CAUSAL LINKAGES BETWEEN GOVERNMENT REVENUE AND SPENDING: EVIDENCE FROM GHANA

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Abstract
This study examines the causal links between revenues and expenditures of Ghana over the period 1983 to 2007 within the framework of Engle-Granger bivariate cointegration and error correction model. The bivariate cointegration results support the hypothesis that revenues and expenditures are cointegrated. Within the error correction approach, the paper finds evidence in support of tax-spend hypothesis in short run, while the spend-tax hypothesis is supported in long run. Policies intended to curtail Ghana’s recurring budget deficit problems must focus on adjusting revenues in the short run while a re-ordering of the intertemporal relationship between revenues and expenditures in a manner consistent with the economy’s revenue mobilization potential is absolutely crucial.

Key words: Revenue, expenditure, budget balance, deficit, fiscal position.
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1. Introduction

A budget deficit is not necessarily a bad thing as it can be used to prop up growth in the critical sectors of the economy. But there is a growing consensus among economists that lingering budget deficits have negative consequences for savings, investment, and public debt which could stunt economic growth. Franklin Roosevelt once said that any government, like any family, can for a year spend a little more than it earns but a continuance of that habit means the poorhouse\(^1\). It is the desire to prevent the occurrence of the poorhouse that fiscal policy makers in both developed and emerging economies have been looking for ways of curtailing budget deficits.

For emerging economies, budget deficits emanate from two main sources; rising demand for public expenditures for infrastructure and social sector investment on one hand, and lack of capacity to raise revenue from domestic sources to finance the increased expenditure primarily due to a narrow tax base. The presence of a large informal sector and inefficient revenue mobilization efforts are the worst culprits for governments’ constrained capacity to raise the needed revenue. As mentioned by Barua (2005), when the government opts for expansionary fiscal policy either through increasing expenditure or reducing taxes or both, it has to borrow from internal and external sources to finance the budget deficit. But expansionary fiscal policy in emerging economies mirrors increased government expenditures and not reduced taxation.

Understanding the relationship between revenue and expenditure is a crucial prerequisite for any effective fiscal consolidation process. The budget deficits can be reduced via changes in government expenditures, or revenues or both. The selection of any of these approaches should be based on the outcome of empirical investigation. On the revenue side, taxes have the potential to distort private agents’ decisions with respect to factor accumulation and supply (Carneiro et al., 2004). On the other hand, public expenditures reflect the policy choices of government. Once governments decide upon which goods and services to provide and the quantity and quality in which they will be produced, public expenditures represent the costs of carrying out these policies\(^2\).

The discussion of the causal link between revenues and expenditures has resulted in several hypotheses. The tax-spend hypothesis suggests changes in revenues induce changes in expenditures without a feedback. The spend-tax hypothesis takes the opposite view in that changes in expenditures induce changes in revenue without a feedback. The fiscal synchronization hypothesis argues that revenue and expenditure decisions are made jointly. Another view relates to the institutional separation of the expenditure and taxation decisions of government. The perspective holds that revenues and expenditures are independent of one another.

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\(^1\) Franklin Roosevelt was the president of the United States of America between 1933 and 1945.

\(^2\) For instance, Barro, 1990; Romer, 1990; and Bloom et al., 2001 argued that expenditure items such as public infrastructure, research and development, education and health can have positive impact on growth.
The focus of this paper is to examine the intertemporal relationship between government revenue and government expenditure and explore the policy implications for managing the budget deficit in Ghana. We will do so by testing the validity of these hypotheses in the case of Ghana. Utilizing cointegration analysis and error correction models, inferences can be drawn concerning the respective hypothesis mentioned above. Section 2 presents a brief overview of the hypotheses along with a review of the empirical literature. Section 3 highlights Ghana’s fiscal position with particular emphasis on the trends in the budget deficit and the sources of its financing. Section 4 discusses the methodology and the data used in the analysis. Empirical results are reported in Section 5 while Section 6 provides concluding remarks.

2. Literature Review

2.1 Theoretical Review
As stated in our introduction, four hypotheses have been set forth to describe the intertemporal relationship between revenues and expenditures.

