817095
	(5.2E-06)	(0.30450)	(0.40669)	(0.24093)	(0.40436)	(0.48791)	(0.41931)
	[0.88785]	[0.02292]	[-2.03864]	[1.45093]	[0.12842]	[-0.27020]	[-1.94866]
DLDT(-3)	3.74E-06	-1.437337	0.701899	-1.048814	-0.942551	0.196891	-0.028161
	(5.3E-06)	(0.30797)	(0.41132)	(0.24368)	(0.40897)	(0.49347)	(0.47259)
	[0.70784]	[-4.66713]	[1.70646]	[-4.30412]	[-2.30472]	[0.39899]	[-0.05959]
DLDT(-4)	2.86E-06	1.525292	-0.605267	-0.885929	0.223445	-0.249419	0.706521
	(8.3E-06)	(0.48187)	(0.64357)	(0.38127)	(0.63989)	(0.77211)	(0.73945)
	[0.34617]	[3.16536]	[-0.94048]	[-2.32361]	[0.34919]	[-0.32304]	[0.95547]
DLFB(-1)	6.88E-07	0.123608	0.580211	0.038754	-0.213833	0.796679	-0.300510
	(3.0E-06)	(0.17427)	(0.23276)	(0.13789)	(0.23143)	(0.27924)	(0.15226)
	[0.23000]	[0.70927]	[2.49278]	[0.28105]	[-0.92398]	[2.85298]	[-1.97369]
DLFB(-2)	-3.15E-06	0.346006	-0.154267	0.258454	0.333056	-0.350463	0.407466
	(3.8E-06)	(0.22250)	(0.29717)	(0.17605)	(0.29547)	(0.35653)	(0.34144)
	[-0.82509]	[1.55505]	[-0.51912]	[1.46804]	[1.12720]	[-0.98300]	[1.19337]
DLFB(-3)	-1.382197	-0.388102	0.216009	0.372561	-0.204170	-0.017482	-0.222379
	(0.54468)	(0.19763)	(0.26395)	(0.15637)	(0.26244)	(0.31667)	(0.30327)
	[-2.53762]	[-1.96378]	[0.81837]	[2.38253]	[-0.77797]	[-0.05520]	[-0.73327]
DLFB(-4)	2.56E-06	0.553344	-0.096745	-0.129987	0.018877	-0.277965	0.122949
	(3.5E-06)	(0.20120)	(0.26872)	(0.15920)	(0.26719)	(0.32240)	(0.30876)
	[0.74244]	[2.75016]	[-0.36001]	[-0.81650]	[0.07065]	[-0.86219]	[0.39821]
DLIT(-1)	6.34E-06	-0.966622	0.279920	-0.958787	-0.481337	-0.520671	-0.234472
	(5.4E-06)	(0.31598)	(0.42201)	(0.25001)	(0.41960)	(0.50630)	(0.48488)
	[1.17006]	[-3.05915]	[0.66330]	[-3.83496]	[-1.14714]	[-1.02839]	[-0.48357]
DLIT(-2)	-3.95E-06	0.303085	1.110793	-1.466354	0.016127	0.875528	0.875006
	(1.5E-06)	(0.41748)	(0.55758)	(0.33033)	(0.55439)	(0.66894)	(0.44511)
	[-2.55084]	[0.72598]	[1.99216]	[-4.43909]	[0.02909]	[1.30882]	[1.96582]
DLIT(-3)	1.63E-06	0.729800	-0.262906	0.015169	0.005037	0.026587	0.119970
	(4.6E-06)	(0.26919)	(0.35952)	(0.21299)	(0.35746)	(0.43132)	(0.41308)
	[0.35366]	[2.71114]	[-0.73127]	[0.07122]	[0.01409]	[0.06164]	[0.29043]
DLIT(-4)	-1.71E-06	-0.811543	0.315441	0.352371	-0.160781	-0.003258	-0.174490
	(3.1E-06)	(0.17911)	(0.23922)	(0.14172)	(0.23785)	(0.28700)	(0.27486)
	[-0.55665]	[-4.53088]	[1.31862]	[2.48637]	[-0.67597]	[-0.01135]	[-0.63484]
ECT1	-2.58E-06	-0.412177	-0.678885	0.669260	0.144056	0.413347	0.237520
	(1.02E-06)	(0.09913)	(0.13240)	(0.07844)	(0.13164)	(0.15885)	(0.15213)
	[-2.51759]	[-4.15774]	[-5.12744]	[8.53224]	[1.09428]	[2.60218]	[1.56134]
ECT2	-3.44E-06	-2.45E-06	-1.98E-06	1.80E-06	-6.00E-08	2.02E-06	6.95E-07
	(1.61E-06)	(4.0E-07)	(5.3E-07)	(3.1E-07)	(5.3E-07)	(6.3E-07)	(6.1E-07)

