THE NEXUS BETWEEN OUTPUT FLUCTUATIONS AND FISCAL DEFICITS: EMPIRICAL EVIDENCE ON GHANA

By

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere. The supervision and preparation of this thesis was supervised in accordance with the guidelines on supervision of thesis laid down by the Faculty of Social Sciences, Department of Economics, Kwame Nkrumah University of Science and Technology.

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DEDICATION

This thesis is dedicated the Almighty God for His manifold blessings and to my loving husband, Ellis Augustt for his immeasurable support and understanding throughout the course of my studies.

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LIST OF ABBREVIATIONS

ADF Test: Augmented Dickey-Fuller test statistic

AIC: Akaike information criterion

FISDGDP: Fiscal deficit to GDP ratio

FPE: Final Prediction Error

GDPBK: Cyclical component of GDP from Baxter-King filter

GDPBW: Cyclical component of GDP from Butterworth filter

GDPCF: Cyclical component of GDP from Christiano-Fitzgerald filter

GDPHP: Cyclical component of GDP from Hodrick-Prescott filter

HQIC: Hannan and Quinn information criterion

IMF: International Monetary Fund

OLS: Ordinary Least Squares

OECD: Organization of Economic Cooperation and Development

SBIC: Schwarz and Bayesian information criterion

SUR: Seemingly Unrelated Regression

VAR: Vector Autoregression

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

It is generally recognized in applied macroeconomics that fiscal policy management is procyclical (i.e. the fiscal deficit grows in good times and falls in recessions) in almost all developing countries as well as some OECD countries. What is puzzling and of intense debate is the direction of causation; (i.e. do output fluctuations drive budget deficits or do budget deficits cause fluctuations in output?). Since the pioneering work of Gavin and Perotti in 1997 on Latin American economies that concluded that fiscal policy (budget deficits) were run procyclically, a large and growing number of literature have documented similar findings on the developing world, (Gavin & R. Perotti, 1997; Alesina & Tabellini, 2005; Lane & Tornell, 1999). The empirical works of several authors have documented stylized facts about the relationship between output fluctuations and budget deficits, but more often than not, the direction of causation is implicitly assumed to move from output fluctuations to fiscal policy, (Ilzetzki & Vegh, 2008). According to Ilzetzki and Vegh, most papers that have claimed to establish that fiscal deficits is run procyclically by running regressions of fiscal deficits variables on output fluctuations while controlling for other factors have essentially ignored the problem of endogeneity. If it is assumed that output fluctuations influence budget deficits, then conventional wisdom would suggest that governments should borrow in recessions when revenues shrink and social spending rises, and repay their debts in times of economic boom by either cutting down on their total expenditure and/or raising the tax base . Generally speaking, procyclical fiscal policy

is at odds with both the neoclassical notion that tax policy should be used to smooth tax distortions and expenditures over the business cycle; provided shocks to the tax base or spending are temporary; and the Keynesian notion that taxes and expenditures should try to dampen, rather than worsen, output fluctuations, (Manasse, 2006).

After several years of economic decline in Ghana prior to the 1980s, the country adopted the World Bank/IMF structural adjustment programme in April 1983. The Provisional National Defense Council (PNDC) despite its initial populist stance, embarked on a programme for economic austerity and structural adjustment supported by the International Monetary Fund and the World Bank. From 1986 the budget started showing surpluses; inflation was brought down from three-digits to an annual average rate of about 25% with the help of favourable harvests and tightening of the country's fiscal policy. Thereafter (i.e. from early 1990s onwards), there was a deterioration which was attributed to weaknesses in macro-economic policy, exacerbated by the slow response of the private sector to the incentives provided by the adjustment programme. Faltering economic performance was related to the lessening of fiscal control which started in 1990 prior to the first democratic elections in decades, (Rojas, 1996). Ghana then began to accumulate huge deficits. This led to the adoption of the Highly Indebted poor Country (HIPC) initiative by the NPP administration in 2002. Even after the HIPC initiative, Ghana has continued to run huge budget deficits, over the years. Ghana's budget deficit rose to 11.8 percent of gross domestic product in 2012, from 4 percent in 2011, according to a prospectus for the Eurobond by the government (MoFEP, 2012). Besides the budget deficits, Ghana's current account shortfall has also expanded, to $4.92 billion or 12.3 percent of GDP, as against 3.0% of GDP in 2005. The public debt increased to 49.4 percent of GDP in 2012, from 40.8 percent in 2011, higher than neighbours such as Nigeria which has a debt-to-GDP ratio of 18.6 percent in the same period,

(MoFEP, 2012). A priori, one could not draw the conclusion that these budget deficits were direct responses to fluctuations in output, or political economy pressures on politicians by loyal voters.

1.2 Statement of the Problem

Persistent budget deficits and mounting public debts with a host of undesirable consequences such as high borrowing costs, huge interest payments and the possibility of a country defaulting on its debt servicing has been a challenge for most governments around the globe, especially those from the developing world. Hypothetically one can conjecture that the overarching reason for any government issuing a debt instrument would be for the principal purposes of macroeconomic stability. Following this line of reasoning, there are basically two macroeconomic tools available to governments for macroeconomic stabilization, namely; fiscal policy and monetary policy. Of these two, the one that has the least implementation lag is fiscal policy, hence its wide use by most governments. This research concentrates on two instances where discretionary fiscal policy is used by governments in response to macroeconomic instability. Firstly, in a recession where output is below trend, government may attempt to stabilize output by using fiscal policy. Such an action may require either a reduction in the tax base or increased government expenditure or both to push output towards trend. One-time or temporary interventions like this may not have permanently negative implications on the budget position, but if government always responds to fluctuations in output by spending or reducing its revenue base by decreasing the tax base, or both, then a persistent increase in the budget deficit will be the outcome of such an action. It can be said therefore, in this scenario that output fluctuations drive budget deficits.

Secondly, government may also use fiscal policy to respond to rising inflation and growing budget deficits, by reducing its overall spending, or raising the tax base or both. Though this action by government may result in improving the budget position, it may at the same time result in output volatility, by creating demand shortfalls and subsequent unemployment challenges. This is a case of fiscal policy causing fluctuations in output. Though these two plausible situations explain the relationship between the output fluctuations and budget deficits, a priori, one cannot tell the direction of causation, hence the need for empirical evidence to find the nexus between these two.

Finally, though a lot and growing number of empirical research has been carried out on developing countries and Sub-Saharan African countries in general about how fluctuations in output affect the fiscal deficit to GDP ratio, there is not enough systematic work done on the relationship between the output fluctuations and budget deficits that focuses on Ghana as a country specific case. This paucity of such important empirical knowledge for policy implementation makes this research timely and very relevant for embarking on.

1.3 Research Objectives

The focus of this research is to establish a causal relationship between output fluctuations and budget deficits in Ghana using time series data starting from 1960 to 2012. The specific objectives of this research are to;

1. Determine if fluctuations in output drive fiscal deficits.
2. Find the nexus between the growing fiscal deficits and fluctuations in output.

1.4 Research Hypotheses

This research seeks to test the following hypotheses;

1. Fluctuations in output do not drive budget deficits.
2. There is no connection between the growing fiscal deficits and fluctuations in output.

1.5 Significance of the Study

The study when conducted will be crucial for designing macroeconomic stabilization and adjustment programmes that will be important for the practice of fiscal policy in Ghana. Also, the analysis of this study will provide vital information that will be useful for analyzing whether similar empirical regularities which are observed across countries with different income levels are relevant for policy formulation in Ghana. The findings of this research will also help to document stylized facts of macroeconomic fluctuations on Ghana. Macroeconomists in academia, particularly macroeconomics lecturers and students would find the work in this research valuable for drawing inferences and making the teaching and learning of fiscal policy more practical to Ghanaian students in this subject area. Specifically, it will be most useful to the Ministry of Finance and Economic Planning (MoFEP), which is directly responsible for the implementation of government's fiscal policy (in terms of policy formulation, monitoring and evaluation, resource mobilization and consolidation of the budget deficits). The study may also be a useful reference material for anyone who wants to continue with further research on this subject. It is the hope of the author to disseminate the findings in this research by publishing it in standard macroeconomic journals worldwide for the perusal of the research community. Finally, findings from this research will increase knowledge and add to literature in the field of applied macroeconomics.

1.6 Organization of the Study

This study is divided into five chapters and the rest of the plan is as follows; Chapter Two puts this research in the context of relevant conceptual and empirical literature; Chapter Three delves into some methodological issues, the data set and estimation techniques that shall be used. Chapter Four presents the results and discussions; and finally Chapter Five presents the summary of findings, conclusions and recommendations for further research.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The optimal practice of fiscal policy that is consistent with conventional wisdom is that fiscal policy should be run counter-cyclically- that is expansionary fiscal policy in economic recessions and contractionary fiscal policy in economic booms. In other words, deficits ought to be accumulated during economic downturns and surplus during economic booms. This conventional wisdom is at odds with the perennial accumulation of budget deficits by governments especially in developing countries irrespective of whether total output in the economy falls below or grows above its long run trend. A conceptual as well as empirical review of literature putting this thorny issue in the context of recent and relevant debate in the research community shall be undertaken presently. This chapter therefore is divided into five sections. Section (2.1) gives an exposition of the conceptual framework that characterizes the relationship between output fluctuations and budget deficits (in particular, this section gives a brief account of the neo-Classical and New Keynesian views of the budget deficits and output fluctuations); Section (2.2) delves into the political system and recurrent budget deficits in Ghana; Section (2.3) discusses the relationship between output fluctuations and government size; and finally Section (2.4) discusses the macroeconomic effects of output fluctuations on economic growth.

2.1 Keynesian and Classical views of Output Fluctuations and Budget deficits

According to the standard Keynesian model, in a closed economy, the effectiveness of fiscal policy depends on the relative slopes of the IS and LM curves. The IS-LM model is a macroeconomic tool that demonstrates the relationship between interest rates and real output, in the goods and services and the money markets. The intersection of the IS and LM curves is the general equilibrium where there is an equilibrium in both the money and goods markets simultaneously. The extreme case is that of the so-called liquidity trap where any additional supply of money fails to put downward pressure on interest rates and monetary policy becomes completely ineffective (Blinder & Solow, 1973). Hence fiscal policy remains the only instrument to prop up economic activity. The traditional Keynesian model largely ignored the opposite case, that of fiscal policy ineffectiveness and possible crowding-out of the private sector. The authors, Blinder and Solow reason that the interest payments on public debts add to the expansionary boost of the initial deficit rise and result in a higher long-term multiplier. On the other hand, the authors point out that, if both tax rates and government spending were exogenously fixed (i.e. if the government behaviour is non-Ricardian), a bond-financed fiscal policy can lead to macroeconomic instability in the long term. From the mid to late 1970s, the much touted stabilizing role of fiscal policy has been questioned by most New Classical Macroeconomists.

