GOVERNMENT REVENUES AND EXPENDITURES IN GUINEA-BISSAU: CAUSALITY AND COINTEGRATION[*]

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The paper establishes empirically the temporal causality and long run relationship between government expenditures and government revenues for the case of Guinea-Bissau - a low income country under stress (LICUS) in Africa. A macroeconomic model is developed to lay out the hypothesis of a spend-tax behavior in the country's public finances management system. Empirical validation is carried out by means of a traditional Granger-causality test and the estimation of an error correction model between expenditures and revenues.

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1. INTRODUCTION

Fiscal policy is, in essence, a short-run issue, but that can have lasting macroeconomic consequences. In the debate about economic policy, fiscal policy is viewed as an instrument used to mitigate short-run fluctuations of output and employment and bring the economy closer to potential output (Zagler and Dürnecker (2003)). This can happen via changes in expenditures, revenues, or both. On the expenditure side, early models of endogenous growth considered some public expenditure categories as the engine of economic growth. For instance, in such framework, expenditures on public infrastructure, research and development, education and health can have a positive impact on growth (e.g., Barro (1990); Romer (1990); and Bloom *et al*. (2001)). On the revenue side, taxes can distort private agents' decisions

with respect to factor accumulation and supply. As in the endogenous growth framework externalities are always present, distortionary taxation can internalize the effect of the externality in private decision rules, and thus induce the efficient allocation of resources (Turnovsky (1996)).

In the short run, fiscal policy can be considered expansionary (contractionary) when public expenditures exceed (fall short of) public revenues and the resulting deficit can be interpreted as a means to finance additional government expenditures. If these expenditures are considered growth enhancing, then a government deficit exhibits an indirect effect on long-term economic growth. In a Ricardian world, however, where agents view the deficit simply as taxes delayed, there should be no difference between tax and deficit finance of government expenditures, as long as the tax structure remains unchanged in the future (Ludvigson (1996)). On the other hand, if the economy is non-Ricardian, due to credit constraints or overlapping generations, then public deficits can change the private incentives to accumulation and thus directly influence the rate of growth of the economy. As argued by Araújo and Martins (1999), running a debt-financed deficit can induce the government to absorb additional resources from the private sector, which could have been used instead for the accumulation of private physical capital. If the revenue raised in that fashion is spent in a less productive way than it would be by the private sector, the overall growth effect would be negative.

This paper is concerned with the issue of the intertemporal relationship between revenues and expenditures and the way in which countries deal with the management of their public deficits. Different hypotheses can be considered to examine such problem. The so-called tax-spend hypothesis postulates that governments raise tax revenues ahead of engaging in new expenditures (Friedman (1978); Buchanan and Wagner (1978)). The spend-tax hypothesis, on the other hand, predicts that governments spend first and then increase tax revenues to finance their expenditures (Peacock and Wiseman (1979); Barro (1974)). There is also the fiscal synchronization hypothesis that suggests that governments take decisions about revenues and expenditures simultaneously (Musgrave (1966); Meltzer and Richard (1981)). Lastly, there is the possibility of independence as regards the decisions to spend and raise revenues (Baghestani and McNown (1994)).

This issue has been investigated for a number of countries, but a consensus has not been reached about the nexus between government revenues and expenditures. Ewing and Payne (1998) have examined the case of five Latin American countries finding mixed results for the countries in their sample. Park (1998) looked at the case of Korea and found supporting evidence for the tax-spend hypothesis. The case of India has been recently examined by Dhanasekaran (2001) who found evidence in support of the spend-tax hypothesis. It is evident, therefore, that the question remains empirically unsettled.

In what follows we test these hypotheses for the case of Guinea-Bissau - a low-income country under stress (LICUS) - and investigate possible long-run relationships between government expenditures and revenues using a simple error correction model (ECM). The case of a LICUS is interesting as these countries are

usually emerging from a conflict experience, have limited capability of borrowing money domestically, and have enormous spending needs. Fiscal discipline and public finance management therefore are relevant issues in this context as they can have lasting effects in terms of resource allocation within the economy with long-run growth implications.

After this Introduction, we develop a simple macroeconomic model (Sections 2 and 3) that lays out the hypothesis that Guinea-Bissau conforms to the spend-tax hypothesis. Empirical validation of this hypothesis is carried out in Sections 4 and 5 by means of a traditional Granger-causality test and the estimation of a simple error correction model between expenditures and revenues, respectively. The conclusions appear in Section 6 and point to policy recommendations to restore fiscal discipline in Guinea-Bissau.