First, the tax-spend hypothesis was championed by Friedman (1978), who posited that changes in government revenues lead to changes in government expenditures. Friedman (1982), re-emphasized his previous argument by suggesting that budget deficit cannot be reduced by simply raising taxes as this only results in more spending, leaving the deficit at the highest level acceptable by the public. Buchanan and Wagner (1977, 1978) advanced an alternative version of the tax-spend hypothesis. In contrast to Friedman (1978), they argue that tax increases would lead to spending cuts. The thrust of the Buchanan and Wagner (1977, 1978) version of the tax-and-spend hypothesis is that taxpayers suffer from fiscal illusion. According to the authors, tax cuts lower the perceived price of government provided goods and services by the public, which in turn increases the public demand for these goods and services. However, the public may actually incur even higher costs; a direct consequence of indirect inflation taxation that results if the government resorts to excessive money creation coupled with the fact that government debt financing is normally associated with higher interest rates which crowd out private investment. To reduce expenditures, Buchanan and Wagner favor limiting the ability of the government to resort to deficit financing. In sum, while tax changes as anticipated by Friedman drive spending changes, the relationship between the two as postulated by Buchanan and Wagner is an inverse one.

Second, the spend-tax hypothesis suggests that changes in government expenditures lead to changes in government revenues. Peacock and Wiseman (1979) argue that temporary increases in government expenditures due to ‘crises’ can lead to permanent increases in government revenues often called the ‘displacement effect’. Utilizing the Ricardian equivalence proposition, Barro (1974) argues that government borrowing today results in an increased future tax liability which is fully capitalized by the public. Thus, under Barro’s analysis fiscal illusion is absent in that increases in government spending lead to increases in direct taxes.

Third, Musgrave (1966) as well as Meltzer and Richard (1981) suggest that voters compare the marginal benefits and marginal costs of government services when formulating a decision in terms of the appropriate levels of government revenues and
expenditures. Thus, revenue and expenditure decisions are jointly determined under this fiscal synchronization hypothesis.

A fourth hypothesis mentioned by Baghestani and McNown (1994) and highlighted by Darrat (1998) relates to the institutional separation of the expenditure and taxation decisions of government. Here, expenditure would be defined on the basis of the requirements expressed by the citizenry and revenue would depend on the maximum tax burden tolerated by the population. As a result, the achievement of fiscal equilibrium would merely a matter of coincidence.

2.2 Empirical Review

The empirical literature on the tax-spend debate has yielded mixed results due in part to the various time periods analyzed, lag length specification used, and methodology employed. Generally, the methodology used in these studies has been to test for Granger causality within a vector autoregressive model; however, some of the studies test for Granger causality within an error-correction framework.

In the case of the United States of America, Blackley (1986), Ram (1988a), Bohn (1991), and Hoover and Shefrin (1992) provide evidence to support the tax-spend hypothesis while Anderson et al. (1986), Von Furstenberg et al. (1986), Jones and Joulfain (1991) and Ross and Payne (1998) find support for the spend-tax hypothesis. Manage and Marlow (1986), Miller and Russek (1989), and Owoye (1995) suggest the fiscal synchronization hypothesis is valid for the USA while Baghestani and McNown (1994) support the institutional separation hypothesis.

In the case of Canada, the studies by Ahiakpor and Amirkhalkhali (1989) and Payne (1997) support the tax-spend hypothesis while the evidence of Owoye (1995) supports the fiscal synchronization hypothesis. Regarding the remaining G7 countries Owoye (1995) finds the tax-spend hypothesis is valid for Italy and Japan while the fiscal synchronization hypothesis is supported in France, and the United Kingdom.

In a study of OECD countries, Joulfain and Mookerjee (1991) find support for the tax-spend hypothesis in Italy and Canada; support for the spend-tax hypothesis in the USA, Japan, Germany, France, United Kingdom, Austria, Finland, and Greece; and support for the fiscal synchronization hypothesis in Ireland.

In the case of Latin American countries, Ewing and Payne (1998) find evidence of a bi-directional causality between revenues and expenditures supporting the fiscal synchronization hypothesis in Chile and Paraguay. For Colombia, Ecuador, and Guatemala they find evidence of causality from revenues to expenditures supporting the tax-spend hypothesis. Baffes and Shah (1990, 1994) on their part, find that for Brazil, Mexico, and Pakistan strong bidirectional causality exists between revenues and expenditures, while for Argentina and Chile expenditures appear to cause revenues, supporting spend-tax hypothesis.