In a direct response to the Blinder-Solow (1973), results, which had implied that the long term implications of government borrowing would be compensated for by the wealth effect, Robert Barro in 1974 published a paper entitled "Are Government Bonds Net Wealth?" (Barro, 1974). In this seminal paper Barro argued that, under certain assumptions, present borrowing would be matched by increased bequest to future generations in order to pay future taxes expected to pay the debt on the government bonds. He further argue that since public debt has to be re-paid at some point in the

future, forward-looking consumers anticipate the higher taxes and offset the expansionary fiscal stance by increasing private savings which has come to be known as the Ricardian equivalence. The traditional Keynesian theory of fiscal policy further stipulates that due to sticky prices or wages the economy would not adjust immediately to its full-employment level of output in response to output shocks. In such economy, an increase in government consumption would increase aggregate demand and lead to higher output. The optimal fiscal policy is thus countercyclical. In theory, reducing government consumption would reduce output even further. A fiscal stimulus in the form of increased government spending or decrease in taxation increases private consumption and output, and as a result fiscal policy should be run counter-cyclically (i.e. fiscal expansion during recessions and fiscal contraction during booms) to reduce output volatility. Two separate findings by (Gali, 1994) and (Fatas & Mihov, 2001) lend support to this view of Keynesian optimal fiscal policy by documenting empirically a robust negative correlation between government size and output volatility in OECD economies. They found that budget surpluses as a share of GDP go up during economic booms and down during recessions. This however has not been the experience of most developing countries, in spite of the fact that fiscal policy seems to have predominantly Keynesian effects. There have been various explanations put forward in the literature to explain this suboptimal practice of fiscal policy. One such explanation is that when going through a recession, developing countries' access to credit is severely restricted, so that they cannot run deficits and have to cut down on expenditures. On the contrary, when economic conditions improve, easily available credit is used to finance larger expenditures (Kaminsky, Reinhart, & Vegh, 2004), (Ilzetzki & Vegh, 2008). This aptly explains why during the periods prior to the structural adjustment programme in Ghana there was such tightening on credit that the government was almost broke. But the reverse was the case when

Ghana continues to run supplementary budget deficits over the years (for instance in 2011 when there was enough excess revenue from the oil sector and also late release of donor funds in the hands of the monetary and fiscal authorities, that excess money was exhausted in supplementary budgets (MoFEP, 2011). The other explanation emphasizes political-economy channels. In this respect, (Alesina, Campante, & Tabellini, 2008) argue that voters demand higher spending at times of economic boom in order to starve corrupt governments from appropriating tax revenues for unproductive public consumption. When voters observe expansions in the economy, they put pressure on governments to fulfill campaign promises made during elections and since governments also face reelection constraints, they are pushed to embark on expansionary fiscal policy during economic booms, as a result accumulating huge budget deficits. The reverse occurs in recessions where in a standard Ghanaian fashion, voters are admonished to "tighten their belt and swallow the bitter pill". The resulting equilibrium yields a pro-cyclical pattern of fiscal policy further aggravating the business cycle.

This view of output fluctuations and budget deficits does not go unopposed however. Some findings have formalized the possibility that fiscal policy has non-Keynesian effects. In the works of (Giavazzi & Pagano, 1990), they document that in this type of economies, a fiscal expansion is contractionary because it reduces household's private consumption. In terms of government consumption, the optimal policy would depend on the specification of the model. Clearly, if government consumption entered preferences separably, then a smooth path would be optimal. According to standard neo-classical theory, an increase in government consumption would also be expansionary. An increase in government spending leads to a short (and long) run increase in output because the resulting negative wealth effect induces consumers to consume

will be investigated in this research. It has also been widely acknowledged in the research literature that when implementing expansionary fiscal policy, governments can increase their spending or cut down on taxes to boost the economy, but one will notice rather curious occurrences in the case of Ghana. For over a decade to date the government of Ghana has increased its spending and taxes concurrently. The current NDC administration has recently increased the tax base whilst still running budget deficits in excess of 12% of GDP. This is something that is either not done in other middle income and developing countries, which could explain why there is not much on it in the research literature, or it is simply unique to Ghana. Once again this makes a case for this timely study on Ghana

Rounding up the discussion in this section, one can identify two streams of consensus among the New Classical Macroeconomists and New Keynesian Macroeconomists. The New Classical Macroeconomists and real business cycle theorists emphasized the benefits of avoiding an excessive volatility of tax rates associated with a strict balanced budget rule; whilst New Keynesians put the emphasis on the smoothing effectiveness of automatic stabilizers which are immune to the typical drawbacks of discretionary fiscal policy such as model uncertainty, risks of pro-cyclical behaviour due to implementation lags, irreversibility of spending decisions, amongst others. In subsequent sub-sections, the review of relevant empirical literature of this phenomenon follows.

2.2 The Political system and Budget Deficits in Ghana

Political agency problems have been widely acknowledged in the research literature as been partly responsible for the excessive accumulation of budget deficits, especially in booms. This agency problem usually takes the following forms; according to (Alesina & Tabellini, 2005)

voters face perceived corrupt governments that can appropriate part of tax revenues for unproductive public consumption, (i.e. political rents). They further postulated that political rents can be thought of as direct appropriation (embezzlement) of tax revenues by government officials, as well as favors paid to special interest groups such as public employees or loyalists of the government, often identified along ethnic, or political lines. Another explanation given in the literature explaining the relationship between the political system and budget deficits is the availability of credits in booms and the government's tendency to spend beyond its budget. It is a common practice in most public institutions in Ghana to do everything possible to exhaust their budgetary allocation for the fiscal year, in order to justify demand for higher allocations for the next period. This practice of fiscal irresponsibility is the bane of fiscal consolidation in the public sector. In line with this reasoning, governments are assumed to spend all budgetary surpluses or terms of trade windfalls without making any savings for anticipated future recessions (Talvi & Vegh, 2005). This creates a distortion and a bias towards recurring annual fiscal deficits. A different reason given by Tornell and Lane is that of the "Voracity effect". This simply means a more than proportionate increase in spending in response to positive economic shocks such as terms of trade windfalls or unexpected grants from donor partners, by various stakeholders in charge of the public purse. (Lane & Tornell, 1999). This common pool problem is more severe in democracies (particularly in Ghana's system of parliamentary representation) where elected politicians all struggle to get their share of the countries resources to satisfy their constituencies with the ultimate aim of reelection into political office. The issue of fragmentation associated with the common pool problems is particularly prevalent in Ghana, where per the country's electoral laws, the electoral commission reserves the right to review (usually upwards) the number of constituencies (and hence new MPs) after every population census thus increasing the

number of actors drawing from the common pool. Empirical research has shown that the demand to overspend during periods of economic growth increases as the number of actors increase further deepening the budget deficit. This political economy explanation for sub-optimal fiscal policy by governments was made first by (Braun, 2001) and was further collaborated by (Lane P. , 2003a). They both discovered that as the number of political veto players' increases, fiscal policy becomes more procyclical.

In addition to the fragmentation issue discussed above, political polarization has also being cited in the empirical literature as being responsible for procyclical fiscal policy and the persistent budget deficits accumulation by countries that practice procyclical fiscal policy. The perception is that as the preferences over the desired distribution of public spending between political parties diverge (or more generally, the deeper the division prevalent among the parties), the greater will be the incentive of policymakers to spend too much while in power, leading to procyclical fiscal policies and subsequent budget deficits, raising debt un-sustainability challenges. (Ardanaz, Pinto, & Pinto, September 2012). In Ghana for instance, it is not only incumbent and (potential) governments seeking reelection (election) into political office that make ambitious promises to potential voters, parliamentarians also do same, even though they are aware that they have no direct command over the country's resources except in the event that they make it as ministers in addition to being members of parliament (MPs). It is also important to highlight at this point on some of the theoretical predictions of fiscal behaviour and their relation to elections: one such behaviour is that (i) opportunistic conduct by politicians suggests fiscal policy maneuvering before the elections; (ii) uncertainty about the electoral outcome and the degree of schism tempt governments to embark on short-sighted policies; and (iii) electoral

rules shape fiscal conduct, with majority (winner takes all) kind of elections leading to larger fiscal activism concentrated on targeted programmes aimed at shifting votes in marginal districts, while proportional elections lead to increase of broad-based programmes.

Current empirical work by (Persson & Tabellini, 2002b) and (Ferretti & Gian, 2003) has lend support, though not unambiguous, for these predictions. Again when voters observed the various ways politicians' lives improve and the opulent manner in which they display their wealth shortly after being elected, the former cannot help but to mount up pressure for their share of the national "cake". For instance, around March to May 2013, when it was announced that Ghanaian MPs and the executive were paid in excess of GH¢50,000 and GH¢120,000 respectively, the general public outcry culminated into general industrial unrest, each labour union demanding its "pound of flesh" from the state.

This rent seeking behaviour from politicians and the subsequent maximization of utility by voters in the form of higher public goods in most cases has led to this recurrent budget deficits accumulation, eventually leading to high and threatening public debts. It is common knowledge that voters can change a government they perceive as corrupt and abusive of the powers entrusted to it, but this usually happens after the government in question has actually appropriated enough rent as to make the debt position apparent to the ordinary voter. And since almost every voter can observe and tell when economic conditions are good, the most rational thing to do is to demand as much from the government as possible. Because in a bid to appropriate rent and satisfy cronies, politicians often renege on their campaign promises, it is up

to the voter to choose a path that not only maximizes its utility but also penalizes the perceived corrupt politician.

While the preceding discussion provides quite a gloomy picture of fiscal management and performance in this country-specific study, there is still hope and a lot of successes can be achieved if institutional variables such as budgetary institutions are put in place to effectively deal with the budgetary process. There have been several definitions of budgetary institutions in the research literature. One such definition given by the authors Stein et al is that; budgetary institutions are the set of guidelines, procedures and practices according to which budgets are planned, approved and implemented (Stein, Talvi, & Alejandro, 1998). One important feature of Ghana's budgetary system is that it involves an intricate decision process of varieties of several actors from ministries, departments and agencies of the central government each drawing from a common pool of the taxpayers money. Since most of the benefits generated by each of the actors in the budgetary process are not fully internalized by the beneficiaries, this generates externality issues that lead to a problem of overutilization of the common pool of resources, further worsening the deficit position of the budget. In order to curtail this overutilization of the common resources to the barest minimum, the government and relevant agencies can create and rely on budgetary institutions that can affect the rules under which these agents interact, either by placing limits on the whole budgetary process, or by allocating authority and accountabilities among the different agents, in ways that can affect results in one course or the other. According to Stein et al, budgetary institutions can be functional in equalizing the expenditure and deficit bias that may otherwise exist due to the incentives of some of the agents involved in the budgetary process (Milesi-Ferretti & Rostagno, 2002).

