

Sustainability of Fiscal Policy: The West African Monetary Zone (WAMZ) Experience

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Abstract

The issue of fiscal sustainability is very important for macroeconomic management. The main focus of this paper is to empirically assess the sustainability of fiscal policy in the countries of the WAMZ using annual time series data for the period 1980 to 2008. The present value budget constraint provides the methodology for analyzing fiscal sustainability in a cointegrating framework that accommodates both stationary and non-stationary variables. Granger causality test was also employed. It was evident from the empirical results that fiscal policy was weakly sustainable for all the countries except Sierra Leone whose fiscal policy was found to be unsustainable. The Granger causality results support the hypothesis of tax-and-spend for Gambia, Guinea and Sierra Leone, while a bi-directional causality was established for Ghana and Nigeria.

JEL Classification: E62, H62, H63

Keywords: Cointegration, Fiscal Policy Sustainability, Present Value Budget constraint, Granger Causality, WAMZ countries

The sustainability of public finances is a key policy issue for the West African Monetary Zone (WAMZ)². Within the WAMZ fiscal framework, fiscal discipline is an important support for the implementation of monetary policy. The existence of sound fiscal policies is seen as a necessary objective for individual countries to pursue. Sustainability is usually discussed in the context of non-drastic shift in fiscal policy to satisfy debt obligations. The analysis of fiscal sustainability focuses on the ability of the government to generate an adequate level of primary budget surplus in order to stabilize its debt ratio. Thus, the purpose of analyzing fiscal sustainability is usually to show the difference between the fiscal position resulting from current policies and the sustainable position in a certain moment in future. The general intuition of fiscal sustainability is self-evident: sustainable policies are those that can be continued on current trends, while unsustainable policies will ultimately have to be modified.

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² The countries of the WAMZ include The Gambia, Ghana, Guinea, Nigeria and Sierra Leone.

The Treaty establishing the WAMZ was adopted by the Authority of Heads of State and Government of Economic Community of West African States (ECOWAS) at its Summit in Lome, Togo in December 1999. The central tenet of the Treaty was the formation of a second monetary zone, the WAMZ, as a fast track initiative to economic and monetary integration in West Africa. It was agreed that WAMZ would merge with the West African Economic and Monetary Union (WAEMU) to create a single ECOWAS monetary union. However, the launching of the monetary union has been postponed thrice following the poor status of macroeconomic convergence. There are four primary and six second criteria that need to be satisfied for the formation of the monetary union. The primary convergence criteria include: single digit inflation; fiscal deficit/GDP ratio of not more than 4.0 percent; central bank financing of central government deficits of not more than 10.0 percent of the previous year's tax revenue and external reserves to cover at least three months of normal imports. The major challenge faced by most of the countries is predominantly in the form of fiscal constraint.

Long term fiscal sustainability plays an important role in a monetary union because of the spill-over effects that spread the negative consequences of one member state's fiscal excessiveness and unwarranted public debt to the others. Fiscal deficit that is financed through external borrowing will increase external debt burden and directly reduces external sustainability. The accumulation of large debts naturally generates a debt overhang that creates a permanent climate of financial fragility for member countries. For countries in the monetary union, this is crucial as debt servicing obligations crowd out resources for social services and therefore exacerbate poverty situations. Protracted fiscal imbalances by one member state would produce negative externalities on the entire monetary union through an increase in real interest rates, a reduction in public investment, and the consequent deterioration of growth potential for all members.

In addition, a fiscal policy (budgetary course) that is not sustainable in the long run would eventually undermine the ability of the central bank to maintain monetary stability. This will result in high inflation engendered through central bank financing of the fiscal deficit (monetization of the deficit). An expansion in domestic credit will increase imports and thereby reduce the amount of foreign exchange available to the domestic economy, resulting to a fall in months of import cover. Domestic financing may also increase pressure for exchange rate depreciation. Thus, maintaining fiscal sustainability is seen as a *sine qua non* for the establishment of monetary union, especially within the WAMZ, since unsustainable fiscal policy may impede the achievement and sustainability of the primary convergence criteria.

Many studies have been done on fiscal policy sustainability using both the present value borrowing constraint and the Accounting Approach. Following Hamilton and Flavin

(1986), many studies such as Trehan and Walsh (1988), Hakkio and Rush (1991), Tanner and Liu (1994), Liu and Tanner (1995), Makrydakis, Tzavalis and Balfoussias (1999), Issler and Lima (2000), Green, Holmes and Kowalski (2001) and Bravo and Silvestre (2002) have tested the sustainability of budget deficits using the intertemporal budget constraint of the government. While Hamilton and Flavin (1986), Trehan and Walsh (1988, 1991), Hakkio and Rush (1991), Tanner and Liu (1994) and Liu and Tanner (1995) test the sustainability of US government deficits; Makrydakis, Tzavalis and Balfoussias (1999) analyze it for Greece, Issler and Lima (2000) did it for Brazil, Green, Holmes and Kowalski (2001) for Poland and Bravo and Silvestre (2002) for eleven European countries.

The aim of this paper is to empirically assess the sustainability of fiscal policy for the WAMZ countries by applying recent advances in the econometrics of non-stationary time series and cointegration. This paper is not only an attempt to contribute to the empirical debate vis-à-vis fiscal sustainability, but it differs from previous studies in several aspects. First, despite the existence of a plethora of empirical work on fiscal sustainability, there is a dearth of work in the case of the WAMZ economies. The researchers are not aware of any study on fiscal sustainability in the WAMZ. Second, this paper utilized the Granger causality methodology to ascertain whether countries of the WAMZ are characterized by either the tax-and-spend, spend-and-tax or fiscal synchronization hypotheses, and this has implications for fiscal sustainability. Following the introduction, the rest of the paper is structured as follows. Section two provides the literature on fiscal sustainability including the theoretical and empirical literature. Section three discusses the development and trends in fiscal policy in the WAMZ countries. Section four addresses the methodology of fiscal sustainability and the approaches used to validate the sustainability of fiscal policy. The empirical result on fiscal sustainability in the WAMZ is addressed in section five, while section six gives the conclusion and policy implications of the study.

LITERATURE REVIEW

The notion of fiscal sustainability has been defined in several ways depending on the methodology used. Wilcox (1989) noted that a sustainable fiscal policy is one that would be expected to generate a sequence of debt and deficits such that the Present Value condition would hold. If this condition is violated, perpetual deficits will be impossible and changes in the fiscal policy will be inevitable. Cuttington (1997) indicated that, if an economy generates a constant debt-GDP ratio under a specified GDP growth rate and constant real interest rates, then the fiscal deficit is said to be sustainable. On the other hand, fiscal sustainability is also related to the solvency of the government. An unsustainable policy will eventually lead to the insolvency of the government if necessary changes are not introduced to the fiscal policy (Buiter and Patel, 1992).