In the case Greece, Provopoulos and Zambaras (1991) as well as Hondroyiannis and Papapetrou (1996) provide evidence of the spend-tax hypothesis while Katrakilidis

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3 The G7 countries include: Canada, U.K, USA, France, Italy, Japan, and Germany
(1997) finds evidence in favor of fiscal synchronization. Ram (1988b) examines twenty-two countries comprising both developed and developing countries. Using constant price measures of revenues and expenditures, Ram finds support for the tax-spend hypothesis in El Salvador, Philippines, Thailand, and the United Kingdom; support for spend-tax hypothesis in Honduras and New Zealand; and support for the fiscal synchronization hypothesis in Nicaragua. The remaining eighteen countries display an absence of causality in either direction thus lending support for the institutional separation hypothesis.

For South Africa, Nyamongo et al. (2007) investigate the relationship between revenue and expenditure in the context of Vector Autoregressive (VAR) approach and conclude that revenue and expenditure are linked bidirectionally in the long run, indicating fiscal synchronization hypothesis, while no evidence of causation is seen in the short run which points to fiscal separation hypothesis.

On their part, Carneiro, et al., (2004) study the relationship between government revenue and expenditure in Guinea Bissau using Granger causality test and error correction and conclude that expenditures granger cause revenues, which indicates spend-tax hypothesis for Guinea Bissau.

Even though some empirical works have been done in the developing world, to the best of our knowledge, no such work exists in the case of Ghana. Thus this paper seeks to add to the existing knowledge about the government revenue-expenditure relationship in Ghana.

### 3.0 Fiscal Position in Ghana

#### 3.1 Trends in Budget Balance

The decade preceding the Economic Recovery Program/Structural Adjustment Program (ERP/SAP) witnessed significant economic decay which found expression in negative real growth, triple-digit inflation, and large fiscal deficits. In particular, the deficits averaged over 10% of GDP in the period, peaking at 13% of GDP in 1976. It however declined steadily to about 3% by 1983. The main causes of the budget deficit include trade shocks and a fall in international transactions, decline in economic activity, inadequacies and errors in domestic policy, and serious misalignment of the real exchange rate accompanied by the emergence of parallel markets, all of which adversely affected government revenues as well as the over-stretched public sector activity (Dordunoo, 2000). The economic crisis of the early 1980s was aggravated by the severe bush fires due to prolonged drought accompanied by famine, and the return of over one million Ghanaians who were expelled from Nigeria in 1983. These developments led to the adoption of the World Bank/IMF sponsored Economic Recovery and Structural Adjustment programs with a view to returning the economy to the path of growth and development.

The main fiscal objective of the ERP and the SAPs was to reduce the budget deficits in order to control inflation and halt crowding-out of the private sector through the

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4 The expulsion of one million Ghanaians would have raised the country’s population by almost 10% as the 1984 population census put the country’s population at 12.4 million.
following policy measures; first, increase in the efforts of revenue mobilization through adjustment of the exchange rate to realistic levels, broadening the export base of the economy, and decontrolling prices of goods and services, and second, selective reduction in some items of government expenditure and elimination of waste through, privatization of inefficient State Owned Enterprises (SOEs), introduction of strict expenditure monitoring and control to reduce the pervasive financial indiscipline in the system, and redeployment and/or retrenchment of excess labour in the public sector.

The public expenditure-revenue gap narrowed with the inception of the ERP/SAPs in 1983 and by mid 1980s revenues had outstripped expenditures translating into a surplus which was maintained until 1991 (see Figure 1). The surplus achieved during this period was due to the large foreign inflows accompanied by a more efficient public spending. As Figure 1 shows the budget balance excluding grants remained in deficit throughout this period. Following expenditure expansion in 1992 as result of the democratization process culminating in general elections, the budget deficit rebounded reaching 4.8% of GDP in 1992. However, there was a steady reduction in the size of the deficit culminating in a budget surplus for fiscal years 1994 and 1995 of 2.3% and 0.9% of GDP respectively. The large deficits reemerged in 1996 (another election year) after recovering from the 1992 level. A similar pattern was also witnessed in 2000, which was another election year. The fiscal discipline introduced as a new administration took office in 2001 meant a significant reduction in the budget deficit from a high of 8.6% of GDP in 2000 to a low of 1.96% of GDP in 2005. Fiscal spillage associated with the election cycle was however absent in 2004 as expenditure growth lagged behind revenues generated. There was a deviation from this path following the energy crisis which began in 2006, and expenditures associated with “Ghana at 50” celebrations, the hosting of the AU summit in Accra in 2007, and the hosting of the 2008 African Cup of Nations. The cumulative effect of these developments was a fiscal deficit of 8.1% of GDP at the end of 2007.