The budgetary process in Ghana though considered as elaborate and detailed, has been observed by some experts to be a mere façade, democratically-deficient and bearing little resemblance to reality. This view has been shared by several authors who have carried out extensive research on Ghana's budgetary system. Among such writers is Tony Killick, who observed that on the expenditure side, the budgetary process is so weak as to be essentially ritualistic, with limited bearing upon reality (Killick, 2005). He further noted that such a system in an otherwise sophisticated society continues to be tolerated because of the inherent democratic deficit in budgetary processes in Ghana. One of the most important capabilities of any state is its government's ability to run its own budget for proper fiscal management. How does a country like Ghana perform under this crucial criterion? According to Killick, There are regularly large deviations between budget estimates and actual spending. A research conducted by the Centre for Democratic Development (CDD) and the London-based Overseas Development Institute (ODI) in 2003 and 2004 found large discrepancies in two principal ministries (Education and Health) of ±42% (Education) and ±68% (Health) of budgeted and actual spending. The study also found evidence of large leakages in allocated funds between their release from the centre and arrival at the point of service delivery. These challenges of the budgetary system in Ghana in addition to no clear-cut and well defined budgetary institutions imparts negatively on the budget deficits. What remains puzzling at this stage is how all these interplay with fluctuations in output and the effect of one on the other. A discussion of this interesting puzzle is the subject of the next subsection.

2.3 The Relationship between Output Fluctuations and Budget Deficits

Output fluctuations occur due to variations in economic growth overtime. Output fluctuations explain these variations in the demand-side of the economy as measured by Gross Domestic Product (GDP). One popular measure of output volatility in the research literature is the standard deviation of annual per capita GDP growth where as the mean of annual per capita GDP growth is usually used as a measure of economic growth. The changes in government policies such as taxes and interest rates as well as non-economic factors such as adverse weather conditions, natural disasters, etc. also affect output in an economy. Theoretically output fluctuations occur because protracted periods of economic expansion are eventually associated with increasing inflation rates and to prevent the economy from overheating governments either increase taxes and/ or cut down on expenditure. This action produces counter-cyclical fiscal policy which is optimal for economic growth and debt sustainability. The challenge occurs where governments fail to use discretionary fiscal policy optimally to smooth out the business cycle. This has implications for the economy as a whole. A high inflation and increasing budget deficit can affect a government's ability to fine-tune the economy, since fiscal policy would be subordinated to the aims of keeping inflation in check and reassuring creditors and investors of favourable macroeconomic conditions.

The function of government in output variability has a dual dimension. To begin with, discretionary fiscal policy may be used to smooth out fluctuations in the economy by intentionally increasing or decreasing the component of government consumption in total output. The basic Keynesian models theorize that variabilities in aggregate income can be partly fine-tuned by recurrent changes in taxes and transfers over business cycles so that disposable income becomes less unpredictable than total income. On the other hand, recent observed studies by Gali

(1994) and Fatas and Mihov (2001) confirm that expanding the size of government reduces the capriciousness of aggregate income as well as disposable income (Gali, 1994) (Fatas & Mihov, 2001). In other words, government expenditure should be deliberately decreased or increased, depending on whether the economy is expanding or contracting. The new classical economists on the other hand oppose this use of fiscal activism, positing that it can be growth and welfare reducing. The general consensus in the literature is that the induced component of public expenditure has strong output volatility effects. This finding was further corroborated by Fatas and Mihov (2001), even though they discover that in general a larger government size reduces the instability of gross and disposable income through the working of automatic stabilizers (Fatas & Mihov, 2001). The modus operandi of automatic stabilization in smoothing-out the business cycle is the subject of succeeding discussions below.

Automatic stabilizers are the components of government policies and structures that affect the economy and its agents spontaneously. Some of these automatic stabilizers come in the form of unemployment and social insurance benefits, progressive tax rates and transfer payments among others. A progressive tax rate rises more than proportionately as income rises. Hence, wealthier people pay higher taxes than poorer people. In the event that due to positive economic conditions, there is a general increase in incomes across board, then government total tax receipts would spontaneously increase and would ultimately lead to a smaller increase in disposable income. The same rationale applies in transfer payments. If there is an overall decline in income, transfer payments to the poor increase. Given the opposite effects both discretionary fiscal policy and automatic stabilizers have on output fluctuations in an economy, the overall relationship between business cycle fluctuations and government size (fiscal deficits) is ambiguous at best.

The final literature of interest is to understand the macroeconomic effects of output fluctuations on the economic development of Ghana. Below is the discussion that follows.

2.4 The Macroeconomic effects of Output Fluctuations on Economic Growth

There is a general consensus in the research community that fiscal policy has effects on economic behaviour, as it acts as incentives as well as disincentives to private investment decision making. A large and growing literature has documented the adverse effects of output fluctuations on economic growth and development. For instance, in a sample of 92 middle and low-income countries as well as 22 OECD countries, Ramey and Ramey found evidence of higher volatility linked to lower growth (Ramey & Ramey, 1995). Using data spanning the period (1962 to 1985), Ramey and Ramey use the standard deviation and mean of per capita annual growth rates as estimates for output volatility and economic growth respectively. They found a statistically significant negative result when they regress the mean of per capita GDP growth on the standard deviation of per capita GDP growth. The authors also discovered the relationship between growth and output volatility in a model in which the variance of innovations to output is linked to the variance of innovations to government spending.

Other researchers have also documented what can be best described as ambiguous relationship between government size and economic uncertainty in open economies. The empirical work of Rodrik (1998) shows that the scope of government size in most open economies is larger contrary to what most economists would expect (Rodrik, 1998). Rodrik argued that scaling governments down in the face of increasing globalization can be inimical to growth of those open economies that are often prone to external risk. His work is one of the few that document a robust positive relationship between government size and output growth and by necessary

implication economic development as well. The empirics by Cohen and Follette (2000) also approximate that in general fiscal policy is detrimental to growth and development and that automatic stabilizers only take up nearly 10% of a negative shock to an economy (Cohen & Follette, 2000). So according to these authors, low income countries with not properly developed social safety nets do not benefit from fiscal activism and are actually harming their economies by increasing the budget deficits.

Fatas and Mihov (2001) examine a sample of 20 OECD countries. The results point to larger governments (which were used as an approximation for automatic stabilizers), reduced output fluctuations. In conclusion, it is fair to say that fiscal activism is not growth-inducing in developing countries, due to the same reasons that make fiscal interventions in developing countries (such as the inadequacy of developed financial systems, good institutions, stable governments and the quality of polity, that mainly underscore why certain policies reduce fluctuation in developed economies while increasing fluctuation in developing economies) destabilizing. Methodological and empirical data strategy investigating into the relationship between business cycle fluctuations and budget deficits is the subject of the next chapter.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter focuses on the baseline model as well as the econometric methodology that is used to investigate the causal relationship between output fluctuations and budget deficits in Ghana. The chapter also discusses the data source and description; definition of key variables used in the research and the methods used in decomposing the GDP data series into trend and cyclical components.

3.1 Definition /Measurements of Variables and Data Sources

The following variables are defined below; primary budget deficits, actual budget deficit, decomposition of GDP, fiscal policy rule, and output gap.

The government budget identity consists of receipts and payments. Usually governments have at least three means of raising revenue, through (i) taxes(T), (ii) issue of new bonds (ΔB) and (iii) creation of high powered money(H). Since the creation of high powered money is now unpopular because of its conflict with the central bank's monetary policy and possible escalation of inflation, that option will be omitted which would reduce the revenue options to items (i) and (ii). On the other hand government purchases (G) and interest payments on bonds (iB) constitute government actual expenditure. This identity can be represented as follows:

$$G + iB \equiv T + \Delta B.$$

Total Government Budget Deficit: from the above identity, the actual government deficit can be defined as the difference between total expenditure on the left hand side and total receipts (revenue) at the right hand side. In other words, the actual deficit $(\Delta B) \equiv (G - T) + iB$.

Where it is assumed that the amount of debt issued by government equals the amount of bonds held by the public.

Primary Budget Deficit: the primary deficit excludes interest payments on government debt, which is measured as the difference between government purchases and revenue; $(G - T)$. The actual government debt to GDP ratio is defined as: $\frac{\Delta B}{Y}$ where Y is real GDP. Applying this reasoning to the earlier identity yields; $\frac{actual\ deficit}{GDP} - \frac{\Delta B}{Y} \equiv \frac{G-T}{Y} + \frac{iB}{Y} \equiv d + ib$ where the primary deficit to GDP ratio becomes $d = \frac{G-T}{Y}$. The data set for primary budget deficit to GDP ratio is currently unavailable for the period 1960 to 2012; hence government budget deficit to GDP ratio which is available would be used instead.

GDP Decomposition: Gross Domestic Product consists of trend (permanent) and cyclical components. Let real GDP be represented by Y_t, and the trend and cyclical components be represented by y_t^p and y_t^c respectively, which implies that $Y_t = y_t^p + y_t^c$. The cyclical component of output can be found by rearranging the equation above as follows:

$$y_t^c = Y_t - y_t^p$$

This cyclical component of GDP will be obtained using the Hodrick-Prescott, Baxter-King, Butterworth and Christiano-Fitzgerald filters.

Data Sources and Description: The main data used is secondary data which is sourced from the World Bank's World Development Indicators and the IMF's International Financial Statistics (IFS) database, as well as data from Ghana Statistical Service (GSS). The cyclical component of GDP is derived from decomposition of real annual GDP data series into trend and cyclical components using the Baxter-King, Christiano-Fitzgerald, Butterworth and Hodrick-Prescott filters. The fiscal deficit to GDP ratio is in real Ghana cedis and taken from the database without any modification. The coverage spans from 1960 to 2012. This period was selected because data for the debt to GDP ratio was not available prior to 1960. The main variables of interest in exploring the nexus between output fluctuations and budget deficits in Ghana are the budget deficit to GDP ratio and the cyclical component of real GDP. The next subsection explores the model that would be used to run the regression.

3.2 The Baseline Model

This section discusses two simple simultaneous equations that would be estimated using the SUR, OLS and VAR models testing the plausibility of bi-directional causality between fiscal deficit to GDP ratio and the cyclical component of GDP.