Two commonly used approaches to evaluating fiscal sustainability dominate the theoretical literature, which include: the Accounting Approach and the Present Value Budget Constraint (PVBC) Approach. The Accounting approach focuses on pre-defined macroeconomic targets in the economy, which include inflation, growth rate of the economy (g) and interest rate (r). According to this approach, a primary deficit (or surplus) is defined as sustainable if it generates a constant (rather than ever-increasing) debt/GDP ratio, given a specified real GDP growth target and constant real interest rate. Therefore, the sustainability condition implies that the growth rate of the economy (g) must be larger than the real interest rate (r). The accounting approach involves the use of a number of indicators of fiscal sustainability, which are based on the Government Budget Constraint. These include debt to GDP ratio, Debt to Export, Total revenue to GDP, etc. Cuddington (1996), presents an approach based on the steady state debt-income ratio condition³.

The PVBC for assessing fiscal sustainability, on the other hand, involves economic testing of the PVBC or of the non-ponzi game (NPG)⁴ condition for a set of time series data on government expenditure, revenue, deficits and/or debt. This involves tests of stationarity and cointegration analysis. According to the PVBC approach, sustainability is said to exist when the present value of budget constraint (PVBC) is satisfied without a major and abrupt correction having to be made in the balance of income and expenditure to avoid solvency and liquidity problems. Solvency, in turn, is ensured when the present value of current and future primary expenditure is not greater than that of current and future streams of income, net of any initial indebtedness. Hakkio and Rush (1991) developed the empirical approach of the sustainability of fiscal policy through cointegration tests between government revenue and expenditure, while Hamilton and Flavin(1986) also considered cointegration tests between fiscal deficit and government debt.

Empirical studies involving sustainability of fiscal policy became an important issue in economic policy mainly after the 1980s, stimulated by the increasing US fiscal deficits as well as the debt crises that affect Latin American countries⁵. There has been a diverse body of studies on fiscal sustainability. Hamilton and Flavin (1986) pioneered the PVBC approach to analyze the concept of fiscal sustainability. Applying this methodology to the US data from 1960 to 1981, and using real primary surplus, seignorage and real debt stock,

³ $PS = \frac{r_t - g_t}{1 + g_t} b$, where PS is primary surplus to GDP ratio, b is the debt to GDP ratio, r_t

is real interest rate and g_t is growth rate in GDP

⁴ The non ponzi game condition states that the present value of the stock of public debt goes to zero in the limit

⁵ See Appendix for review of relevant literature on fiscal sustainability

they found that the US Budget balance presented a long run sustainable path, despite its systematic budget deficits. However, Kremers (1988) re-examined this conclusion by stating that in order to satisfy the PVBC, debt should grow at a rate lower than the interest rate. The deficit and debt also should be stationary if the fiscal policy is to be sustainable. Hence, reversing the Hamilton and Flavin's conclusion, Kremers concluded that it is difficult to reject the non stationarity of the debt and deficit situation in the United States and therefore, fiscal policy is not sustainable

Hakkio and Rush (1991) also employed the PVBC techniques to test for fiscal sustainability in the US using quarterly data for the period 1950Q1 to 1988Q4. Data used include real government revenue and spending inclusive of real interest. Their empirical result showed that fiscal policy is not sustainable. Trehan and Walsh (1991) and Tanner and Liu (1994) arrived at the same conclusion using cointegration tests.

Studies by Buitier and Patel (1992) on India and Gerson and Nellor (1997) on the Philippines analyzed fiscal sustainability using PVBC in the context of developing countries. In their study, Buitier and Patel (1992) analyzed the Indian government solvency based on the PVBC using Wilcox's (1989) approach. They concluded that given the non-stationarity of the discounted public debt, the indefinite continuation of the pattern of behavior reflected in the historical time series process is inconsistent with the maintenance of solvency. In a related development, Greiner and Semmler (1999) tested the sustainability of the public debt for Germany in order to find out if the unification has caused any violation of the long run path of the public debt. Using annual data from 1955 to 1994 and employing both Flood-Garber test, and ADF tests for unit root in the series of discounted net debt, the result showed that the public debt in Germany does not meet the requirements to warrant a sustainable fiscal policy in the long run.

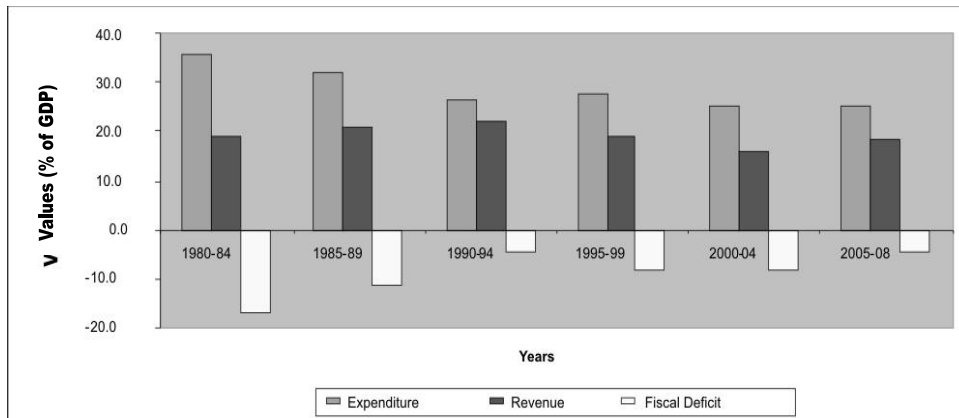
Bascand and Razin (1997) assessed various aspects of the sustainability of the Indonesian fiscal situation using the Accounting Approach. Given the positive values of the calculations of net worth of the government (after adjusting for the exhaustibility of oil and gas reserves), they conclude that solvency in Indonesia is assured in the sense that policies can be maintained without recourse to monetisation, while meeting debt obligations. Gerson and Nellor (1997) in their study on the Philippines concluded that although the budget has almost been balanced and the recent debt-GNP ratio is declining, the historical data of both the discounted debt level and the debt-GNP ratio are non stationary implying the unsustainability of fiscal policy

**PUBLIC FINANCES IN THE WAMZ:
DEVELOPMENT AND TRENDS**

With the adoption of the convergence criterion aimed at ensuring budgetary discipline to underpin the stability of the common currency, fiscal imbalance is being tackled with renewed vigor across the WAMZ countries. From a theoretical standpoint, in a monetary union where member countries no longer have an independent monetary policy, fiscal policy becomes the only instrument available to them to protect themselves against exogenous shocks. On this ground, it can be argued that strict budgetary rule, may impose a heavy burden on countries in the event of large, idiosyncratic shocks. The trends in government revenue, expenditure and budget deficits for the countries of WAMZ are captured in Figures 1 to 5.