5 The oil price hikes of 2000 worsened Ghana’s fiscal position as was the case in other non-oil producing developing countries.
6 Government spending increased from 25.7% of GDP in 2001 to 28.4% of GDP in 2004; government revenue on the other hand, rose from 22.1% of GDP in 2001 to 26.6% of GDP in 2004.
7 This refers to the country’s golden jubilee celebration of its independence.
3.2 Financing the Budget Deficit

The public finance literature recognizes four broad means through which a country can finance its budget deficit; namely (i) it can run down its cash reserves, (ii) it can sell some of its assets like properties, shares in companies, and even enterprises, (iii) it can print more currency, which in turn will increase money supply, and (iv) it can also borrow from central and/or Deposit Money Banks (DMBs) or from the general public internally and externally. Each method employed in financing the deficit has its own economic implications. For instance, whilst external borrowing increases an economy’s external debt and therefore high interest payments, domestic borrowing does not only raise domestic debt profile but it also impinges on inflation and interest rates and hurt the long run growth path of the economy.

The Government of Ghana over the years has utilized more or less all of these means but the major source of financing the budget deficit has been borrowing from both the banking and the private sector (Domestic sources) which for the study period averaged about 70% of the overall deficit financing. Domestic financing of the budget deficit in 1999 was 83% of the overall financing or 5.4% of GDP, out of which 93 percent or 5.1 percent of GDP came from the banking sector, of which 21 percent or 1.1% of GDP came from BoG. It is significant to note that by the year 2000, domestic financing of the deficit shot up to 102% of the overall financing or 8.8 percent of GDP; the banking sector's share was 80% or 7.0% of GDP, and Bank of Ghana’s

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8 In circumstances where the budget deficit is defined to include divestiture as is the case in this study, item (ii) ceases to be a means of financing the deficit.
9 Ghana agreed to access relief under HIPC initiative in 2001 because its external debt became unsustainable.
10 In this case, excess domestic resources were mobilized to meet some external obligations. The reverse is the case if the proportion of external financing exceeds 100% (e.g., in 2005 external financing was 124.4 percent of the deficit).
share of the banking sector was 94% or 6.6 percent of GDP. Such level of Central Bank financing of the budget deficit is consistent with the high inflation and the considerable macroeconomic instability witnessed between 1999 and 2000.

During the last seven years, the composition of the deficit financing has undergone a paradigm shift. In 2001, government succeeded in traditional debt rescheduling (exceptional financing) of up to 22.3 percent of the overall deficit. And since 2003, exceptional financing mainly related debt relief (Cologne terms) constitute a large proportion of the overall deficit financing, averaging over 40 percent between 2003 and 2007. With legal restriction and West Africa Monetary Zone (WAMZ) criterion now setting a limit on the Central Bank’s ability to finance the deficit\(^\text{11}\), emphasis also shifted from domestic financing to external financing. This period also coincided with a disinflationary process and a considerable ease in interest rates path, resulting in appreciable macroeconomic stability.