3.2.1 A Contemporaneous and Lagged Fiscal Rule

Two simultaneous equation models are used to find the nexus between output fluctuations and budget deficits in Ghana and to investigate the plausibility of bi-directional causality between the two variables. The general form of the fiscal deficit to GDP ratio and cyclical component of GDP relationship is as follows:

$$d_t = \alpha_0 + \alpha_1 d_{t-1} + \alpha_2 y_{t-1}^c + \alpha_3 y_t^c + \varepsilon_t \quad \ldots\ldots (3.1)$$

$$y_t^c = \beta_0 + \beta_1 d_{t-1} \pm \beta_2 y_{t-1}^c + \beta_3 d_t + \mu_t \quad \ldots\ldots (3.2)$$

error terms are contemporaneously correlated, as is most likely in applied macroeconomics, the estimation procedure should take this into account. The Seemingly Unrelated Regression (SUR) estimator accounts for these contemporaneous correlations and allows the dependent variables to have different sets of explanatory variables. The SUR method estimates the parameters of all equations simultaneously, so that the parameters of each single equation also take the information provided by the other equations into account. This results in greater efficiency of the parameter estimates, because additional information is used to describe the system. These efficiency gains increase with increasing correlation among the error terms of the different equations (Judge et al. 1988), (Yahya et al. 2008). The base models above when estimated by OLS would consist of six different equations comprising three different cyclical components each from the HP, CF and BW filters and the fiscal deficit to GDP ratio, with each variable serving as a dependent variable and an independent variable as well as their lags. The VAR estimation method used on the model is the recursive VAR. A recursive VAR constructs the error terms in each regression equation to be uncorrelated with the error in the preceding equations. This is done by including some contemporaneous values as regressors. Equations (3.1) and (3.2) present a two-variable VAR, ordered as (1) Fiscal deficit to GDP ratio and (2) the cyclical component of GDP. In the first equation of the corresponding recursive VAR, fiscal deficit to DGP ratio is the dependent variable and the regressors are lags of fiscal deficit to GDP ratio, cyclical component of GDP variable plus the current value of the cyclical components of GDP. The cyclical component of GDP is the dependent variable in the second equation and the regressors are lags of fiscal deficit to GDP ratio and the cyclical component of GDP, plus the current value of the fiscal deficit to GDP ratio. Since all three cyclical components from HP, CF

and BW are used, the two baseline models above would be six, which are two equations each for the deficit to GDP ratio and each cyclical component of output.

3.3.1 Stationarity Test (ADF and Phillips Perron Test)

A unit root test, tests whether a time series variable is non-stationary using an autoregressive model. A well-known test that is valid in large samples is the augmented Dickey–Fuller (ADF) test. The (ADF) statistic, used in the test, is a negative number. The more negative it is, the more robust the rejection of the hypothesis that there is unit root at some level of confidence (Dickey & Fuller, 1979). The testing procedure for the ADF test is applied to the model;

$$\Delta y_t^c = \theta + \beta t + \rho y_{t-1}^c + \delta_1 \Delta y_{t-1}^c + \ldots + \delta_{\rho-1} \Delta y_{t-\rho+1}^c + \varepsilon_t \ldots\ldots\ldots\ldots (3.3)$$

Where θ is a constant, β the coefficient on a time trend and ρ the lag order of the autoregressive structure. Imposing the constraints $\theta = 0$ corresponds to modelling a random walk and the constraint $\beta = 0$ corresponds to modelling a random walk with a drift.

The Phillips and Perron's test statistics can be viewed as Dickey–Fuller test statistics that have been made robust to serial correlation by using the Newey–West (1987) heteroscedasticity-and autocorrelation-consistent covariance matrix estimator. Both tests are conducted under the following null hypothesis;

H_0: $\rho = 1$ (Series has a unit root or is non-stationary)

H_0: $\rho = 0$ (Series is stationary and does not follow a random walk)

Usually the null hypothesis is rejected when the approximate *p-value* is less than or equal to a specified significance level, often 0.05 (5%), or 0.01 (1%) or even 10%. The other way to reject the null hypothesis is to see if the test statistic is less (this test is non symmetrical so one does not consider an absolute value) than the (larger negative) critical value. One advantage of the PP tests over the ADF tests is that the PP tests are robust to general forms of heteroscedasticity in

$$a_K(L) = -(1-L)(1-L^{-1})\psi_{K-1}(L)$$

$$a_K(L) = L^{-1}(1-L)^2\psi_{K-1}(L)$$

Where $\psi_{K-1}(L) = \sum_{h=-(K-1)}^{K-1} \psi_h L^h$

And the coefficients of $\psi_{K-1}(L)$ are given by

$$\psi_{|h|} = \sum_{j=|h|+1}^{K} (j - |h|)a_j$$

Since the BK filter contains two differencing operators, it removes linear and quadratic time trends up to two unit roots.

The Hodrick-Prescott Filter

The HP filter removes a smooth trend y_t^p from a time series Y_t by solving the minimization problem $Min \sum_{t=1}^{T}[(Y_t - y_t^p)^2 + \lambda((y_{t+1}^p - y_t^p) - (y_t^p - y_{t-1}^p))^2]$ with respect to y_t^p. The deviation from the trend $y_t^c = Y_t - y_t^p$ is referred to as the cyclical component of output. The HP filter is a high-pass filter, removing the trend and maintaining high-frequency components in y_t^c. The parameter λ penalizes fluctuations in the second differences of Y_t and must be specified in the HP filter. The common parameter value chosen for annual time series data is that of $\lambda = 6.25$

The Christiano-Fitzgerald Filter

Unlike the BK filter which minimizes the coefficients between its symmetric moving average filter and the ideal band-pass filter, the CF filter minimizes the mean squared error between the cyclical component of output and the trend component, assuming that the non-decomposed series is a random-walk process. A random-walk process is a first-order integrated process that must be differenced once to produce a stationary process (Christiano & Fitzgerald, 2003). It must be

noted that the CF filter achieves its optimality properties at the cost of an additional parameter that must be estimated and a loss of robustness. The CF filter is optimal for a random-walk process. If the true process is a random walk with a drift, the drift term must be estimated and removed. Secondly unlike the HP filter that can make integrated processes of up to order four stationary, the CF filter is non-symmetric, and hence will not remove second-order deterministic or second-order integrated processes.

The Butterworth Filter

The Butterworth filter is a-two-parameter high pass filter which shares the properties of symmetry and phase neutrality, just like the BK filter. In contrast to the HP filter which sets a single smoothing parameter equal to λ, the Butterworth filter has greater flexibility in approximating a phase-neutral square wave filter, which precisely separates frequencies to be passed and frequencies to be discarded. The Butterworth filter involves a smoothing operation which is applied both forwards and backwards via a recursive filtering process to the time series to be filtered. The combination of the resulting filtered series is guaranteed to preserve phase, as the phase shifts caused by smoothing cancel each other. The next presents the analysis of actual decomposition carried out on the GDP data series, the results and the discussions based on the hypotheses and the objectives of the study.

CHAPTER FOUR

ANALYSIS, RESULTS AND DISCUSSION

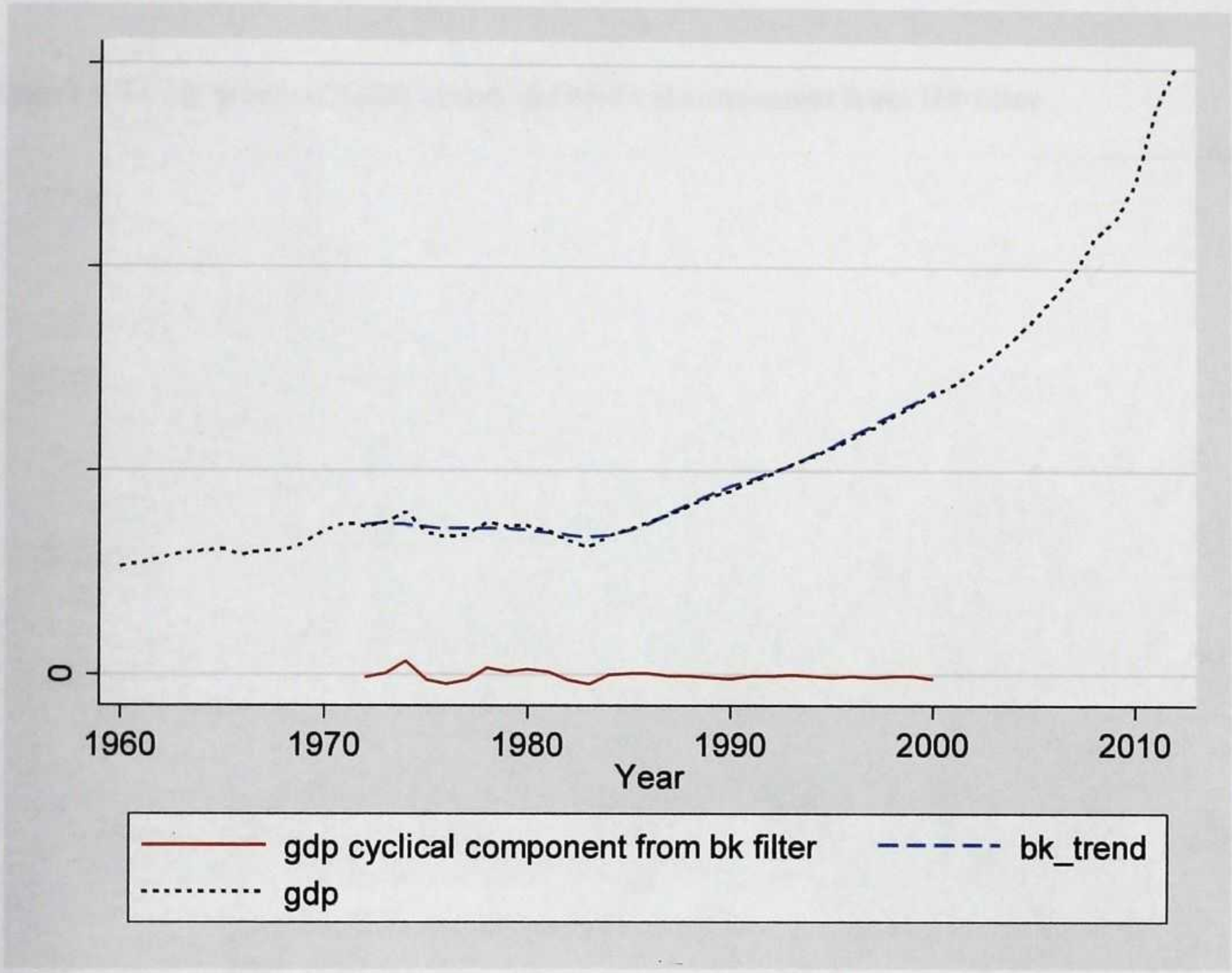
4.0 Introduction

This chapter discusses the results from the OLS, SUR and VAR estimators' and the hypotheses that are tested as the basis for the discussion. The raw GDP series are decomposed into trend and cyclical components before any further analysis is carried out on the data series. Section 4.1 analyzes how the GDP is decomposed into trend and cyclical components using the BK, BW, CF and HP filters. As mentioned in chapter three and consistent with theory, the decomposed cyclical components of output are all stationary at the levels, but further test for stationarity is carried out using the ADF and PPerron tests to check for additional robustness.