Gambia's fiscal out turn during the period 1980-2008 was encouraging as the country experienced declining fiscal deficit. Government expenditure remained high averaging 35.3 percent of GDP during 1980-1985. Devaluation in the CFA zone, increased debt repayment and high interest payment on government loans on account of high inflation, informed the huge expenditure outlay during this period. However, government expenditure stagnated around 25.4 percent of GDP between 2000 and 2008, while government revenue increased gradually during the same period, resulting in a decline in government budget deficit during the review period. The increase in government expenditure over the period 2000 to 2008 was largely driven by loose spending by the military regime, increased expenditure on presidential, parliamentary and local government elections, among others. The country experienced slight decline in revenue between 1995 and 2004, arising from persistent drought and fall in tourism import.

Figure 1: The Gambia- Trends in Government Expenditure, Revenue and Fiscal Deficit (% of GDP)

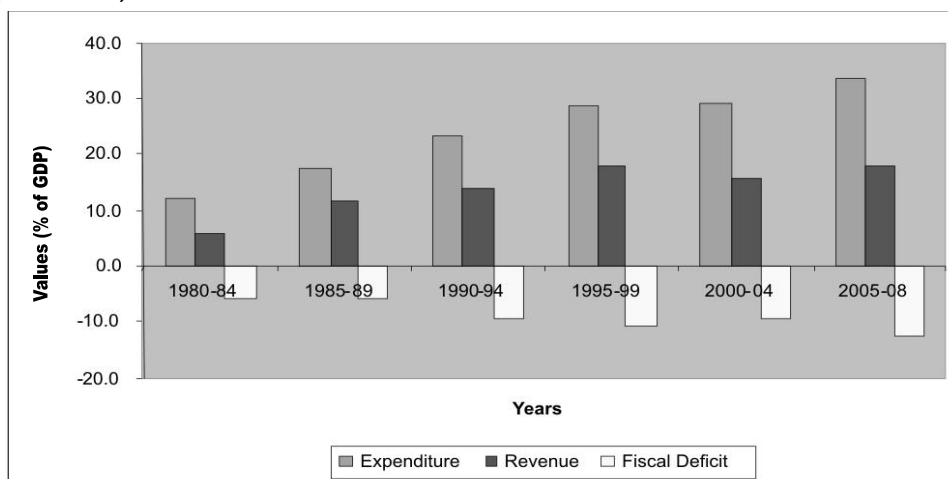


Sources: IMF (2008)

Ghana's fiscal position remained weak during the review period, informed by persistent fiscal deficits. Government expenditure accelerated between 1980 and 2008 due to loose expenditure outlay, especially on wages and salaries. However, the adoption of the Economic Recovery Programme (ERP) in the mid 1980's helped cushion the increase in government expenditure. Since the 1990's, government expenditure has experienced an increasing trend, partly on account of increased capital spending, especially in foreign finance component as well as HIPC fund, and high interest payments on government loans. Furthermore, the substantial increase in salaries and other benefits to civil servants in the run up to the presidential and parliamentary elections in 1992 and 1996, also accounted for the huge expenditure outlay during the 1990's.

Government revenue accelerated steadily during the review period owing to tax reforms, leading to broadening of the tax base, and introduction of the Value added Tax. The sale of the Ashanti Goldfields company also increased government revenue in the 1990s, resulting in a narrowing of the budget deficit. However, despite the increase in government revenue, the budget deficit widened during the period, owing to increased expenditure in excess of revenue.

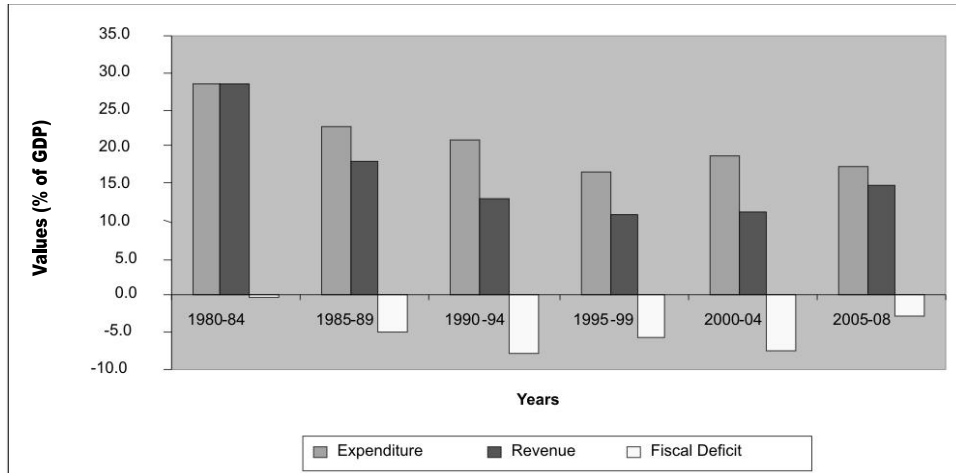
Figure 2: Ghana- Trends in Government Expenditure, Revenue and Fiscal Deficit (% of GDP)



Sources: IMF (2008)

The Guinean economy experienced persistent fiscal deficit during the period under review. The country was under military rule for over two decades, which resulted in an increased expenditure in excess of revenue, hence leading to persistent fiscal deficit. However, since 2005, the country has maintained a fiscal deficit as a ratio of GDP below the threshold of the WAMZ criterion of 4.0 percent. Despite the adoption of a Structural Adjustment Programme, the country's fiscal policy remained relatively weak in the mid 1980s and 1990s, engendered by excessive spending by the military regime.