### Table 1: Financing the Budget Deficit

<table>
<thead>
<tr>
<th>Year</th>
<th>Overall Budget Balance (million GH₵)</th>
<th>% of GDP</th>
<th>Domestic (Net) Financing (% of Overall)</th>
<th>Foreign (Net) Financing (% of Overall)</th>
<th>Exceptional Financing (% of Overall)</th>
<th>Savings due to Inflation-indexed Bonds (%)</th>
<th>Other Financing (% of Overall)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>0.34</td>
<td>0.2</td>
<td>831.0</td>
<td>-731.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>1991</td>
<td>3.90</td>
<td>1.5</td>
<td>133.0</td>
<td>-33.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>1992</td>
<td>-14.44</td>
<td>-4.8</td>
<td>100.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>1993</td>
<td>-9.73</td>
<td>-2.6</td>
<td>47.0</td>
<td>53.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>1994</td>
<td>11.17</td>
<td>2.3</td>
<td>24.0</td>
<td>76.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>1995</td>
<td>7.03</td>
<td>0.9</td>
<td>39.0</td>
<td>61.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>1996</td>
<td>-33.55</td>
<td>-3.2</td>
<td>158.3</td>
<td>-58.3</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>1997</td>
<td>-117.39</td>
<td>-8.2</td>
<td>62.0</td>
<td>38.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>1998</td>
<td>-104.87</td>
<td>-6.1</td>
<td>64.0</td>
<td>36.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>1999</td>
<td>-133.97</td>
<td>-6.5</td>
<td>83.0</td>
<td>17.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>2000</td>
<td>-234.09</td>
<td>-8.6</td>
<td>102.4</td>
<td>-2.4</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>2001</td>
<td>-166.08</td>
<td>-4.4</td>
<td>29.2</td>
<td>48.4</td>
<td>22.3</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>2002</td>
<td>-298.64</td>
<td>-6.1</td>
<td>92.7</td>
<td>7.3</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>2003</td>
<td>-232.93</td>
<td>-3.5</td>
<td>-10.6</td>
<td>27.0</td>
<td>83.6</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>2004</td>
<td>-221.34</td>
<td>-2.8</td>
<td>15.1</td>
<td>57.3</td>
<td>41.1</td>
<td>-13.5</td>
<td>0.0</td>
</tr>
<tr>
<td>2005</td>
<td>-190.02</td>
<td>-2.0</td>
<td>-80.0</td>
<td>124.4</td>
<td>60.7</td>
<td>-5.0</td>
<td>0.0</td>
</tr>
<tr>
<td>2006</td>
<td>-897.09</td>
<td>-7.8</td>
<td>53.1</td>
<td>25.1</td>
<td>10.3</td>
<td>-0.8</td>
<td>12.3</td>
</tr>
<tr>
<td>2007</td>
<td>-1132.19</td>
<td>-8.1</td>
<td>63.0</td>
<td>14.0</td>
<td>8.1</td>
<td>0.0</td>
<td>14.9</td>
</tr>
</tbody>
</table>

\(^{11}\) West Africa Monetary Zone (WAMZ) criterion states that respective central banks cannot finance the budget deficit of more than 10% of the previous year’s revenue whilst the Bank of Ghana’s Act of 2002 imposed similar restrictions but based on the projected current year’s revenue.
4. Methodology and Data Issues

4.1 Data Issues

Government revenue and spending data are collected from the database of the Bank of Ghana, Ministry of Finance and Economic Planning, and Ghana Statistical Service. GDP at current prices and the GDP deflator data are collected from Bank of Ghana’s database. Annual data from 1983 to 2007 are taken and converted into quarterly series. To circumvent the debate regarding whether nominal or real form of revenue and expenditure would be appropriate to test causality between the variables, we intend to carry out the analysis in both nominal and real terms. The revenue and expenditure series are scaled by the GDP and deflated by the Consumer Price Index (1998Q4=100). In the case of the real GDP, the nominal GDP is deflated by the GDP deflator.

4.2 Methodology

The existence of a causal relationship between two variables when a common trend exists between them have been investigated by Granger (1986), Engle and Granger (1987), Engle and Yoo (1987), and Johansen and Juselius (1990). In the econometric literature, if two time series are individually nonstationary but some linear combination of them is a stationary process it follows that the series are cointegrated. A time series is said to be integrated of order zero, $I(0)$, if its mean, variance, and covariances are invariant with respect to time. If the time series requires first-order differencing to achieve stationarity, it is said be integrated of order one, $I(1)$. If there exists some linear combinations of the two series which is $I(0)$, then cointegration is present.

In order to examine the stationarity of the respective time series in this study the following Augmented Dickey-Fuller (ADF) test was performed on each series:

$$\Delta X_t = \alpha + \beta t + (\rho - 1)X_{t-1} + \sum_{j=1}^{p} \rho_j \Delta X_{t-j} + \ell_t$$

where $\Delta$ is the first-difference operator; $t$ is a linear time trend; $\ell_t$ is a covariance stationary random error term and $\rho$ was determined by the Schwarz criterion to ensure serially uncorrelated residuals. The null hypothesis is that $X$ is a nonstationary series and is rejected if $(\rho - 1) < 0$ and statistically significant. If the respective time series are difference stationary, $I(1)$, then cointegrating regression can be undertaken to determine whether or not linear combinations of the series are stationary.

Given the bivariate nature of the study, we employ the Engle-Granger cointegration procedure to test for the presence of cointegration between the two time series. If both time series are integrated of the same order then one can proceed with the estimation of the following cointegration regressions. Let $GR$ denote the revenue measures and $GE$ denote the expenditure measures.\(^{12}\)

\(^{12}\) The variables are transformed into logarithms to permit interpretation of their coefficients as elasticities.
\[ GR_i = \beta_0 + \beta_i GE_i + \varepsilon_i \] (2a)

and
\[ GE_i = \alpha_0 + \alpha_i GR_i + \nu_i \] (2b).