4.1 Analysis of GDP Decomposition into Trend and Cyclical Components

The BK filter decomposes the GDP data series into cyclical and trend components with coefficients that sum to zero and removes stochastic and deterministic trends of first and second order in the data. As the BK approximates the ideal band-pass filter, it also increases the number of missing observations in the filtered series. Figure 4.1 shows a graph of the filtered series using the BK filter. The cyclical component of output from figure 4.1 starts from the mid-1970s to the early 2000s losing 12 observations prior to the 1970s period and 12 observations after the year 2000. The black broken line from the graph represents the cyclical components of output from the BK filter.

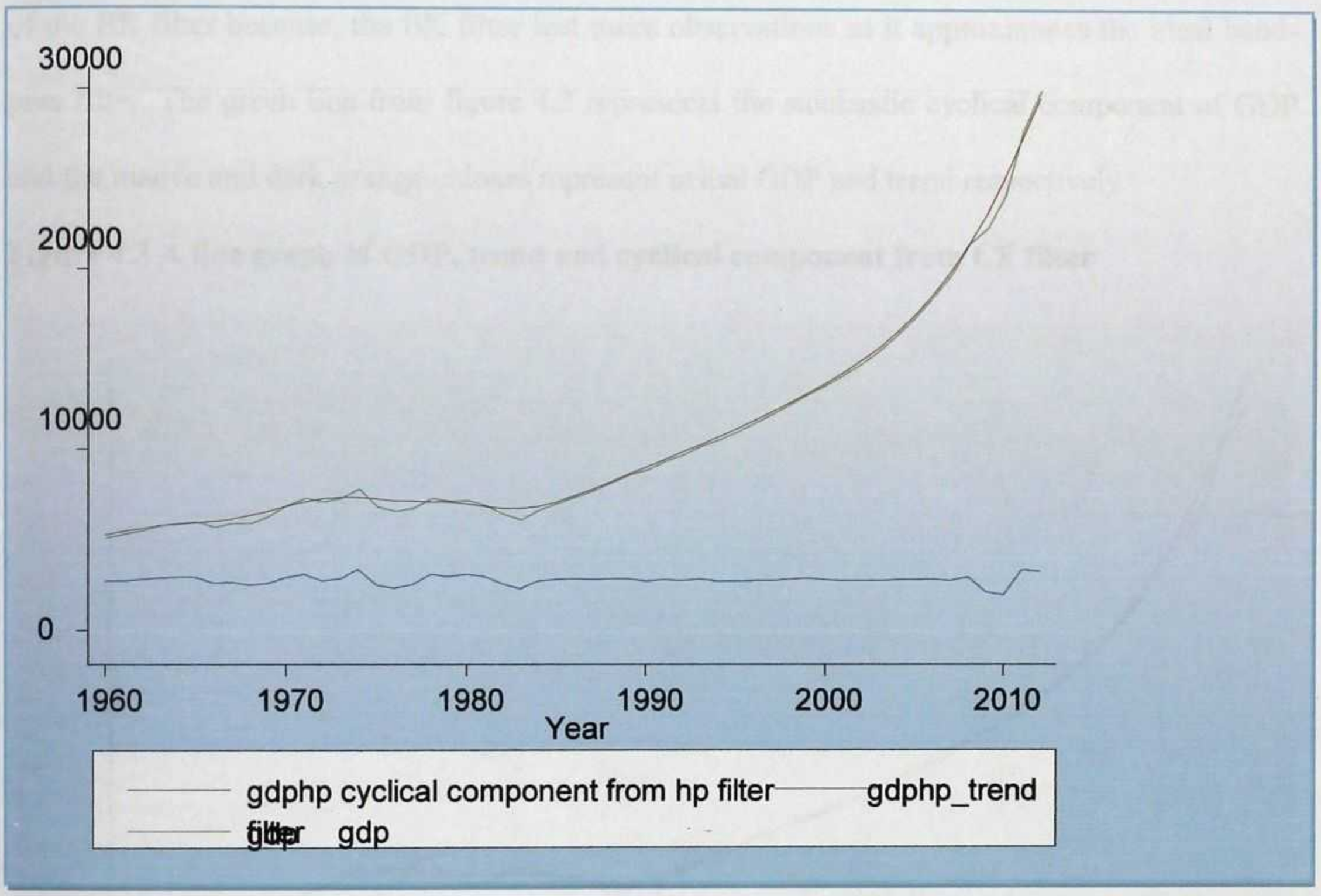
Figure 4.1 A line graph of GDP, trend and cyclical component from BK filter.



The HP filter is a one-parameter high-pass filter that separates a time series into trend and cyclical components. The trend component may contain a deterministic or a stochastic trend. The smoothing parameter (λ) determines the periods of the stochastic cycles that drive the stationary cyclical component of output. The smoothness of the trend depends on the smoothing parameter, (λ). The HP filter sets (λ) = 6.25 for annual data. The GDP data series in this work is filtered using (λ) = 6.25, since the data is an annual data. It has been shown that The HP filter could

make integrated processes of order 4 or less stationary. Figure 4.2 presents the graph of the actual GDP, trend and cyclical components of output from the HP filter.

Figure 4.2 Line graph of GDP, trend and cyclical component from HP filter

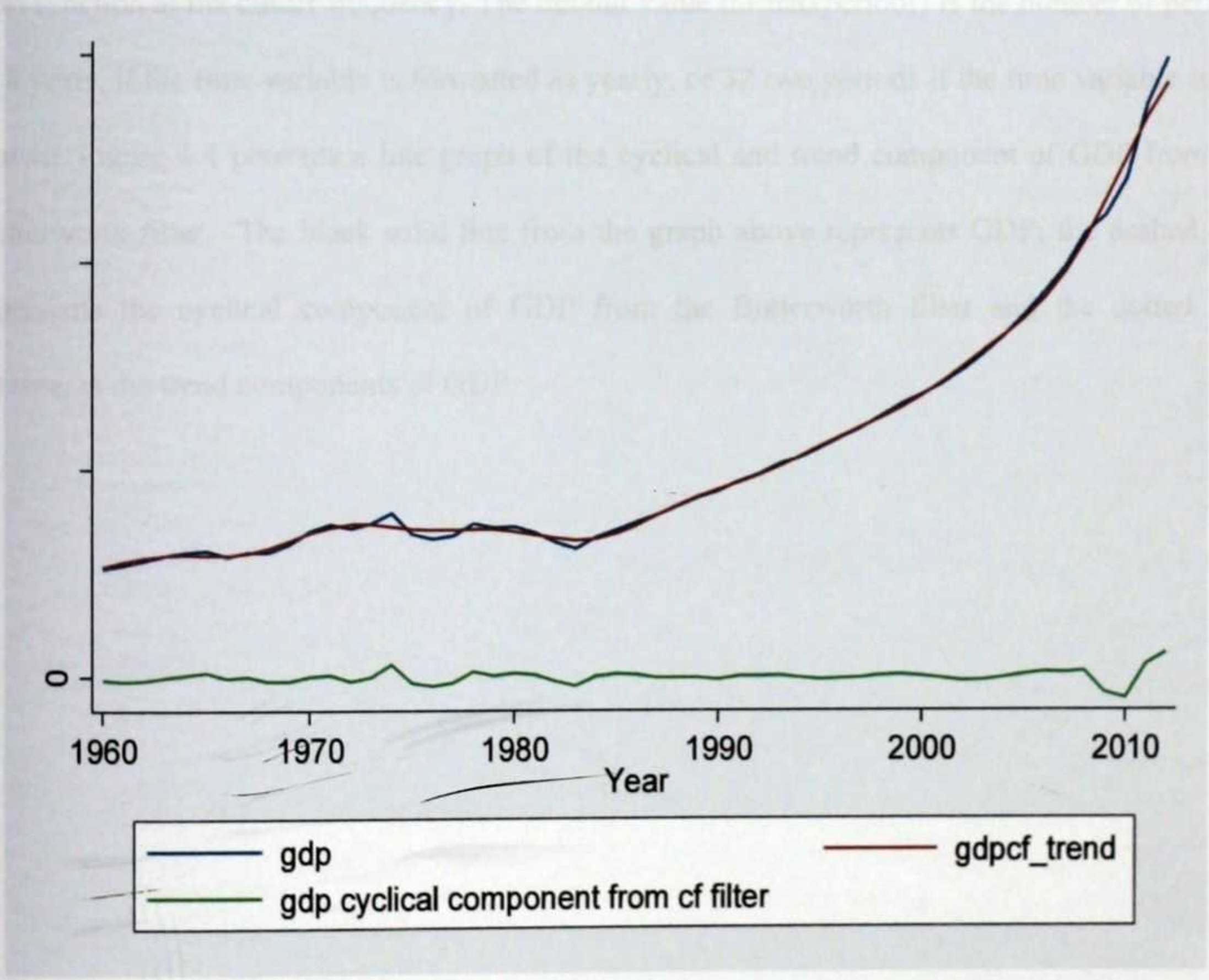


The green line in the graph shows actual GDP, the red line shows the trend and the blue line shows the stochastic cyclical component of the GDP series. The green actual GDP line in the graph shows an upward trend. The blue line, which is the cyclical component, seems more volatile during the 1970s and 1980s, which is not surprising given the economic challenges that were fraught the country during that period. But it seems to stabilize around the 1990s and the 2000s only to start its fluctuation in the late 2000s. The deterministic or trend cycle is the permanent component of GDP and so it is not surprising its identical co-movement with actual

GDP. One weakness of the HP filter is that it does not zero out the low-frequency stochastic cycles as well as the other filters do.

The cyclical component of GDP from the CF filter on the graph below looks different from that of the BK filter because, the BK filter lost more observations as it approximates the ideal band-pass filter. The green line from figure 4.3 represents the stochastic cyclical component of GDP and the mauve and dark orange colours represent actual GDP and trend respectively.