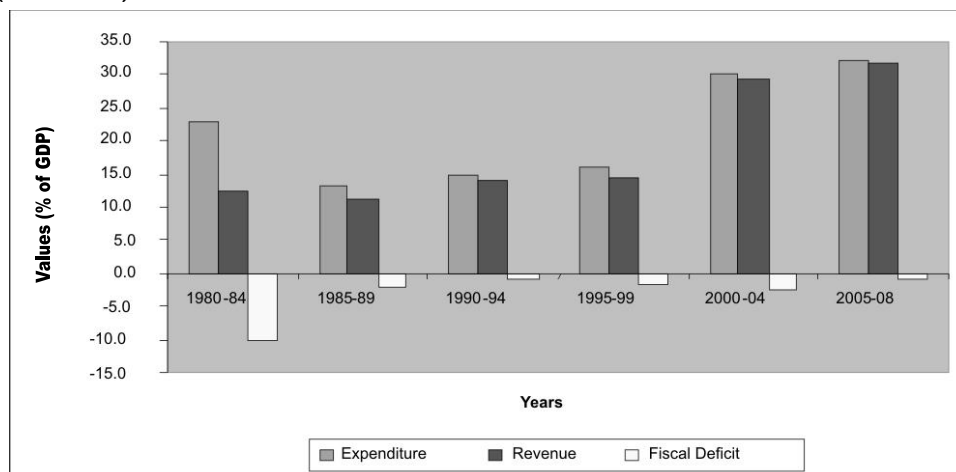
Figure 3: Guinea - Trends in Government Expenditure, Revenue and Fiscal Deficit (% of GDP)



Sources: IMF (2008)

Since the early 1980's, Nigeria's fiscal position has remained resilient despite experiencing persistent budget deficit. The country recorded a decline in fiscal deficit during the review period. Fall in oil prices coupled with reduction in excise duties, reduction in import duties on essential items and reduced donor inflows during the military regime caused a decline in revenue mobilization during the 1980s and early 1990s. However, despite exceeding government revenue during the same period, government expenditure remained low. The constraint on government expenditure was informed by the weak revenue mobilization from oil export and reduced donor support. The restoration of civilian rule in the late 1990's, witnessed an upsurge in government expenditure in order to promote general economic development. Government revenue also increased during the same period, and hence the budget deficit narrowed.

Figure 4: Nigeria - Trends in Government Expenditure, Revenue and Fiscal Deficit (% of GDP)

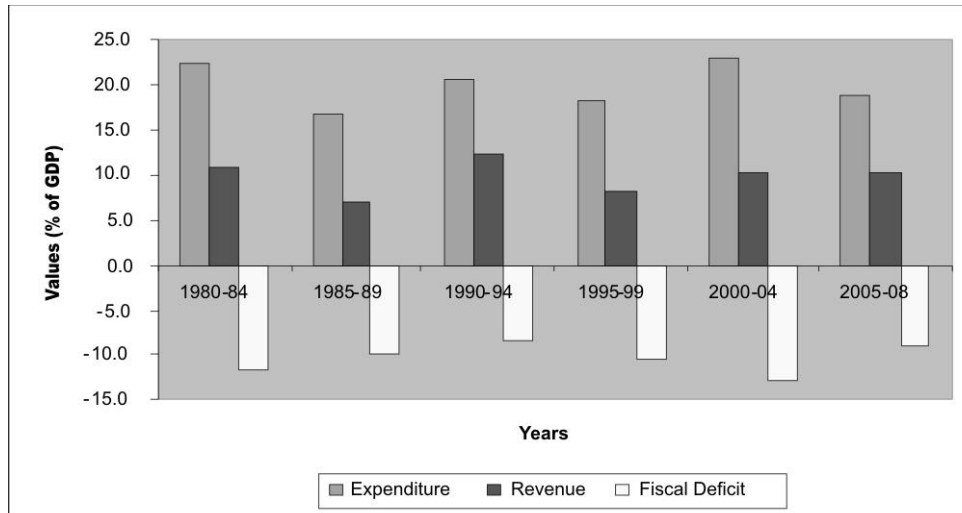


Sources: IMF (2008)

Sierra Leone's fiscal performance during the review period has been weak, characterized by persistent fiscal deficit, due to huge expenditure outlay. Government expenditure remained relatively high during the early 1980's, arising from the hosting of the organization of African Unity summit. Following the deteriorating economic situation in the mid-1980's, the country adopted the Structural Adjustment Programme (SAP) associated with removal of subsidies on basic items and this subsequently reduced government expenditure during the period 1986-1990. Increased expenditure on arms to curtail the political impasse accounted for the huge expenditure during the 1990's. However, in order to rebuild the economy and achieve macroeconomic stability, government expenditure increased significantly during the post war period (2001-2006).

Amidst the high expenditure during the review period, revenue mobilization remained relatively weak. The drop in official diamond exports and reduction in the country's tax base informed the decline in revenue between 1976 and 1985, resulting to high fiscal deficit. Furthermore, the war period (1991-2000) was marred by unstable security and disruption of economic activities, which resulted in a decline in government revenue and a widening of the budget deficit.

Figure 5: Sierra Leone - Trends in Government Expenditure, Revenue and Fiscal Deficit (% of GDP)



Sources: IMF (2008)

METHODOLOGY

The methodology for modeling the dynamics of fiscal sustainability is the PVBC pioneered by Hamilton and Flavin (1986) and Hakkio and Rush (1991). This choice draws from the fact that the PVBC is anchored on recent advances in the econometrics of non-stationary and cointegration methodology for assessing fiscal sustainability. In addition, unlike the accounting approach, the PVBC does not make assumptions that liabilities can continue to grow at the growth rate of the economy's GDP, so that debt/GDP ratios remain constant; leaving rather vague the role that *lenders* ultimately play in determining what debt strategies are "sustainable" and which is not.

Empirical Model

The PVBC for assessing fiscal sustainability involves economic testing of the PVBC or of the non-ponzi game (NPG) condition for a set of time series data on government expenditure, revenue, deficits and/or debt. This involves tests of stationarity and cointegration analysis. The initial analysis of the PVBC is the government budget constraint given in equation (1)

$$G_t - R_t + r_t B_{t-1} = B_t - B_{t-1} \quad (1)$$

Where B_t is the stock of public debt at period t , R_t is the public sector revenue, G_t is the primary public expenditure, i.e. public expenditure excluding interest payments on public debt, and r is the return on government debt in period t . This budget constraint also ignores, to ease the analysis, public revenues arising from the creation of money. From equation (1), if the government runs a primary surplus equals to zero, the stock of debt will grow at a rate equals to the interest rate. However, if the government runs a primary deficit, the stock of debt will grow at a rate exceeding the interest rate. Also, if the government runs a primary surplus, the stock of debt will grow more slowly than the interest rate. If the surplus more than offset interest payments on existing debt, then the debt will actually shrink over time.