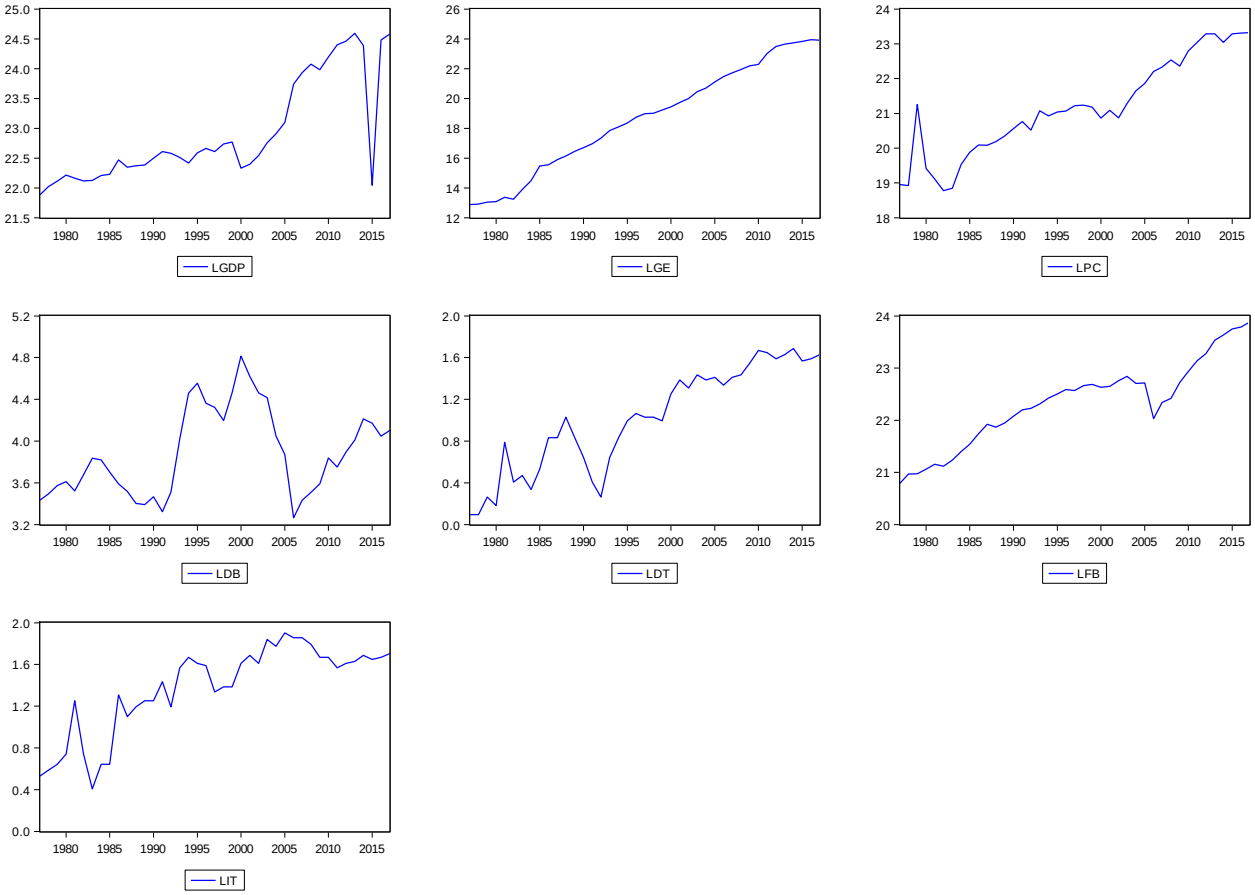
	[-2.13659.]	[-6.19687]	[-3.74961]	[5.73855]	[-0.11421]	[3.18155]	[1.14447]
R-squared	0.979000	0.999900	0.998920	0.996220	0.990337	0.994811	0.981373
Adj. R-squared	0.976520	0.999484	0.994446	0.980560	0.950306	0.973312	0.904204
Sum sq. resids	1.12E-11	0.038031	0.067839	0.023810	0.067065	0.097644	0.089556
S.E. equation	1.26E-06	0.073709	0.098444	0.058321	0.097881	0.118106	0.113109
F-statistic	5.80E+11	2405.689	223.2767	63.61571	24.73912	46.27357	12.71723
Log likelihood	480.7932	74.78411	64.07768	83.44803	64.28991	57.34025	58.93970
Akaike AIC	-24.36720	-2.420763	-1.842037	-2.889083	-1.853508	-1.477851	-1.564308
Schwarz SC	-23.06105	-1.114613	-0.535887	-1.582933	-0.547359	-0.171702	-0.258158
Mean dependent	23.00745	19.24997	21.31975	3.924182	1.104622	22.48411	1.452414
S.D. dependent	0.864299	3.244975	1.320976	0.418292	0.439084	0.722964	0.365448