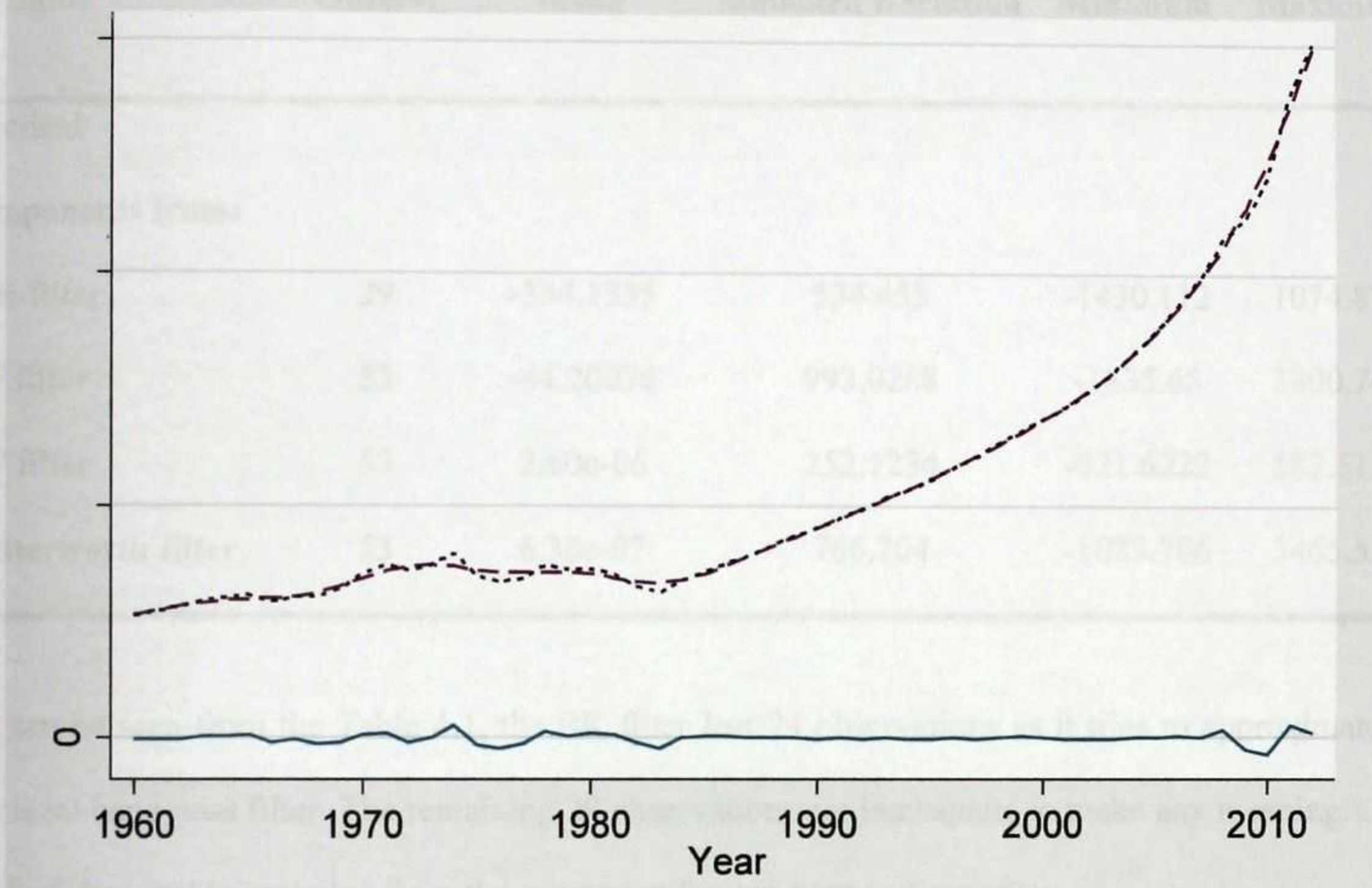
Figure 4.3 A line graph of GDP, trend and cyclical component from CF filter



The choice between the BK and the CF filter is one between robustness and efficiency. The BK filter deals with a broader class of stochastic processes, whilst the CF filter produces a better estimate of the cyclical component of GDP if the GDP series is close to a random-walk process or a random-walk-plus-drift process.

The BW filter has two periods and the order of the filter. The maxperiod() option from the software specifies the maximum period, (that is the stochastic cycles of all higher periodicities are filtered out). The maxperiod() option also sets the location of the cutoff period in the gain function. The order() option specifies the order of the filter, which determines the slope of the gain function at the cutoff frequency. The default value for maxperiod() is the number of periods in 8 years, if the time variable is formatted as yearly, or 32 two periods if the time variable is not known. Figure 4.4 presents a line graph of the cyclical and trend component of GDP from the Butterworth filter. The black solid line from the graph above represents GDP; the dashed line represents the cyclical component of GDP from the Butterworth filter and the dotted line represents the trend components of GDP.

Figure 4.4 A line graph of GDP, trend and cyclical component from BW filter



The table below provides summary statistics of the cyclical component of GDP from the BK, CF, HP and Butterworth filters.

Table 4.1 Summary statistics of cyclical components of GDP from (BK, CF, HP and BW) filters

Variable	Observ.	Mean	Standard Deviation	Minimum	Maximum
Cyclical components from:					
BK filter	29	-354.1335	534.455	-1430.112	1074.876
CF filter	53	-64.20076	993.0268	-1835.65	3800.747
HP filter	53	2.60e-06	252.1234	-821.6222	587.5198
Butterworth filter	53	6.30e-07	766.704	-1033.706	3465.586

As can be seen from the Table 4.1, the BK filter lost 24 observations as it tries to approximate the ideal band-pass filter. The remaining 29 observations are inadequate to make any meaningful analysis hence it is excluded from the regression for any further discussion.

Table 4.2 below presents the correlation among the fiscal deficit to GDP ratio and the cyclical components of output from the HP, CF and BW filters. Though each cyclical component of GDP has a low positive correlation with the fiscal deficit to GDP ratio, the cyclical component of output from the BW filter had the highest ($r = 0.0736$). This sensitivity was reflected in the model estimation since the cyclical output from the BW filter was the only variable that was contemporaneously related to the fiscal deficit to GDP ratio. There was however, a high correlation among the decomposed components of output, with the BW and HP decomposed series having the highest correlation of ($r = 0.9760$).

Table 4.2 Correlation among the fiscal deficit to GDP ratio and the cyclical components of output from the HP, CF and BW filters.

Variable	FISDGDP	GDPHP	GDPCF	GDPBW
FISDGDP	1.0000	-	-	-
GDPHP	0.0522	1.0000	-	-
GDPCF	0.0561	0.9045	1.0000	-
GDPBW	0.0736	0.9760	0.8739	1.0000

4.2 The Results of Unit Root Test

Consistent with theory, the null hypothesis that the cyclical components of GDP from the CF, HP and Butterworth filters has unit root is rejected (at the levels), at all the conventional levels of significance. The null hypothesis of the presence of a unit root for the deficit to GDP ratio was also rejected at 5% confidence level with the ADF test and 10% confidence level with the Phillips Perron unit root test. This implies that all the underlying series in this study are stationary. This justifies the use of OLS, SUR and VAR methods. Table 4.3 presents the results from the unit root test carried out on the data series.

Table 4.3 Augmented Dickey-Fuller and Phillips Perron Unit Root Test (at Levels)

Variable	Test Statistics (ADF)	*P-Value*	Test Statistics (PPerron)	*P-Value*
FISDGDP	-3.102	0.0264**	-2.972	0.0376*
GDPHP	-5.560	0.0000***	-5.294	0.0000***
GDPCF	-4.451	0.0002***	-3.638	0.0051***
GDPBW	-6.780	0.0000***	-7.019	0.0000***

Note: *- indicates Significance at 10%; ** Significance at 5% and *** Significance at 1%

4.3 Optimal Lag Selection

Before fitting the model using OLS, SUR and VAR, optimal lag-order selection and Granger-causality are performed. The optimal lag-order selection is carried out because the VAR presentation requires specification of an optimal lag order. The [varsoc] command in STATA is used to select the optimal lag order for the fiscal deficit to GDP ratio and cyclical components of output from the HP, CF and BW filters. It is widely believed that strongly consistent lag order selection criteria such as the Schwarz/Bayesian Information Criterion (SBIC) and the Hannan and Quinn Criterion (HQIC) are better suited for the analysis of Finite-lag-order VAR models than the less parsimonious Akaike Information Criterion (AIC). In contrast for infinite-order autoregressions the AIC is regarded as more appropriate. In this Study the AIC, FPE, HQIC and SBIC criteria seem to agree on a similar lag-order and selected an optimal lag-order of two for the fiscal deficit to GDP ratio and cyclical components from HP and BW and CF filters with the FPE and AIC giving four lags for the CF decomposed series. The results from the optimal lag-order selection tests are presented in Tables 4.4, 4.5 and 4.6 below, followed by the Granger-causality test.

Table 4.4. Optimal Lag Order Selection for fiscal deficit to GDP ratio and cyclical component of GDP from HP filter.

FISDGDP GDPHP

Lags	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-474.611	-	-	-	962967	19.4535	19.4828	19.530
1	-457.641	33.94	4	0.000	567320	18.9241	19.012	19.1558
2	-447.914	19.455*	4	0.001	449560*	18.6904*	18.8368*	19.0764*

*indicates selection by criterion; LR:-Sequential modified Likelihood Ratio test statistic (each test at 5% level); FPE: - Final Prediction Error; AIC:-Akaike Information Criterion; HQIC:-Hannan and Quinn Information Criterion; SBIC:-Schwarz and Bayesian Information Criterion.

Table 4.5. Optimal Lag Order Selection for fiscal deficit to GDP ratio and cyclical component of GDP from BW filter.

FISDGDP GDPBW								
Lags	**LL**	**LR**	**df**	**p**	**FPE**	**AIC**	**HQIC**	**SBIC**
0	-467.567	-	-	-	722333	19.166	19.1953	19.243
1	-451.44	32.252	4	0.000	440466	18.671	18.7589	18.9027
2	-441.292	20.297*	4	0.000	343091*	18.4201*	18.5666*	18.8062*

*indicates selection by criterion; LR:-Sequential modified Likelihood Ratio test statistic (each test at 5% level); FPE: - Final Prediction Error; AIC:-Akaike Information Criterion; HQIC:-Hannan and Quinn Information Criterion; SBIC:-Schwarz and Bayesian Information Criterion.

Table 4.6. Optimal Lag Order Selection for fiscal deficit to GDP ratio and cyclical component of GDP from CF filter.

FISDGDP GDPCF								
Lags	**LL**	**LR**	**df**	**p**	**FPE**	**AIC**	**HQIC**	**SBIC**
0	-484.999	-	-	-	1.5e+06	19.8775	19.9068	19.9547
1	-467.024	35.949	4	0.000	832057	19.3071	19.395	19.5388
2	-446.098	41.852	4	0.000	417447	18.6162	18.7627*	19.0023*
3	-443.012	6.171	4	0.187	434413	18.6536	18.8586	19.1941
4	-436.986	12.053*	4	0.017	401730*	18.5709*	18.8345	19.2658

*indicates selection by criterion; LR:-Sequential modified Likelihood Ratio test statistic (each test at 5% level); FPE: - Final Prediction Error; AIC:-Akaike Information Criterion; HQIC:-Hannan and Quinn Information Criterion; SBIC:-Schwarz and Bayesian Information Criterion.