$$\text{Let, } S_t = R_t - G_t \quad (2)$$

Substituting equation (2) into equation (1) and rearranging result in equation (3)

$$B_{t-1} = B_t(1+r)^{-1} + S_t(1+r)^{-1} \quad (3)$$

Substituting recursively forward for N periods gives the inter-temporal budget constraint in equation (4).

$$B_t = (1+r)^{-N(-1)} B_N + \sum_{i=1}^N (1+r)^{-i} S_{t+i} \quad (4)$$

By letting $N \rightarrow \infty$ the limiting value of equation (4) can be expressed as follows.

$$B_t = \text{Lim}_{N \rightarrow \infty} [(1+r)^{-N(-1)} B_N] + \sum_{i=1}^{\infty} [(1+r)^{-i} S_{t+i}] \quad (5)$$

Equation (5) states that, the current debt stock is equal to the present value of the debt stock in the limit plus the present value of its future primary surplus. A sustainable fiscal policy should ensure that the “no-ponzi game (NPG)” condition holds, i.e. the present value of the stock of public debt goes to zero in the limit. It is also worth noting that the hypothesis of fiscal policy sustainability is related to the condition that the trajectory of the main macroeconomic variables is not affected by the choice between the issuance of public debt and the increase in taxation. Under such conditions, it would therefore be irrelevant

how the deficits are financed, which also implies the assumption of the Ricardian Equivalence hypothesis⁶. Thus,

$$\text{Lim}_{N \rightarrow \infty} [(1+r)^{-N(-1)} B_N] = \mathbf{0} \quad (6)$$

Equation (6) represents the NPG condition, and the implication of this equation is that in the long run, debt cannot grow at a rate equal to, or higher than the interest rate. Assuming that the NPG is satisfied, then substituting equation (6) into (5), gives the PVBC equation as follows:

$$B_t = \sum_{i=1}^N [(1+r)^{-1} S_i] \quad (7)$$

Equation (7), which represents the PVBC, showed that government debt at any point in time must equal the present value of its future primary surplus. The implication is that public sector debt cannot be continuously rolled over, that is, repayment of the principal must take place at some point and, while the PVBC does not rule out large fiscal deficits or debt ratios, government is required to run some primary surplus in the future by increasing revenue through taxes or grants; reduction in expenditure; monetization of the debt or shifting between debt sources to take advantage of lower interest rate.

The PVBC approach to evaluating fiscal sustainability involves econometric techniques in stationarity and cointegration analysis. The starting point for these tests is to take the first difference of equation (5) to get an empirical testable representation of the intertemporal government budget constraint

$$\Delta B_t = \text{Lim}_{N \rightarrow \infty} [(1+r)^{-N(-1)} \Delta B_{N+1}] + \sum_{i=1}^N [(1+r)^{-1} (\Delta R_{t+i+1} - \Delta G_{t+i+1})] \quad (8)$$

Assuming the real interest rate is stationary, with mean, r , and defining $E_t = G_t + (r_t - r)B_{t-1}$ and an additional definition, $GG_t = G_t + r_t B_{t-1}$, and assuming the NPG in equation (6) is satisfied, the intertemporal budget constraint may also be written as:

$$GG_t - R_t = \sum_{i=1}^N [(1+r)^{-1} (\Delta R_{t+i+1} - \Delta E_{t+i+1})] \quad (9)$$

⁶ Afonso (2005) provides evidence of overall Ricardian behaviour on the part of EU15 governments

Equation 9 forms the basis for testing the sustainability hypothesis where GG_t and R_t must be cointegrated variables of order one. Assuming that R_t and E_t are non-stationary variables, and that the first differences are stationary variables, this implies that the series R_t and E_t in levels are $I(1)$. Then, for equation (9) to hold, its left-hand side will also have to be stationary. If it is possible to conclude that GG_t and R_t are integrated of order 1, these two variables should be cointegrated with cointegration vector (1, -1) for the left-hand side of equation (9) to be stationary. The conditions for sustainability is that, both variables must be integrated of order one, $I(1)$, and should be cointegrated.

The procedure to assess the sustainability of the intertemporal government budget constraint therefore involves testing the following cointegration regression:

$$R_t = a + bGG_t + \mu_t. \quad (10)$$

If the null hypothesis of no cointegration, i.e. that the two $I(1)$ variables are not cointegrated, is rejected (with a high-test statistic), this implies that one should accept the alternative hypothesis of cointegration. If there is cointegration, it implies the PVBC holds and fiscal deficit is sustainable. Similarly, if there is no cointegration, the PVBC does not hold and the fiscal policy is unsustainable. However, the condition $b=1$ is not, strictly speaking, a necessary condition for the government's budget constraint to hold. When there is co-integration, with $b < 1$, government expenditures are growing faster than government revenues, and the deficit may not be sustainable⁷. Hakkio and Rush (1991) showed that when GG_t and R_t are in levels, the condition $0 < b < 1$ is a sufficient condition for the budget constraint to be obeyed. However, when revenues and expenses are expressed as a percentage of GDP or in per capita terms, it is necessary to have $b = 1$ in order for the trajectory of the debt-to-GDP not to diverge in an infinite horizon⁸. Table 1 summarizes the condition for sustainability.

⁷ Concerning this cointegration analysis approach, Bohn (1991, 1995) argues that a sustainable fiscal policy in a certain environment, may become unsustainable under uncertainty

⁸ Quintos (1995), Ahmed and Rogers (1995) and Bergman (1998) discuss the necessary conditions for sustainability in terms of the order of integration of public debt

Table 1: Criteria for Sustainability

| Cointegration | Value of b | Degree of Integration ΔB | Sustainability |
|---------------|------------|----------------------------------|-----------------|
| Yes | b=1 | I(0) | Strong |
| Yes | 0<b<1 | I(0) | Weak |
| Yes | b=0 | I(0) | Non-sustainable |
| No | Irrelevant | I(1) | Non-sustainable |

Suppose R and E are non-stationary in levels so that their first difference is stationary, implying that the term on the right-hand side is stationary; then, for Equation 9 to hold, the left-hand side of the equation must also be stationary. Therefore, both GG_t and R_t must be integrated of order one, $I(1)$, and should be cointegrated. The intuition behind this is that although government revenue and expenditure may grow over time, a stable equilibrium (cointegrating) relationship should exist between them. If GG_t , for example, is nonstationary ($I(1)$) while R_t is stationary ($I(0)$), then there is no long-term or equilibrium relation between them. This implies that government is violating its intertemporal budget constraint because GG_t tends to grow while R_t does not.