PAIRWISE CAUSALITY TESTS

Null Hypothesis:	Obs	F-Statistic	Prob.
DLGE does not Granger Cause DLGDP	36	0.83606	0.4424
DLGDP does not Granger Cause DLGE		0.32914	0.7219
DLPC does not Granger Cause DLGDP	36	1.45902	0.2471
DLGDP does not Granger Cause DLPC		0.10342	0.9020
DLDB does not Granger Cause DLGDP	36	3.68974	0.0358
DLGDP does not Granger Cause DLDB		0.44376	0.6454
DLDT does not Granger Cause DLGDP	36	0.31063	0.7351
DLGDP does not Granger Cause DLDT		0.03543	0.9652
DLFB does not Granger Cause DLGDP	36	2.18512	0.1285
DLGDP does not Granger Cause DLFB		0.10846	0.8975
DLIT does not Granger Cause DLGDP	36	0.10586	0.8999
DLGDP does not Granger Cause DLIT		0.00049	0.9995
DLPC does not Granger Cause DLGE	36	0.10490	0.9007
DLGE does not Granger Cause DLPC		7.12318	0.0027
DLDB does not Granger Cause DLGE	36	0.24722	0.7824
DLGE does not Granger Cause DLDB		0.04758	0.9536
DLDT does not Granger Cause DLGE	36	4.47618	0.0191
DLGE does not Granger Cause DLDT		0.64304	0.5322
DLFB does not Granger Cause DLGE	36	0.02014	0.9801
DLGE does not Granger Cause DLFB		1.09259	0.3472
DLIT does not Granger Cause DLGE	36	2.57028	0.0917
DLGE does not Granger Cause DLIT		2.89355	0.0695
DLDB does not Granger Cause DLPC	36	2.56086	0.0981
DLPC does not Granger Cause DLDB		0.22113	0.8028
DLDT does not Granger Cause DLPC	36	1.75699	0.1883
DLPC does not Granger Cause DLDT		12.8238	8.E-05
DLFB does not Granger Cause DLPC	36	0.24245	0.7861
DLPC does not Granger Cause DLFB		0.15171	0.8598
DLIT does not Granger Cause DLPC	36	2.78293	0.0764
DLPC does not Granger Cause DLIT		9.78020	0.0005
DLDT does not Granger Cause DLDB	36	0.59982	0.5548

DLDB does not Granger Cause DLDT		1.39282	0.2626
DLFB does not Granger Cause DLDB	36	0.54218	0.5866
DLDB does not Granger Cause DLFB		0.69764	0.5049
DLIT does not Granger Cause DLDB	36	0.20005	0.8197
DLDB does not Granger Cause DLIT		0.16368	0.8497
DLFB does not Granger Cause DLDT	36	0.00996	0.9901
DLDT does not Granger Cause DLFB		0.06756	0.9348
DLIT does not Granger Cause DLDT	36	0.48435	0.6204
DLDT does not Granger Cause DLIT		3.42835	0.0444
DLIT does not Granger Cause DLFB	36	0.61771	0.5453
DLFB does not Granger Cause DLIT		0.00159	0.9984