4.4 Result of Granger-Causality Test

Two hypotheses are tested on Granger-causality, with three measures of the cyclical components of output each from HP, BW and CF filters and the fiscal deficit to GDP ratio. Two different models were tested; first Granger causality was performed to determine if fiscal deficit to GDP ratio could be used to accurately predict fluctuations in the cyclical component of output from (Hypothesis1, Table 4.7). The second hypothesis was to test if Granger causality existed in the reverse direction, i.e. if cyclical component of output Granger-causes fiscal deficit to GDP ratio, (Hypothesis 2, Table 4.7). The results of hypothesis one for the fiscal deficit to GDP ratio and the cyclical component of output from the HP filter concluded that $\chi 2 = 21.77^{***}$, with p = 0.0002. The reverse causality under hypothesis two based on the same HP filter concluded with $\chi 2 = 64.41^{***}$, with p = 0.0000. Therefore, it can be concluded that at 99% confidence level, there is a Granger-causal relationship between fiscal deficit to GDP ratio and the cyclical component of output from the HP filter in either direction of the relationship. This implies that past deficits are able to explain current fluctuations in output around its long-run trend. Similarly, past fluctuations in output around trend (based on the HP filter), are helpful in predicting the current deficit.

The results of the third hypothesis (based on BW filter) concluded that $\chi 2 = 20.47$, with p = 0.0004. The reverse causality under hypothesis four gave $\chi 2 = 65.43$, with p = 0.0000. Once again the test strongly rejects the null hypothesis of Granger-non-causality at 99% confidence levels in either direction, implying that past deficits help explain fluctuations in output (based on BW filter) around its long-run trend. Likewise past fluctuations in output (based on BW filter) are useful for predicting the current deficit.

Finally the fifth hypothesis gave the following results; $\chi 2 = 63.38^{***}$, with $p = 0.0000$ and $\chi 2 = 71.95^{***}$, with $p = 0.0000$ for the Granger-causal relationship between the fiscal deficit to GDP ratio and the cyclical component of output from the CF filter. At 99% confidence level, the test strongly rejects the null hypothesis in either direction of the relationship that fiscal deficit to GDP ratio does not Granger-cause fluctuations in the cyclical components of output from CF filter. This bi-directional Granger-causality implies that past fluctuations in output influence the deficit whilst at the same time, past deficits also result in fluctuations in output around its long-run trend. In addition to what is implicitly assumed in the research literature that output fluctuations drive budget deficits, the results from this test show a bi-directional causation implying that fiscal deficits also drive fluctuations in output.

Given the robust results from the test and based on the null hypotheses, we can reject at the 99% confidence level for the null hypothesis that output fluctuations does not Granger-cause fiscal deficit to GDP ratio. At the same time the null hypothesis that fiscal deficit to GDP ratio does not Granger-cause output fluctuations (using all three measures of output fluctuations), is also rejected at the 99% confidence level. The bi-directional Granger-causality between the fiscal deficit to GDP ratio and the fluctuations in output holds for all the three different measures of the cyclical component of GDP. This provides evidence for the co-movement of the fiscal deficit to GDP ratio and the fluctuations observed in output around its long-run trend irrespective of the type of filter used. Table 4.7 below presents the result of the Granger-causality Wald test.

Table 4.7 Granger-causality Wald Test

Null Hypothesis	df	Chi-Square	P > Chi-Sq	Decision
(1) FISDGDP does not Granger-cause GDPHP	4	21.77***	0.0002	Reject Null
(2) GDPHP does not Granger-cause FISDGDP	4	64.41***	0.0000	Reject Null
(3) FISDGDP does not Granger-cause GDPBW	4	65.43***	0.0000	Reject Null
(4) GDPBW does not Granger-cause FISDGDP	4	20.47***	0.0004	Reject Null
(5) FISDGDP does not Granger-cause GDPCF	4	63.38***	0.0000	Reject Null
(6) GDPCF does not Ganger-cause FISDGDP	4	71.95***	0.0000	Reject Null

* Null rejected with 90% confidence
** Null rejected with 95% confidence
*** Null rejected with 99% confidence

4.4.1 OLS Estimation Results

Table 4.8 presents the of OLS estimation results with the baseline model where the fiscal deficit to GDP ratio is the dependent variable with each cyclical components of output from BW, CF and HP filters with their lags as well as the lag of the fiscal deficit to GDP ratio as explanatory variables. The contemporaneous relationship between each cyclical component of output and the fiscal deficit to GDP ratio is positive, indicating the procyclical stance of the fiscal deficit to GDP ratio. In other words, in economic booms government tends to spend most of its revenue from favourable tax returns and any other windfall in the hand of the fiscal authorities. The relationship between the lags of the fiscal deficit to GDP ratio and its current value is positive and statistically significant, implying the persistence and influence of previous deficits on the

current deficit. With the exception of the lag of the cyclical component of output from the CF filter, the lags of cyclical component of output from the BW and HP filters are not significant in explaining the growth in the fiscal deficit. Though Granger-causal relationship was found between the fiscal deficit to GDP ratio and all the three measures of output, and the results from the regression also statistically strong in a causal sense, their impact based on the size of the coefficients on the deficit is rather small. But the regression result does show that there exists a relationship between the fiscal deficit to GDP ratio and fluctuations in output (based on the CF filter) around its long-run trend in a causal sense. The effects and the magnitude of the constants also show that if the coefficients on all the regressors are zero, governments would still run some deficits. Finally, the significant F-value and the small Prob>F as well as the medium-to-high adjusted R-squares show that overall the model fits well and could explain more than half the variability in the fiscal deficit to GDP ratio. Table 4.8 below presents the results of the OLS estimation with the fiscal deficit to GDP ratio as a dependent variable.

Dependent Variable: FISDGDP

Ordinary Least Squares Regression

Table 4.8

Variable	Model (1)	Model (2)	Model (3)
GDPBW	0.0017007 (1.00)	-	-
GDPBW(-1)	-0.0020591 (-1.20)	-	-
GDPCF	-	0.0005176 (0.43)	-
GDPCF(-)	-	-0.0025416 (-1.79)*	-
GDPHP	-	-	0.0014073 (0.94)
GDPHP(-1)	-	-	-0.001953 (-1.25)
FISDGDP(-1)	0.7112803 (7.34)***	0.712049 (7.39)***	0.7092133 (7.31)***
Constant	-1.469686 (-2.54)**	-1.499614 (-2.60)**	-1.490039 (-2.57)**
Adjusted R^2	0.5127	0.5127	0.5015
F(3, 48)	18.89	18.89	18.10
Prob > F	0.0000	0.0000	0.0000
Root MSE	2.6707	2.6482	2.6787

Note; *, **, *** indicates significance level at 10%, 5% and 1% respectively; estimated coefficients are given with t-ratios in parenthesis. N= 52

Table 4.9 below presents OLS estimation results with the cyclical components of output as the dependent variable. Since there are three alternative measures of the cyclical components of output, three separate regressions are run each time using the lag of the dependent variable and the current and immediate past value of the fiscal deficits to GDP ratio as regressors. The coefficients of the fiscal deficit to GDP ratio are positive and significant in all the equations implying the expansionary effect of the fiscal policy on output. The impact of the lags of the dependent variable on its current value is positive, again indicating persistence. For instance, an upward trend in output in the previous fiscal year is likely to continue into the current period (all things being equal) and likewise, a downward fluctuation in output will persist unless government actively engages in output stabilization to reverse the trend. However, the magnitude of the effect is not the same for each of the three measures of the cyclical component of output. The economic significance of the effect of the lag of the dependent variable (based on the BW filter) is small compared to the CF and HP filters. For example, a unit increase in output in the previous year would lead to an increase of (0.0594) in output (based on the BW filter); whilst a unit increase in previous output would lead to (0.2956) and (0.2222) in output (based on the CF and HP filters respectively). The economic impact of the lags of the fiscal deficit to GDP ratio on output is even more significant. A unit increase in the past deficit would lead to a fall in output up to (10.0922 for BW filter) and (10.8455 for HP filter) respectively. The past deficit has expansionary effect on output based on the CF filter. The overall model fit is not as strong as the first one, where the fiscal deficit to GDP ratio was the dependent variable.

Ordinary Least squares Regression

Dependent Variables; Model 1(GDPBW); Model 2(GDPCF) and Model 3(GDPHP)

Table 4.9

Variable	Model (1)	Model (2)	Model (3)
GDPBW(-1)	0.0594455	-	-
	(0.41)	0.2956258	-
GDPCF(-)	-	(1.75)*	
GDPHP(-1)	-	-	0.2222837
			(1.50)
FISDGDP	12.05911	7.324219	12.75621
	(1.00)	(0.43)	(0.94)
FISDGDP(-1)	-10.09222	0.8024776	-10.84555
	(-0.86)	(0.05)	(-0.81)
Constant	11.17662	52.863	13.52813
	(0.22)	(0.73)	(0.23)
Adjusted R^2	-0.0388	0.0106	-0.0042
F(3, 48)	0.36	1.18	0.93
Prob > F	0.7788	0.3246	0.4343
Root MSE	224.89	315.03	255.02

Note; *, **, *** indicates significance level at 10%, 5% and 1% respectively; estimated coefficients are given with t-ratios in parenthesis. N= 52

4.4.2 SUR Estimation Results

Table 4.10 below presents the results of the SUR estimation with the fiscal deficit to GDP ratio as a dependent variable. The contemporaneous relationship between the fiscal deficit to GDP ratio and each measure of the cyclical component of output is positive and statistically significant, and their economic impact based on the magnitude of the coefficients is stronger compared to similar coefficients in the OLS estimation results. Likewise the relationship

between the fiscal deficit to GDP ratio and lags of the cyclical components of output is negative and statistically significant, as well as their economic impact when compared to the OLS estimation results. The lags of the fiscal deficit to GDP ratio on its current value is significant both statistically and based on its impact on the deficit, implying the persistence in deficit accumulation. As in the OLS estimation, the constants in this regression are significant both statistically and in the economic sense, indicating that government would run deficits, even if it is not occasioned by fluctuations in output. Theoretically estimation results from SUR estimator give more robust estimates than the OLS estimator, since the SUR method estimates the parameters of all equations simultaneously, so that the parameters of each single equation also take the information provided by the other equations into account which results in greater efficiency of the parameter estimates. This is obvious from the table as the statistical significance of the parameter estimates are higher compared to the OLS estimates. Below is the result of the estimation.