Data

The data set used for the empirical analysis in this paper consists of annual time series data for the period 1980-2008 on total government revenue (R)⁹ and government spending inclusive of interest payments on debt (GG). All variables are expressed as a ratio of GDP. Data were obtained from the West African Monetary Institute data set and the World Economic Outlook.

⁹ Government revenue excludes seigniorage since our primary concern is the sustainability of the debt finance procedure. Virtually, any deficit is sustainable if an unlimited inflation adjustment through money finance is allowed.

EMPIRICAL RESULTS

This section is preoccupied with analysis of the empirical results. The stationarity of the variables were established and cointegration analysis was also pursued. The section also provides the empirical results using both the PVBC and Granger causality.

Unit root tests

In line with recent developments in time series modeling, unit root tests of the variables in the model were performed to determine their time series properties/characteristics. The order of integration of the series was ascertained using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests statistics. The ADF test assumes that the residuals from the test equation are normal while the PP test does not make any assumption about the residuals of the test equation. The results of the unit root tests are provided in Table 2.

Table 2: Unit Root Tests Results

| Country | | Augmented Dickey-Fuller (ADF) test | | Phillips-Perron (PP) test | | Order of Integration |
|--|----------------------|------------------------------------|-------------|---------------------------|-------------|----------------------|
| | | Revenue | Expenditure | Revenue | Expenditure | |
| Gambia | Level | -3.013 | -1.7602 | -3.204 | -1.9635 | I(1) |
| | 1 st diff | -7.626 | -5.4139 | -8.761 | -5.4139 | |
| Ghana | Level | -2.117 | -0.3416 | -2.194 | 2.2264 | I(1) |
| | 1 st diff | -5.718 | -5.2384 | -5.718 | -5.2384 | |
| Guinea | Level | -2.608 | -1.9587 | -2.478 | -2.0957 | I(1) |
| | 1 st diff | -7.743 | -5.2645 | -7.744 | -5.2645 | |
| Nigeria | Level | -3.002 | -1.6470 | -3.012 | -1.3129 | I(1) |
| | 1 st diff | -5.057 | -4.3126 | -5.859 | -4.3126 | |
| Sierra Leone | Level | -2.964 | -2.1801 | -2.964 | -2.0056 | I(1) |
| | 1 st dif | -4.437 | -7.2743 | -4.420 | -7.2743 | |
| Critical Values: 1% = -4.324 and 5% = -3.587 | | | | | | |

The results showed that the ADF and PP statistics for both revenue and expenditure variables in levels for all the countries did not exceed their critical values. However, when the variables were differenced once and subjected to ADF and PP tests, the test statistics exceeded their critical values at least at the 5.0% significant level. These results suggest that both series for each of the countries are integrated of order one, that is, they are I (1) series.

Cointegration Tests

Having established that the series are I(1), it is now possible to search for cointegration between revenue and expenditure using the Johansen multivariate framework. The Johansen cointegration test is conducted by considering a vector autoregressive model (VAR) of the form:

$$A(L)X_t = \xi_t \quad (11)$$

Where $X_t = [R_t, GG_t]'$, $A(L)$ is a matrix of long run multiplier, A is short run dynamic coefficients and L is a lag operator. When two or more series are not stationary, it is important to test whether there is a linear combination of the series. This phenomenon is referred to as test of cointegration. The existence of cointegration implies that there is a long run relationship among the variables. The intuition behind the existence of cointegration is that although government expenditure and revenue may grow over time, a stable equilibrium (cointegrating) relationship should exist between them. Specifically, a fiscal policy is sustainable if the government expenditure and revenue do not drift apart over the long run. In other words, expenditure and revenue can deviate from each other over the short run, but market forces and/or fiscal policy bring them back together over the long run.

The Johansen procedure is based on likelihood ratio (LR) test to determine the number of cointegration vectors in the regression. This technique enables us to test for the existence of non-unique cointegration relationships. Two test statistics are suggested to determine the number of cointegration vectors based on the LR test, namely, the trace test and maximum eigen value test statistics:

The trace test (λ_{trace}) is defined as:

$$\lambda_{trace} = -T \sum_{i=r+1}^n \log(1 - \lambda_i) \quad (12)$$

The null hypothesis is that the number of cointegration vectors is r , where $r=0,1$ or 2 ; against the alternative hypothesis that the number of cointegration vectors is $= r$.

The maximum eigen value test (λ_{max}) is defined as:

$$\lambda_{max} = T \log(1 - \lambda_r) \quad (13)$$

The maximum eigen value tests the null hypothesis that the number of cointegration vectors $= r$ against the alternative that there are $r+1$ cointegrating vectors. The null hypothesis, $r=0$ is tested against the alternative that $r=1$, and $r=0$ is tested against the alternative $r=2$, etc.

In the Johansen Maximum Likelihood procedure, tests for the optimal lag lengths of the related Vector Auto-regression (VAR) were first conducted. This is because the method is preceded by estimating a VAR model which must have the appropriate lag length. The Likelihood ratio test, Akaike Information Criterion, Schwartz Information Criterion, Hannan Quin test and Final Prediction Error test were used in the lag length selections. The lag length supported by more of the five criteria was chosen as the appropriate lag length. In order to save the degrees of freedom, the highest lag length in the testing-down procedure of the lag-length tests was taken to be one for each of the countries. The Johansen procedure tests the null hypothesis of no cointegration, and rejection of the null hypothesis implies the data series are cointegrated. The results of the Johansen tests are shown in Table 3.

Table 3: Johansen's Cointegration Test Results

| Country | Trace Statistics | 0.05 critical value | Probability | Maximum eigen value | 0.05 critical value | probability |
|--------------|------------------|---------------------|-------------|---------------------|---------------------|-------------|
| Gambia | 18.44* | 18.39 | 0.04 | 7.73 | 14.26 | 0.04 |
| | 6.97* | 3.84 | 0.00 | 3.72 | 3.84 | 0.053 |
| Ghana | 24.15* | 18.39 | 0.00 | 17.82* | 17.14 | 0.03 |
| | 6.32* | 3.84 | 0.01 | 6.31* | 3.84 | 0.01 |
| Guinea | 15.51* | 15.49 | 0.04 | 15.55* | 14.26 | 0.04 |
| | 2.75 | 3.84 | 0.09 | 2.75 | 3.84 | 0.09 |
| Nigeria | 37.02* | 15.49 | 0.00 | 31.93* | 14.26 | 0.00 |
| | 5.08* | 3.84 | 0.02 | 5.08* | 3.84 | 0.02 |
| Sierra Leone | 11.20 | 15.49 | 0.19 | 9.32 | 14.26 | 0.26 |
| | 1.88 | 3.84 | 0.16 | 1.88 | 3.84 | 0.16 |