The residuals, namely, \( \varepsilon_i \) and \( \nu_i \), from the above cointegrating regressions are then tested for stationarity to determine whether or not the two time series are cointegrated by using the following ADF unit root tests on the respective residuals.

\[ \Delta \varepsilon_i = \delta_0 + \delta_i \varepsilon_{i-1} + \sum_{j=1}^{n} \delta_j \Delta \varepsilon_{i-j} + \eta_{it} \] (3a)

and
\[ \Delta \mu_i = \lambda_0 + \lambda_i \mu_{i-1} + \sum_{j=1}^{n} \lambda_j \Delta \mu_{i-j} + \eta_{2i} \] (3b)

where \( \eta_{it} \) and \( \eta_{2i} \) represent the respective stationary random errors. The null hypothesis of nonstationarity (not cointegrated) is rejected when \( \delta_i \) and \( \lambda_i \) are significantly negative. If cointegration is present the following error correction models can be used to test for granger causality.

\[ \Delta GR_i = \phi_0 + \sum_{j=1}^{n} \phi_{ij} \Delta GR_{i-j} + \sum_{j=1}^{n} \phi_{2j} \Delta GE_{i-j} + \gamma \varepsilon_{i-1} + \zeta_{1i} \] (4a)

and
\[ \Delta GE_i = \sigma_0 + \sum_{j=1}^{n} \sigma_{ij} \Delta GE_{i-j} + \sum_{j=1}^{n} \sigma_{2j} \Delta GR_{i-j} + \tau \mu_{i-1} + \zeta_{2i} \] (4b)

where \( \Delta GR_i \) and \( \Delta GE_i \) are first-difference stationary and cointegrated with \( \varepsilon_{i-1} \) and \( \mu_{i-1} \) representing the lagged values of the error terms from the cointegrating regressions given by equations (2a) and (2b). From equation (4a) the null hypothesis that \( \Delta GE_i \) does not granger cause \( \Delta GR_i \) is rejected if the coefficients \( \phi_{2j} \)’s are jointly significant, or if \( \gamma \), the coefficient on the error correction term, is significant. If the coefficient \( \gamma \) is significant, then the null hypothesis of no long run equilibrium relationship can be rejected. Similarly, from equation (4b) the null hypothesis that \( \Delta GR_i \) does not granger cause \( \Delta GE_i \) is rejected either if the coefficients \( \sigma_{2j} \)’s are jointly significant, or if the coefficient on the error correction term is significant. If the coefficient \( \tau \) is significant, then the null hypothesis of no long run equilibrium relationship can be rejected. One can interpret the lagged changes in independent variables in equations (4a) and (4b) as representing the short run causal impact while the error correction terms provide the adjustments of \( \Delta GR_i \) and \( \Delta GE_i \) towards their respective long run equilibrium.

5. Empirical Results

Table 1 presents the results of the ADF tests on each variable in levels and in first differences. In the case of the levels of the series, the null hypothesis of non-stationarity cannot be rejected for any of the series. Therefore, the levels of the series are non-stationary. Applying the same tests to first differences to determine the order of integration, the critical value is (are) less (in absolute terms) than the calculated values of the test statistic for both series. Given the respective revenue and expenditure measures are integrated of the same order we proceed to test for
cointegration using the Engle-Granger bivariate methodology. Equations (2a) and (2b) were estimated by OLS and the respective residuals were tested for stationarity using ADF unit root test outlined in equations (3a) and (3b). We found evidence that the revenue and expenditure measures are cointegrated.

Table 1: ADF Unit Root Test

<table>
<thead>
<tr>
<th>variables</th>
<th>Levels</th>
<th>p-values</th>
<th>First-Difference</th>
<th>p-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>NGE</td>
<td>-0.13085</td>
<td>0.9419</td>
<td>-3.402315</td>
<td>0.0135**</td>
</tr>
<tr>
<td>RGE</td>
<td>-0.35572</td>
<td>0.9109</td>
<td>-2.941056</td>
<td>0.0449**</td>
</tr>
<tr>
<td>NGR</td>
<td>-1.21349</td>
<td>0.6659</td>
<td>-3.729674</td>
<td>0.0051*</td>
</tr>
<tr>
<td>RGR</td>
<td>-1.15538</td>
<td>0.6906</td>
<td>-4.047638</td>
<td>0.0019*</td>
</tr>
</tbody>
</table>

Critical values at 1%, 5%, and 10% are taken from MacKinnon (1996) and reported by E-views 5.0.
* denotes significant at 1% level and ** denotes significance at 5% level.