GRAPHS OF LOG LEVELS OF VARIABLES



FORECAST ERROR VARIANCE DECOMPOSITION

Variance Decomposition of DLGDP:

Period	S.E.	DLGDP	DLGE	DLPC	DLDB	DLDT	DLFB	DLIT
1	0.527586	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.831208	87.38444	10.74019	0.021873	0.091808	0.027347	1.443558	0.290784
3	0.945707	70.33181	13.18244	2.623937	0.890616	0.023994	8.723587	4.223612
4	1.030929	60.20903	14.38674	4.697152	4.267900	3.285563	7.989755	5.163855
5	1.477473	65.55870	18.31743	4.095147	3.603547	1.782854	3.983377	2.658949
6	2.840069	80.57057	12.52685	1.208225	2.217249	0.594663	1.723712	1.158728
7	4.209182	85.63949	6.521762	0.617726	1.747232	0.275783	3.289910	1.908100
8	5.525855	84.01197	3.806418	0.406485	3.144336	0.364424	4.901382	3.364982
9	7.776208	81.37300	3.236110	0.626718	4.650906	0.688107	5.497870	3.927289
10	12.86240	82.33440	4.649010	0.504430	4.309051	0.468654	4.546136	3.188317

Variance Decomposition of DLGE:

Period	S.E.	DLGDP	DLGE	DLPC	DLDB	DLDT	DLFB	DLIT
1	0.250178	53.10229	46.89771	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.275787	45.34597	41.96823	1.707321	0.032290	0.216413	8.672170	2.057610
3	0.320035	47.26611	31.70026	3.845088	7.728744	0.169556	6.484223	2.806021
4	0.690570	87.38560	7.351276	0.933767	1.794559	0.490330	1.434002	0.610471
5	0.976312	86.92988	6.198690	0.512274	1.276879	0.369822	3.087328	1.625128
6	1.190510	78.84541	4.994252	0.425118	2.852252	0.433326	7.302208	5.147439
7	1.603938	77.18581	2.793119	0.851271	4.998898	1.255415	7.234595	5.680891
8	2.863093	80.55619	5.614638	0.931203	4.520311	0.669953	4.322883	3.384817
9	5.200485	85.61098	4.790727	0.403560	3.306242	0.213649	3.233677	2.441169
10	8.451881	87.73210	2.836978	0.197299	2.939946	0.116535	3.592128	2.585010

Variance Decomposition of DLPC:

Period	S.E.	DLGDP	DLGE	DLPC	DLDB	DLDT	DLFB	DLIT
1	0.285419	0.202344	92.52263	7.275027	0.000000	0.000000	0.000000	0.000000
2	0.294044	0.359952	88.66819	6.885920	0.210942	0.685132	0.853798	2.336064
3	0.319446	0.693460	88.39112	6.546194	0.611091	0.642950	0.954561	2.160625
4	0.360785	8.193367	73.01586	7.171180	6.980072	1.063617	0.755473	2.820432
5	0.502212	46.90562	41.32892	4.089830	4.495513	0.738716	0.423329	2.018078
6	0.794455	71.65541	18.34544	1.692896	2.628120	0.347897	3.061437	2.268804
7	1.243013	76.04427	7.614606	0.769808	4.787299	0.527249	6.025940	4.230832
8	1.865385	76.29615	4.468966	0.452731	4.995593	0.925709	7.712054	5.148802
9	3.274024	83.22306	2.899981	0.526306	4.566707	0.542864	4.757758	3.483326
10	5.872974	86.99127	3.093427	0.371292	3.398317	0.241190	3.427735	2.476765

Variance Decomposition of DLDB:

Period	S.E.	DLGDP	DLGE	DLPC	DLDB	DLDT	DLFB	DLIT
1	0.236319	0.109042	55.92831	12.64638	31.31627	0.000000	0.000000	0.000000
2	0.334824	2.794244	41.78305	14.47201	17.57937	0.004305	15.92476	7.442262
3	0.387960	4.246243	31.60559	20.40674	17.09758	8.448993	11.92029	6.274557
4	1.006262	81.03632	7.878077	3.583032	3.061963	1.673619	1.810457	0.956533
5	1.730114	85.20234	4.751785	1.318688	1.821916	0.634918	4.379432	1.890919
6	2.180589	81.11014	3.000285	0.922134	2.428973	0.594355	7.838339	4.105776
7	2.944465	80.60102	2.203592	1.079407	5.152917	0.679910	5.931144	4.352009
8	5.053691	83.13938	5.059179	0.997593	3.805191	0.545511	3.765981	2.687164
9	8.525829	84.66941	5.308445	0.413330	3.190768	0.211190	3.713966	2.492895
10	13.49468	86.80344	3.049010	0.231616	3.318523	0.119130	3.762632	2.715651

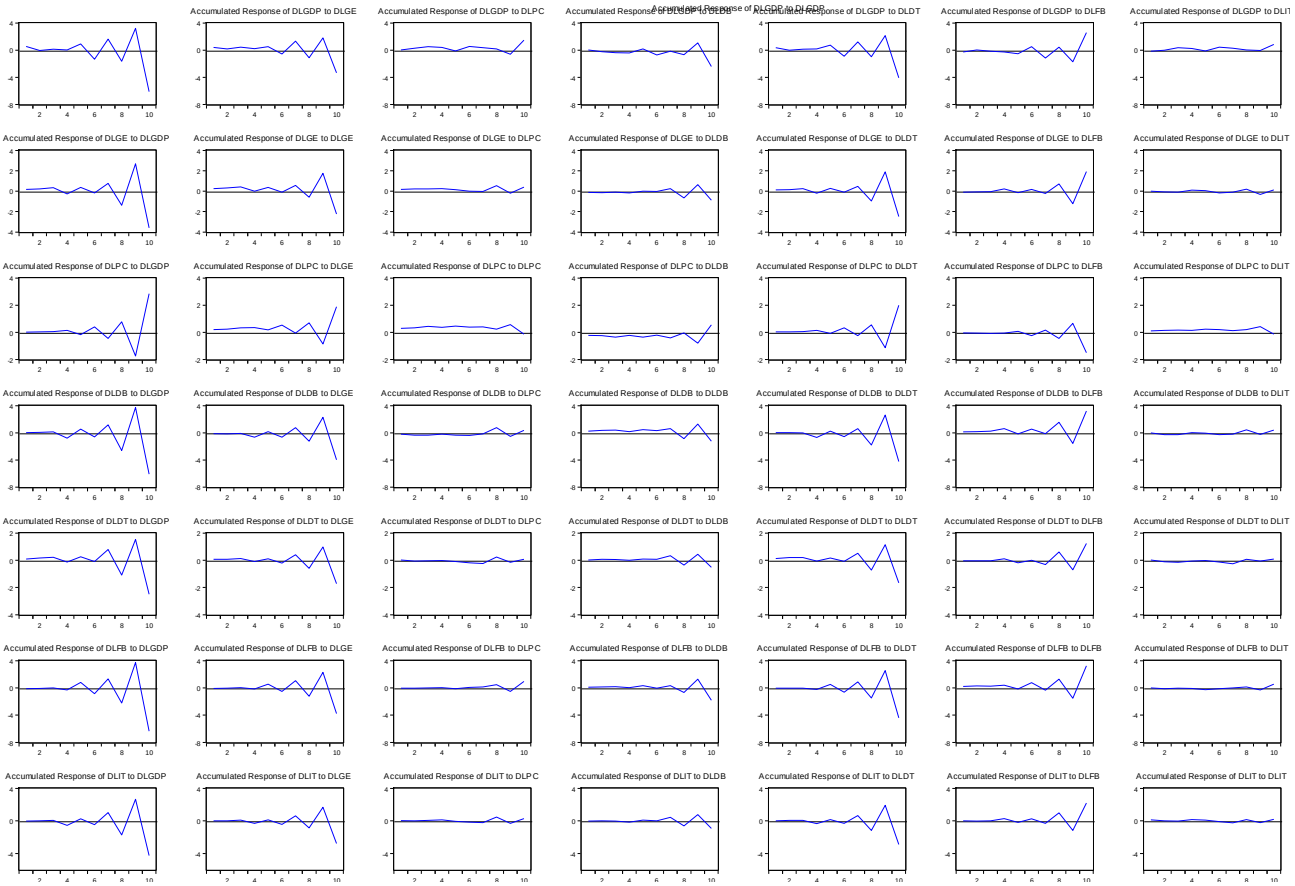
Variance Decomposition of DLDT: Period	S.E.	DLGDP	DLGE	DLPC	DLDB	DLDT	DLFB	DLIT
1	0.131736	46.25574	0.097940	5.103600	6.099233	42.44349	0.000000	0.000000
2	0.204022	33.86951	12.22881	4.104964	3.619144	21.70543	12.53120	11.94094
3	0.216898	33.80257	13.08193	6.686661	3.217855	20.24278	12.31801	10.65019
4	0.410013	78.56605	4.257188	2.066767	1.709186	6.887883	3.455505	3.057423
5	0.629173	71.50895	5.528596	1.296686	0.841195	4.504135	11.37819	4.942251
6	0.768421	68.55471	4.741448	0.872861	3.200295	3.538148	12.09910	6.993432
7	1.223271	79.29306	2.062968	1.850104	5.502331	1.711569	5.516899	4.063074
8	2.371523	84.12780	6.078276	0.751909	2.776551	0.607250	3.491933	2.166277
9	3.702162	84.91561	4.469081	0.324998	3.110886	0.259740	4.175530	2.744153
10	5.688681	86.38883	2.316108	0.240717	3.605147	0.198416	4.191755	3.059027