Note: * denote rejection of the hypothesis at the 0.05 level

The Johansen test results allow the rejection of the null hypothesis of no cointegration for all countries except Sierra Leone. The results indicate that the variables under examination are cointegrated for the Gambia, Ghana, Guinea and Nigeria; while no cointegration was established for Sierra Leone. The empirical result on non sustainability of fiscal policy for Sierra Leone is not at variant with the empirical work of Hakkio and Rush (1991) for the US. The existence of cointegration between government expenditure and revenue implies sustainability of fiscal policies in Gambia, Ghana, Guinea and Nigeria, while Sierra Leone's fiscal policies was found to be unsustainable. The Trace statistics indicated two cointegrating vectors for Gambia, Ghana and Nigeria, and one cointegrating vector for Guinea; while the Maximum Eigen value indicated two cointegrating vectors for Ghana and Nigeria, and one cointegrating vector for Guinea. These results are consistent with the empirical works of Hamilton and Flavin (1986).

Having established the existence of cointegration for some of the countries, we then use the normalized cointegrating coefficients (which represent the long run equation from the Johansen cointegration results) to test whether the countries exhibit weak or strong fiscal sustainability. This involves testing the hypothesis $b=1$ in equation 10 against the alternative that $0 < b < 1$. If the null hypothesis is accepted, we infer that there exists strong sustainability; otherwise we conclude that sustainability is weak. According to the Johansen test, the normalized cointegrating coefficient (b) for the Gambia, Ghana, Guinea and Nigeria are 0.11, 0.57, 0.23 and 0.86. The results showed that these countries had weak fiscal sustainability, with the Gambia having a weaker sustainability relative to Ghana, Guinea and Nigeria.

Granger Causality Tests

The preoccupation in this sub-section is to conduct a granger causality test between government expenditure and revenue for the countries of the WAMZ, developed by Granger (1969). According to Granger (1969), a variable (in this case government revenue) is said to granger cause another variable (government expenditure) if past and present values of government revenue help to predict government expenditure. The rationale for conducting the granger causality test between government expenditure and revenue is to determine whether the WAMZ countries are characterized by either the tax-and-spend, spend-and-tax or fiscal synchronization hypotheses. The result obtained may have severe policy implications for fiscal discipline as well as sustainability of fiscal policy.

In the standard Granger-causality test, R_t is said to Granger-cause GG_t if the lagged value of R_t helps improve the forecast of GG_t . To test the causal relationship between government expenditure and revenue, this paper utilizes the Engle-Granger two-step algorithm procedure. The first step is to establish the time series properties of both expenditure and revenue, that is to determine whether they are integrated of order zero $[I(0)]$ or order one $[I(1)]$. The second step is to test for cointegration, and this involves testing for the stationarity of the residuals generated from the static long run regression¹⁰. Thus, we try to determine whether the stochastic trends in the variables that contained unit root have long run relationship. The Granger representation theorem posits that if cointegration is established then R_t and GG_t may be considered to be generated by error correction models of the form.

¹⁰ The results of the static long run regression is not reported in this paper

$$\Delta GG_t = \alpha_0 + \sum_{i=1}^{n1} \alpha_{1i} \Delta GG_{t-1} + \sum_{i=1}^{n2} \alpha_{2i} \Delta R_{t-1} + \delta \mu_{t-1} + \varepsilon_{1t} \quad (14)$$

$$\Delta R_t = \beta_0 + \sum_{i=1}^{T1} \beta_{1i} \Delta R_{t-1} + \sum_{i=1}^{T2} \beta_{2i} \Delta GG_{t-1} + \lambda \xi_{t-1} + \varepsilon_{2t} \quad (15)$$

Where n_{1i} and T_{1i} are the optimal lag length. R and GGt are government revenue and government expenditure including interest payment on public debt, respectively. Equation 14 is expenditure equation, while 15 is revenue equation. Δ is the difference operator, μ_{t-1} and ξ_{t-1} are the error correction terms and; ε_{1t} and ε_{2t} are white noise error terms, which are identically and independently normally distributed with mean zero and constant variance. δ and λ are the error correction coefficients and are expected to capture the adjustment of ΔGG_t and ΔR_t towards long-run equilibrium, while ΔR_{t-1} and ΔGG_{t-1} are expected to capture the short-run dynamics of the model.

In Equations 14 and 15, the focus is mainly on the statistical significance of the error correction coefficients, δ and λ ; which are used to test the causal relationship between expenditure and revenue. The null hypothesis to be tested in equation 14 is that R_t does not granger cause GG_t . Thus, the null hypothesis would be rejected if $\sum \alpha_{2i}$ is significantly different from zero. In a similar view for equation 15, the null hypothesis to be tested is that GG_t does not granger cause R_t . The null hypothesis would be rejected if $\sum \beta_{2i}$ were significantly different from zero.

Having established earlier that the variables, are characterized by I(1) series (see Table 3), we then proceed to the second step to test the stationarity of the residuals from the static long run regression. The granger causality cointegration results using the Engel Granger procedure are shown in Tables 5 and 6.

Table 4: Results of the Causality between GG_t and R_t (Tax-and-spend, equation 14)

| Country | ECM | t-value | R-squared |
|--------------|-------|----------|-----------|
| Gambia | -0.24 | -3.61** | 0.48 |
| Ghana | -0.07 | -4.67*** | 0.51 |
| Guinea | -0.01 | -3.08* | 0.41 |
| Nigeria | -0.62 | -6.65*** | 0.56 |
| Sierra Leone | -0.03 | -2.78* | 0.52 |

Note: *** indicates significance at the 1% level

** indicates significance at the 5% level

* indicates significance at the 10% level

Table 5: Results of the Causality between R_t and GG_t (Spend-and-tax, equation 15)

| Country | ECM | t-value | R-squared |
|--------------|-------|----------|-----------|
| Gambia | -0.19 | 0.46 | 0.68 |
| Ghana | -0.16 | -4.84*** | 0.53 |
| Guinea | -0.05 | -0.72 | 0.52 |
| Nigeria | -0.37 | -4.65*** | 0.56 |
| Sierra Leone | -0.01 | -0.97 | 0.55 |

Note: *** indicates significance at the 1% level

The results from both tables showed that a bi-directional causality existed between expenditure and revenue in Ghana and Nigeria. These results showed that simultaneity existed between expenditure and revenue in these countries. Thus, for Ghana and Nigeria the decision to spend-and-tax or tax-and-spend are determined jointly. Similar results have been reported by Miller and Russek (1990), Meltzer and Richard (1981), and Musgrave (1966). For The Gambia, Guinea and Sierra Leone, the results showed that causality runs from revenue to expenditure with no feedback, implying that the decision to spend in these countries depends on revenue, and hence higher revenue would lead to higher government expenditure, but not vice versa. These results support the tax-and-spend hypothesis, and are not at variant with the empirical results reported by Eita and Mbazima (2008) for Namibia, and Moalusi (2004) for Botswana.