Table 2: Engle-Grange Cointegration Test and Long run Relationship

<table>
<thead>
<tr>
<th>Cointegration Regression</th>
<th>Adj. R^2</th>
<th>ADF*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Real Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GR=0.34+0.86GE…….(2a’)</td>
<td>0.8575</td>
<td>-3.9419 (0.0027)</td>
</tr>
<tr>
<td>GE=0.07+1.03GR…….(2b’)</td>
<td>0.8575</td>
<td>-3.9353 (0.0027)</td>
</tr>
<tr>
<td><strong>Nominal Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GE=0.22+0.88GR……..(2a’”)</td>
<td>0.8667</td>
<td>-3.8668 (0.0034)</td>
</tr>
<tr>
<td>GR=0.18+0.99GE…….(2b’”)</td>
<td>0.8667</td>
<td>-3.9419 (0.0071)</td>
</tr>
</tbody>
</table>

* p-values are in brackets and indicate significance at 1% in all four cases

The cointegration regressions in Table 2 suggest that a 1 percent increase in real expenditures as a percent of GDP raises the long run value of real revenues as percent of GDP by 0.86 percent (see equation 2a’), while a 1 percent rise in revenues elicit 1.03% increase in government expenditures (2b’). In nominal terms, a 1 percent increase in government revenue increases government expenditure by 0.88 percent, but a 1 percent rise in government expenditure results in 0.99 percent in government revenues. The coefficients on the revenue and expenditure variables are positive, reflecting the positive relationship between government revenues and spending.

The next step is to estimate the error correction models given in equations (4a) and (4b) to test for Granger causality. The t-statistic on the respective error correction terms can be used to draw inference on the direction of causality. For instance, from equation (4a) a statistically significant coefficient on \(e_{t-1}\) suggests that expenditures cause revenues thereby supporting the spend-tax hypothesis. Likewise from Equation (4b) a statistically significant coefficient on \(\mu_{t-1}\) suggests that revenues cause expenditure thereby supporting the tax-spend hypothesis. If both error correction terms are statistically significant then the fiscal synchronization hypothesis is supported. On the other hand, if both error correction terms are statistically insignificant then the fiscal separation hypothesis is supported.
The results of the error correction models are presented in Tables 3A and 3B. The diagnostic statistics indicate that the equations are well specified. None of the statistics shown in the tables are significant at the 5% level. The models satisfied the conditions of non-serial correlation, functional form specification and the normality of the disturbance terms. There is also absence of heteroskedascity in the equations. The cumulative sum (CUSUM) and cumulative sum of squares tests show that the model parameters are stable.

As can be deduced from the two tables, the coefficients on the lagged changes in revenue variables in the expenditure functions are statistically significant but the coefficients on lagged changes in expenditures are statistically insignificant, indicating the presence of a unidirectional causality running from revenue to expenditure in the short run. This appears to support the tax-spend hypothesis for Ghana. This finding is consistent with the budgetary process in Ghana. Traditionally, the first stage of the budgetary process involves the prediction of the growth of the economy and therefore the projection of government revenues. Based on the revenue projections, the Ministry of Finance and Economic Planning then establishes deficits limits for the various Ministries, Departments and Agencies (MDAs).

However, the coefficients on the error correction terms are statistically insignificant in both expenditure functions but such coefficients are statistically significant in the revenue equation (see Tables 3A and 3B). This indicates that in the long run there is unidirectional causality from expenditure to revenue, providing support for the spend-tax hypothesis. The establishment of a long run relationship in the revenue equation also means that the risk of fiscal explosion is highly limited, but suggests that the government seems to plan the expenditure first and then raise revenues, or request or receive grants to finance the expenditures so planned. The speed of adjustment to restore equilibrium indicates that less than 10% (-0.08 in real terms and -0.06 in nominal terms) of any deviation from the long run path between revenue and expenditure is corrected over the next quarter and points to persistence in the budget deficits.