Seemingly Unrelated Regression

Dependent variable; FISDGDP

Table 4.10

Variable	Model (1)	Model (2)	Model (3)
GDPBW	0.0033331 (2.07)**	-	-
GDPBW(-1)	-0.0021168 (-1.28)	-	-
GDPCF	-	0.0010312 (0.89)	-
GDPCF(-1)	-	-0.0026845 (-1.97)**	-
GDPHP	-	-	0.002765 (1.93)**
GDPHP(-1)	-	-	-0.0022259 (-1.48)*
FISDGDP(-1)	0.7138048 (7.67)***	0.7089463 (7.66)***	0.7117 (7.63)***
Constant	-1.458776 (-2.62)***	-1.521207 (-2.75)***	-1.482464 (-2.66)***
R-square	0.5246	0.5397	0.5228
Chi-square	62.67	61.98	61.61
P > Chi-square	0.0000	0.0000	0.0000
RMSE	2.590555	2.549086	2.595365

Note; *, **, *** indicates significance level at 10%, 5% and 1% respectively; estimated coefficients are given with z-statistics in parenthesis. N= 52

Table 4.11 below presents the second results of SUR estimation, with the cyclical components of output as the dependent variable. Once again the positive correlation between the lags of the cyclical components of output and its current value is observed in this estimation. The sign and magnitude of the coefficient of the current fiscal deficit to GDP ratio on output is positive and very significant. For instance, a unit increase in the fiscal deficit leads to an increase in output of about (23.6335; 14.5931 and 25.0624) for the cyclical components of output from BW, CF and HP filters respectively. The results also show the contractionary effect of previous deficits on current output. As it was in the case of the contemporaneous relationship between the fiscal deficit to GDP ratio and the cyclical components of output, the sign and the effects of the coefficients on the lags of the fiscal deficit to GDP ratio on current output is significant statistically and economically. For example, a unit increase in immediate past deficit would reduce current output by (18.2944; 4.3960 and 19.5416) for the cyclical components of output from BW, CF and HP filters respectively. This is a source of concern as persistent fiscal debts can be growth-reducing. In line with the second objective for undertaken this study and based on the results from the study that persistent deficits are growth-reducing, any attempt by government to reduce the deficit might affect output in the short-run, but in the long term a reduction in the fiscal deficit to GDP ratio would have no adverse effect on output and might even be a stimulus for future growth. Table 4.11 below, presents the results of the second SUR regression where each measure of the cyclical component of output is a dependent variable.

Seemingly Unrelated Regression

Dependent Variables: Model 1(GDPBW); Model 2(GDPCF) and Model 3(GDPHP)

Table 4.11

Variable	Model (1)	Model (2)	Model (3)
GDPBW(-1)	0.0825829 (0.59)	-	-
GDPCF(-1)	-	0.3130545 (1.93)**	-
GDPHP(-1)	-	-	0.2428373 (1.71)*
FISDGDP	23.63352 (2.07)**	14.59312 (0.89)	25.06248 (1.93)**
FISDGDP(-1)	-18.29443 (-1.62)*	-4.396061 (-0.27)	-19.54161 (-1.53)*
Constant	28.31894 (0.57)	63.60539 (0.91)	31.96159 (0.57)
R-square	0.0034	0.0653	0.0388
Chi-square	4.36	4.43	5.80
P > Chi-square	0.2247	0.2184	0.1217
RMSE	218.1392	303.2412	247.0925

Note; *, **, *** indicates significance level at 10%, 5% and 1% respectively; estimated coefficients are given with z-statistics in parenthesis. N= 52

4.4.3 VAR Estimation Results

Table 4.12 presents the results from the VAR estimation. The relationship between the contemporaneous fiscal deficit to GDP ratio and its previous year's value is positive and statistically significant which is indicative of the persistence in the fiscal deficit to GDP ratio. For instance, a 1-point increase in the previous deficit leads to about 0.45% increase in the current deficit across all the three models. On the other hand, the past year's deficit has a negative and statistically strong relationship with the cyclical component of output irrespective of the measure of the cyclical component of output. For example, a unit increase in the lag of the fiscal deficit to GDP ratio results in the fall in the cyclical component of output by (9.2712 for GDPBW); (8.0962 for GDBCF) and (8.9625 for GDPHP). This is indicative of the contractionary effect of the past deficits accumulation on output. The first and second lags of the fiscal deficit to GDP ratio on its current value are positive and statistically significant, so are the economic impacts of their coefficients. This shows persistence in the deficits overtime, and unless conscious efforts are made in consolidating the deficit, the upward trend would persist. Finally, The R-squares from the fiscal deficit to GDP ratio equation are (r =0.5645 for Model 1); (r = 0.5917 for Model 2) and (r = 0.5590 for Model 3), implying that the lags of the cyclical components of out and the lags of the fiscal deficits to GDP ratio explain more than half the variations in the fiscal deficit to GDP ratio. The VAR estimator provides the most significant coefficients of determination from the regressions carried out compared to the OLS and SUR methods. Table 4.12 below presents result of VAR estimation.

Vector Autoregression

Dependent variables: FISDGDP, GDPBW, GDPCF and GDPHP

Table 4.12

	Model (1)		Model (2)		Model (3)	
Regressors	**FISDGDP Eqn**	**GDPBW**	**FISDGDP Eqn**	**GDPCF**	**FISDGDP Eqn**	**GDPHP**
FISDGDP(-1)	0.4542115 (3.37)***	-9.27123 (-0.90)	0.4331858 (3.28)**	-8.096233 (-0.67)	0.4533897 (3.34)**	-8.962596 (-0.76)
FISDGDP(-2)	0.3223545 (2.43)*	8.970415 (0.88)	0.3488902 (2.71)*	12.72607 (1.08)	0.3212974 (2.40)	7.27643 (0.63)
GDPBW(-1)	-0.0014079 (-0.88)	0.0452544 (0.37)	-	-	-	-
GDPBW(-2)	-0.0019348 (-1.14)	-0.5608429 (-4.33)***	-	-	-	-
GDPCF(-1)	-	-	-0.0019124 (-1.53)	0.3650228 (3.20)**	-	-
GDPCF(-2)	-	-	-0.0021635 (-1.62)*	-0.8602365 (-7.05)***	-	-
GDPHP(-1)	-	-	-	-	-0.0009541 (-0.66)	0.2727384 (2.17)**
GDPHP(-2)	-	-	-	-	-0.0013787 (-0.91)	-0.559825 (-4.23)***
Constants	-1.222909 (-2.14)*	-8.609059 (-0.20)	-1.246194 (-2.25)**	16.50568 (0.33)	-1.23503 (-2.15)**	-15.77187 (-0.32)
R-square	0.5645	0.2721	0.5917	0.5274	0.5590	0.2879
RMS	2.58559	198.122	2.50363	228.596	2.60184	226.04
Chi-square	66.1077	19.0648	73.9012	56.91291	64.64966	20.62157
P > Chi-squ	0.0000	0.0008	0.0000	0.0000	0.0000	0.0004

Note; *, **, *** indicates significance level at 10%, 5% and 1% respectively; estimated coefficients are given with t-ratios in parenthesis. Sample: 1962 – 2012; N = 51

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

Persistent budget deficits for several decades has been the bane of development especially in the developing world, where huge and unsustainable public debts have resulted in some of these countries been declared as heavily indebted poor countries (HIPC); of which Ghana has been a one time member. Ghana's persistent fiscal deficits over the years, even after post HIPC days has been a source of concern for the country's fiscal authorities and all well-meaning stakeholders. Several reasons have been given in the research literature trying to explain the persistent deficits in most of the developing world. Reasons such as procyclical fiscal policy implementation, the voracity effects, less developed and shallow financial markets and output fluctuations have all been espoused. This study investigated the nexus between the fiscal deficit to GDP ratio and fluctuations in output in a causal sense. The study found a b-directional causality between the fiscal deficit to GDP ratio and output fluctuations in Ghana.

The study hypothesized that; Fluctuations in output do not drive budget deficits; there is no connection between the growing fiscal deficits and fluctuations in output. Three measures of cyclical components of output from HP, CF and BW filters together with the fiscal deficit to GDP ratio are used to estimate the base model. Three estimation methods were also used, which are the OLS, SUR and VAR.

5.2 Major Findings

Granger non-causality test between the fiscal deficit to GDP ratio and all the measures of the cyclical components of output was rejected in either direction at 99% confidence level implying

that past values of the fiscal deficit to GDP ratio are useful for predicting current movements in the cyclical component of output around trend; likewise past output fluctuations around trend were also able to explain the growth in the fiscal deficit to GDP ratio overtime. Taking as a whole the Granger-causality test specify a robust and useful relationship between the fiscal deficit to GDP ratio and the cyclical component of output.

The results from the regression support the practice of pro-cyclicality of the fiscal deficit to GDP ratio, in that when economic conditions are favourable government runs deficit and when economic conditions are bad, government could not spend much. This is evident from the positive correlations between the fiscal deficit to GDP ratio and the cyclical components of output, consistent with similar findings in other developing countries. The results also show that past fluctuations in output has a negative effect on the deficit in that previous output fluctuations induce current spending by government. In line with similar findings that output fluctuations drive budget deficits, the results from this research also show that budget deficits drive fluctuations in output.

Equally significant is the persistence and influence of past fiscal deficits on the current deficit; previous deficits influence current deficit positively. The results also show that whilst current government spending has an expansionary effect on output, previous deficits are growth-reducing, which is indicative of possible debt overhaul effect on output.

5.3 Conclusions

This study has used real annual GDP and fiscal deficit to GDP ratio data set on Ghana from 1960-2012 to analyze whether the cyclical component of GDP does indeed drive fiscal deficits and to ascertain if the practice of fiscal management in Ghana is procyclical. Various econometric methods have been employed to analyze this issue. Amongst them; ordinary least squares regression, seemingly unrelated regression, vector autoregression and granger-causality test. The study found support for the existence, in Ghana, of a causal relationship from cyclical fluctuations in output to fiscal deficits. The outcome of this research is consistent with other findings that fiscal policy is procyclical in most developing countries. Besides, by taking into account possible bi-directional causality, the study also identified a significant expansionary effect of government spending on output in Ghana.

5.4 Recommendations

Based on the findings from this study it the following recommendations are made;

There is bi-directional causation between budget deficits and output fluctuations in Ghana, to ensure that gains made in consolidating the fiscal deficit does not become short-lived, government must make a conscious effort to stabilize output so as to prevent downward fluctuations in output, since output fluctuations below trend, cause more spending by government which is not favourable for the deficit position of the country.

Since contemporaneous government spending has an expansionary effect on current output, but past deficits do not, it is recommended that government spending would be geared towards infrastructure and capital investments so that benefits from past government spending would spill over into current output to ensure long term growth in output.

The variables in the model have moderate effect size on the fiscal deficit. As mentioned earlier, there are other reasons for the escalation of the deficit which was outside the scope of this study, this calls for further research on the subject.

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