Variance Decomposition of DLFB: Period	S.E.	DLGDP	DLGE	DLPC	DLDB	DLDT	DLFB	DLIT
1	0.197893	28.40446	0.014571	27.01802	29.32783	0.982766	14.25235	0.000000
2	0.234910	21.67544	0.049351	28.86775	23.29311	0.729756	22.38372	3.000885
3	0.299908	19.81386	3.683210	21.13268	20.46628	9.268440	19.14801	6.487519
4	0.468792	52.13732	1.966384	9.409167	14.08070	4.955076	11.75403	5.697332
5	1.269825	86.97480	1.967172	1.636000	3.819942	0.802916	2.988981	1.810188
6	2.187552	89.09681	2.048299	0.563946	2.390723	0.290468	3.540521	2.069231
7	3.216759	86.99165	0.959620	0.277593	3.326654	0.248311	4.839812	3.356361
8	4.992557	86.05254	1.176197	0.444881	3.921328	0.406687	4.596551	3.401816
9	8.162265	85.34523	2.668211	0.378345	3.848419	0.306272	4.323793	3.129734
10	13.57356	86.16297	2.893802	0.294656	3.680783	0.189536	3.911025	2.867226

Variance Decomposition of DLIT: Period	S.E.	DLGDP	DLGE	DLPC	DLDB	DLDT	DLFB	DLIT
1	0.117483	8.139422	7.072675	13.18500	10.96223	1.510771	40.08255	19.04735
2	0.195843	9.280988	5.650391	4.757185	7.510912	15.20054	33.49667	24.10332
3	0.235010	11.46731	10.99761	10.76994	5.369911	20.13721	23.45764	17.80037
4	0.658048	86.23829	2.974636	1.719361	1.098003	2.572399	3.090251	2.307059
5	1.096178	84.15473	5.335054	0.622249	0.998897	1.244044	5.209834	2.435193
6	1.386906	79.06716	3.437181	0.451699	2.578133	1.189376	8.500558	4.775894
7	2.116997	83.05100	1.575913	1.312314	5.012284	0.832324	4.789423	3.426744
8	3.681935	84.00249	4.927351	0.768170	3.637285	0.451840	3.733158	2.479700
9	6.010167	85.27544	4.391203	0.353190	3.405880	0.188510	3.796575	2.589197
10	9.502378	87.08187	2.524807	0.230569	3.451386	0.128697	3.814703	2.767967