CONCLUSION AND POLICY IMPLICATIONS

This paper has drawn on recent advances in the econometrics of non-stationary and cointegration methodology to assess the sustainability of fiscal policies for the WAMZ countries during the period 1980-2008. Starting from the present value borrowing constraint of governments, we investigated past fiscal data to see if government fiscal policy follows a stationary process, or if there is cointegration between government revenue and

government expenditure. The study also employed the granger causality approach to test the spend-and-tax, tax-and-spend and fiscal synchronization hypotheses for these countries.

The results showed that fiscal policies in the Gambia, Ghana, Guinea and Nigeria had been sustainable, although the sustainability was rather weak for these countries, as evident in the values of the normalized cointegrating coefficients. The results further revealed that fiscal policy in Sierra Leone remained unsustainable during the review period, as no long run relationship was established between government expenditure and revenue. The granger causality results indicated that a bi-directional causality existed between government expenditure and revenue in Ghana and Nigeria, while uni-directional causality runs from revenue to expenditure with no feedback effects in the Gambia, Guinea and Sierra Leone. These results showed that the tax-and-spend hypothesis remained prominent in these three countries.

The policy implications arising from these results are summarized as follows:

- (i) Fiscal policy should not be contemplated in a vacuum, but rather it must be seen within the wider context of overall macroeconomic sustainability. In this regard, policy makers in the WAMZ countries must coordinate fiscal policy with other policy areas, so as to maintain an environment of low inflation, exchange rate stability and external account equilibrium, as well as fiscal sustainability. In addition, domestic debt reduction should be set as a fiscal anchor over the medium term.
- (ii) Furthermore, governments in the WAMZ countries, with particular reference to Sierra Leone should pursue robust fiscal policy aimed at raising revenue and reducing expenditure. On the fiscal policy side, direct measures should aim to streamline the tax system in order to make it more efficient. Additional measures should include broadening tax bases and making more improvements in revenue administration and collections. On the expenditure side, governments should prioritize and rationalize their expenditure towards growth enhancing and poverty reduction activities.
- (iii) Given that fiscal policies in the Gambia, Ghana, Guinea and Nigeria were found to be sustainable, the onus is therefore on policymakers to extend this favourable track record into the future, working to ensure that future policy decisions continue in the tradition of prudent fiscal management that has been established. This should be achieved in the face of the new challenges posed by the twin phenomena of globalisation and liberalization.

- (iv) The results showed that the tax-and-spend hypothesis holds for Gambia, Guinea and Sierra Leone, and hence reducing budget deficit and maintaining fiscal sustainability requires a more equitable and transparent tax system, with prudent tax reforms which are intended to increase revenue. However, to break away from the tax-and-spend strategy, such improvement in tax revenue should accompany reforms in public spending.
- (v) The results also revealed a bi-directional causality between government expenditure and revenue for Ghana and Nigeria. The policy implications of the results suggest that there is interdependence between government revenue and expenditure, and governments make their revenue and expenditure decisions simultaneously. On the one hand, increasing government expenditure stimulates economic activities which in turn increase government revenue. On the other hand, increase in revenue will boost expenditure and the growth of the economy. The results suggest that spending cuts will ultimately lead to revenue reduction; and revenue increase will correspondingly lead to expenditure increases, thus raising questions about the feasibility of fiscal adjustment based on policies affecting the revenue and expenditure side of the budget independent of each other.

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APPENDIX 1: Review of relevant literature

| Study | Country/Sample | Data requirement | Test Methods | Conclusion |
|-----------------------------|---|--|--|---|
| Hamilton-Flavin (1986) | U.S.A, 1960-84. Annual data | Real primary surplus, seigniorage, real stock of debt | Test stationarity of fiscal deficit and debt | Both are stationary, implying sustainable fiscal policy |
| Wilcox (1989) | U.S.A, 1960-84. Annual data | Market value of govt debt, ex-post real return and govt debt | Test whether discounted debt series is stationary with mean zero | Weak evidence that discount debt is stationary, yet its mean is nonzero. Hence fiscal policy is unsustainable |
| Elliot and Kearney (1988) | Australia, 1953/54-1986/87. Annual data | Public revenue and expenditure | Test whether public revenue and expenditure are cointegrated | Cointegration was established, hence fiscal policy is sustainable |
| Corsetti and Roubini (1991) | OECD, 1960-89. Annual data | Net general govt debt, ex-post return on debt | Test stationarity of discount debt and the existence of positive drift or time trend | Results are mixed for OECD countries studied |
| Ahmed and Rogers (1995) | U.S.A, 1792-1972 U.K, 1692-1992. Annual data | Real govt tax revenue, expenditure and interest payment | Test whether govt revenue, expenditure and interest payment are cointegrated | Fiscal sustainability was found for both U.S.A and U.K |

| | | | | |
|------------------------------|--------------------------------------|--------------------------------|---|--|
| Payne (1997) | G7 Countries, 1947-1994. Annual data | Public revenue and expenditure | Test whether cointegration exist between public revenue and expenditure | Germany's fiscal policy was sustainable |
| Buiter and Patel (1992) | India, 1970/71-1987/88. Annual data | Public deficit and public debt | Test for cointegration between public deficit and public debt | Accept nonstationarity, imply fiscal policy is unsustainable |
| Bravo and Silvertre (1999) | EU countries, 1970-1997. Annual data | Public revenue and expenditure | Test whether cointegration exist between public revenue and expenditure | Fiscal sustainability was found for Germany, Austria, Finland, UK and Netherland |
| Balioni and Cherubini (1993) | Italy, 1979:1-1991:5. Monthly data | Fiscal deficit and public debt | Test for cointegration between fiscal deficit and public debt | Accept nonstationarity, imply fiscal policy is unsustainable |
| Haug (1995) | USA, 1950:I-1990:IV | Public revenue and expenditure | Test whether cointegration exist between public revenue and expenditure | USA's fiscal policy was sustainable |