Reaching the same conclusion from Tables 3A and 3B does not only suggest how successful the Ghanaian government has been in stabilizing aggregate price level (inflation) and economic growth but also renders the debate over which time series data is appropriate, whether nominal or real, trivial at least in the Ghanaian case.
Table 3A: Error Correction Models (Real Variables)**

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>ΔGE</th>
<th>ΔGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.00027 (1.5334)</td>
<td>0.0015 (0.734)</td>
</tr>
<tr>
<td>ΔGE_{t-1}</td>
<td>0.97237* (16.2161)</td>
<td>0.1127 (1.1196)</td>
</tr>
<tr>
<td>ΔGR_{t-1}</td>
<td>-0.13791* (-3.0024)</td>
<td>0.7609* (14.0653)</td>
</tr>
<tr>
<td>ε_{t-1}</td>
<td>-0.00635 (-0.481413)</td>
<td>-0.0801 (-4.5013)*</td>
</tr>
<tr>
<td>μ_{t-1}</td>
<td></td>
<td>0.08201 (-4.5013)*</td>
</tr>
</tbody>
</table>

R^2 0.7894 0.892
Serial Correlation LM Test [p-value] 0.0247 [1.283692] 0.0038 [0.6888]
ARCH(1) [p-value] 0.011112 [1.731835] 0.4237 [1.32456]
Ramsey Reset Test [p-value] 0.112165 [0.738481] 2.3187 [0.131371]
Jarque-Bera Normality Test [p-value] 3.541512 [0.170204] 1.0626400 [0.587828]
F-statistics 112* 127*

* denotes significance at 1% level
** t-statistics are in parentheses

Table 3B: Error Correction Models (Nominal Variables)

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>ΔGE</th>
<th>ΔGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.0015(1.2125)</td>
<td>0.001128(0.5846)</td>
</tr>
<tr>
<td>ΔGE_{t-1}</td>
<td>1.0221(23.1868)*</td>
<td>0.126443(1.743444)</td>
</tr>
<tr>
<td>ΔGR_{t-1}</td>
<td>-0.10675(-3.5413)*</td>
<td>0.770233(16.0092)*</td>
</tr>
<tr>
<td>ε_{t-1}</td>
<td>-0.015929(-1.8382)</td>
<td></td>
</tr>
<tr>
<td>μ_{t-1}</td>
<td></td>
<td>-0.062185(-4.0050)*</td>
</tr>
</tbody>
</table>

R^2 0.87745 0.826160
Serial Correlation LM Test [p-value] 0.004583 [0.3155] 0.006534 [0.4252]
ARCH(1) [p-value] 0.56055 [0.105200] 0.464030 1.591772
Ramsey Reset Test [p-value] 1.109279 [0.295090] 2.720901 [0.102567]
Jarque-Bera Normality Test [p-value] 1.3668605 [0.504442] 1.927421 [0.059974]
F-statistics 214* 142*

* denotes significance at 1% level
** t-statistics are in parentheses

6. Concluding Remarks

The paper investigates the causal relationship between revenue and expenditures by using Ghana’s fiscal data spanning 1984 first quarter to 2007 fourth quarter. Employing Engle-Granger cointegration test, we show that revenues and expenditures
are cointegrated. Working with error correction models, we find that in the short run causality runs unidirectionally from revenue to expenditure suggesting tax-spend hypothesis whilst in the long run causation runs from expenditure to revenue indicating spend-tax hypothesis.

The policy implications for Ghana are summarized as follows. First, fiscal policy focus should be on adjusting revenue in order to control spending and the size of the budget deficits at least in the short run. Second, in the long run the government could seek ways to re-order the intertemporal relationship between expenditures and revenues in a way consistent with the country’s revenue mobilization potential. This could be done by strengthening the medium-term budgeting framework with an ultimate objective to control spending rather than raising revenues. This would enable the country reestablish a sustainable fiscal path without reducing critical expenditure and keeping the economy’s long run growth trajectory.
References


Appendix

Figure 1: Plot of Cumulative Sum of Recursive Residuals of Revenue Equation

The straight lines represent critical bounds at 5% significance level

Figure 2: Plot of Cumulative Sum of Squares Recursive of Residuals of Revenue Equation

The straight lines represent critical bounds at 5% significance level

Figure 3: Plot of Cumulative Sum of Recursive Residuals of Expenditure Equation

The straight lines represent critical bounds at 5% significance level

Figure 4: Plot of Cumulative Sum of Squares Recursive of Residuals of Expenditure Equation

The straight lines represent critical bounds at 5% significance level