IMPULSE RESPONSE FUNCTIONS

Accumulated Response to Generalized One S.D. Innovations



Accumulated Response of DLGDP:

Period	DLGDP	DLGE	DLPC	DLDB	DLDT	DLFB	DLIT
1	0.527586	0.384459	0.023732	0.017422	0.358820	-0.281181	-0.150519
2	-0.042850	0.155323	0.263411	-0.223600	-0.033016	0.035860	-0.003684
3	0.116134	0.414325	0.512813	-0.381061	0.133995	-0.183379	0.337409
4	0.011781	0.210154	0.372022	-0.410642	0.167521	-0.264953	0.225697
5	0.901268	0.518019	-0.119556	0.163146	0.715911	-0.554228	-0.126606
6	-1.349891	-0.587324	0.555000	-0.704602	-0.910535	0.494762	0.412943
7	1.595295	1.298046	0.350663	-0.159126	1.214136	-1.179962	0.272178
8	-1.642017	-1.117572	0.158292	-0.698725	-0.999261	0.432257	0.013886
9	3.211091	1.808515	-0.616976	1.069295	2.135899	-1.709186	-0.045769
10	-6.116788	-3.348906	1.448900	-2.432289	-4.103336	2.590100	0.842980

Accumulated Response of DLGE:

Period	DLGDP	DLGE	DLPC	DLDB	DLDT	DLFB	DLIT
1	0.182308	0.250178	0.172998	-0.122107	0.129352	-0.099231	-0.006448
2	0.217708	0.310675	0.213610	-0.148791	0.154008	-0.070730	-0.084904
3	0.335699	0.412685	0.227574	-0.094416	0.243358	-0.056837	-0.090431
4	-0.271195	0.005279	0.255337	-0.174757	-0.199250	0.230567	0.096604
5	0.370577	0.366794	0.140698	-0.011378	0.274350	-0.141151	0.048053
6	-0.166903	-0.098946	0.003364	-0.030282	-0.110407	0.180963	-0.165933
7	0.764874	0.557629	-0.020200	0.235953	0.461794	-0.213487	-0.107730
8	-1.384018	-0.581510	0.545525	-0.659304	-0.950981	0.706373	0.193594
9	2.684162	1.757098	-0.199503	0.627935	1.890177	-1.242324	-0.316251
10	-3.602116	-2.238316	0.388174	-0.896969	-2.485426	1.917095	0.126579

Accumulated Response of DLPC:

Period	DLGDP	DLGE	DLPC	DLDB	DLDT	DLFB	DLIT
1	0.012839	0.197366	0.285419	-0.232268	0.034715	-0.050172	0.097303
2	0.024938	0.230797	0.319129	-0.249337	0.030370	-0.059700	0.139813
3	0.044848	0.324979	0.439201	-0.357024	0.053654	-0.090511	0.153226
4	0.144635	0.350040	0.362859	-0.231889	0.148004	-0.062431	0.136102
5	-0.183449	0.176635	0.448792	-0.352139	-0.091030	0.070582	0.225922
6	0.394441	0.524150	0.376595	-0.218975	0.332756	-0.256068	0.193149
7	-0.455668	-0.065778	0.389251	-0.425741	-0.245112	0.158878	0.119380
8	0.760844	0.687473	0.240073	-0.041134	0.539113	-0.457117	0.195831
9	-1.742360	-0.866726	0.560985	-0.804689	-1.139218	0.664696	0.418255
10	2.849372	1.883843	-0.141076	0.554780	1.997044	-1.510658	-0.144323

Accumulated Response of DLDB:

Period	DLGDP	DLGE	DLPC	DLDB	DLDT	DLFB	DLIT
1	0.007804	-0.115343	-0.192312	0.236319	0.013451	0.113275	-0.035957
2	0.063226	-0.160511	-0.335805	0.339258	0.015410	0.160149	-0.259531
3	0.120310	-0.100425	-0.339738	0.407204	-0.026397	0.226392	-0.291991
4	-0.781994	-0.635059	-0.187600	0.176056	-0.677897	0.613118	0.027506
5	0.533230	0.152205	-0.353603	0.472149	0.229874	-0.162385	-0.041339
6	-0.609751	-0.666537	-0.402964	0.304291	-0.560078	0.542305	-0.277390
7	1.159782	0.773584	-0.171934	0.599610	0.627929	-0.135211	-0.211289
8	-2.614555	-1.258236	0.775899	-0.858043	-1.809774	1.543249	0.419128
9	3.734647	2.271390	-0.537135	1.275326	2.619081	-1.591036	-0.228556
10	-6.090251	-3.996892	0.366708	-1.226166	-4.256064	3.197657	0.376454

Accumulated Response of DLDT:

Period	DLGDP	DLGE	DLPC	DLDB	DLDT	DLFB	DLIT
1	0.089596	0.068113	0.016023	0.007498	0.131736	-0.037143	0.007662
2	0.167511	0.076113	-0.056722	0.061696	0.197406	-0.043043	-0.122406
3	0.209987	0.129406	-0.033658	0.050664	0.203685	-0.040948	-0.155703
4	-0.130858	-0.097291	-0.013646	-0.011349	-0.061689	0.105024	-0.063831
5	0.257726	0.102764	-0.101918	0.089719	0.161765	-0.192821	-0.017005
6	-0.091159	-0.205008	-0.191574	0.065213	-0.071695	-0.009057	-0.138309
7	0.793002	0.402583	-0.243848	0.328826	0.511495	-0.311816	-0.256675
8	-1.089792	-0.587541	0.240455	-0.345410	-0.731164	0.611487	0.072638
9	1.538342	0.971323	-0.154579	0.438253	1.132853	-0.711952	-0.057092
10	-2.501192	-1.718876	0.068982	-0.518364	-1.663950	1.226686	0.093459

Accumulated Response of DLFB:

Period	DLGDP	DLGE	DLPC	DLDB	DLDT	DLFB	DLIT
1	-0.105469	-0.078492	-0.034786	0.094856	-0.055795	0.197893	-0.017301
2	-0.076530	-0.054227	-0.048749	0.139053	-0.046107	0.271110	-0.109005
3	2.35E-05	0.040813	-0.005133	0.160150	-0.044403	0.263638	-0.049619
4	-0.311037	-0.164113	0.022446	0.048938	-0.240467	0.387195	-0.062875
5	0.823798	0.549502	-0.106089	0.335024	0.522802	-0.142521	-0.254663
6	-0.867708	-0.506789	0.072142	-0.050758	-0.650632	0.753122	-0.102717
7	1.308957	1.054893	0.124424	0.330952	0.866861	-0.353324	-0.021065
8	-2.219165	-1.214560	0.466568	-0.662078	-1.471434	1.272226	0.159807
9	3.731469	2.287374	-0.539046	1.284072	2.554986	-1.536111	-0.301356
10	-6.362525	-3.777236	0.965696	-1.800128	-4.388249	3.251229	0.545394

Accumulated Response of DLIT:

Period	DLGDP	DLGE	DLPC	DLDB	DLDT	DLFB	DLIT
1	-0.033517	-0.003028	0.040052	-0.017876	0.006833	-0.010271	0.117483
2	0.015841	0.009306	0.008488	-0.010356	0.078542	-0.015331	0.000754
3	0.068507	0.090489	0.053658	-0.027365	0.056696	-0.009068	-0.022869
4	-0.537382	-0.294530	0.116200	-0.146502	-0.351777	0.278040	0.153917
5	0.261225	0.132431	-0.067099	0.098776	0.163830	-0.185695	0.085488
6	-0.452675	-0.418486	-0.151704	0.012597	-0.320839	0.237174	-0.098951
7	1.030973	0.616664	-0.209970	0.425577	0.660615	-0.307066	-0.246046
8	-1.737752	-0.871655	0.466339	-0.609516	-1.177289	0.987115	0.145910
9	2.668535	1.683048	-0.298464	0.787527	1.913084	-1.164508	-0.220775
10	-4.247204	-2.786213	0.268105	-0.933187	-2.896489	2.185216	0.191712

Generalized Impulse

RESIDUALS OF THE ENDOGENOUS VARIABLES