2.   THE MODEL

The economy of Guinea-Bissau is based on the primary sector which is specialized in the production (Y) and export (X) of cashew nuts:

$$\alpha Y = X,\qquad(1)$$

where $0 < \alpha \leq 1$, without loss of generality, we assume $\alpha = 1$.

As a poor country with an almost inexistent financial market [there is only one commercial bank in activity], with an economy based in the production of cashew nuts that increases extensively by allocating more land to increase production, we can assume that investments (I) are inelastic and independent of the interest rate, and savings (S) being an increasing function of output:

$$I = \bar{I},\qquad(2)$$

$$S = S(Y).\qquad(3)$$

The amount of cashew nuts exported increases with its international price (p) [that reflects supply and demand shocks], and with the income of the rest of the world (Y^f). In addition exports depend on the exchange rate (π), defined as the price of foreign currency (CFA F. per U.S. Dollar), thus a rise in the exchange rate increases exports by making them cheaper:

$$X = X(p, Y^f, \pi).\qquad(4)$$

Total imports (Z) are an increasing function of domestic income (Y) and a

decreasing function of the exchange rate (π):

$$Z = Z(Y, \pi).$$
(5)

The exchange rate is held fixed by the BCEAO, the independent central bank of the West African common market and monetary union [WAEMU]

$$\pi = \bar{\pi}.$$
(6)

The Central Bank's monetary policy objective is to guarantee price level stability and consequently low inflation. In order to achieve the price level stability objective the central bank uses a mixed policy of fixed interest rates and credit controls [aiming at achieving a stable velocity of circulation of money] to its state members:

$$r = \bar{r},$$
(7)

$$\bar{v} = Y / M,$$
(8)

where r is the interest rate, M is the quantity of money, v is the velocity of circulation of money. Therefore, the money market equilibrium leads to the determination of the price level:

$$\frac{M}{P} = L(Y, r).$$
(9)

Concerning public finance, the government relies on three main sources of revenue (T): export and import taxes and fishing licenses (l)

$$T = T(X) + T(Z) + l.$$
(10)

Due to lack of transparency, weak governance, rent seeking, corruption, management malpractices and inelastic demands for public services, government expenditures (G) are always above the level consistent with short term budget equilibrium $(\bar{G})$:

$$G \geq \bar{G}.$$
(11)

The model above determines the equilibrium values of the following endogenous variables: $G, r, \pi, M, I, X, Y, Z, S, P$ and T. It is block recursive, Equations (11), (7),

(6), (2) determine simultaneously the equilibrium values of G, r, π and I respectively. Then, given π, Equation (4) determines the equilibrium value of exports X. Given X, Equation (1) determines equilibrium output Y. Given Y Equation (5) determines imports Z, Equation (8) determines the quantity of money M and Equation (3) determines savings S. Given M and Y Equation (9) determines the price level P. Finally, given Y and Z, Equation (10) determines government revenues T.

Note the important role of the monetary policy set by the BCEAO in this model, since the interest rate r and the exchange rate π are determined by it independently of any other variables in the model. Another important characteristic of this model is that government expenditures (G) are determined ahead of government revenues (T). That is, for each period of time, G temporally precedes T. Thus one can argue that government expenditures *Granger-cause* government revenues, which makes our model a simple macroeconomic version of the spend-tax hypothesis for the case of Guinea-Bissau. This is the hypothesis that we are going to test in the following section.

3. THE GRANGER-CAUSALITY TEST

The methodology of the Granger-causality test can be briefly described as follows. If better predictions of a given series Y can be obtained by adding to lagged values of Y current and lagged values of another given variable X, then X is said to Granger-cause Y. That is, X is said to precede temporally Y in that changes in X take place first than changes in Y. Three other possible results are the cases of unilateral causality from Y to X, bi-directional causality (or feedback), and independence. It is important to notice however that temporal precedence does not imply a cause and effect relationship, but establishing the order of temporal precedence between two variables can be very useful to understand the nature of several economic problems.

As noted by Park (1998), in a number of previous studies that investigated the issue addressed in this paper, important statistical properties of the data have not been taken into account when the Granger-Causality tests were implemented. These caveats may have contributed to inconsistent results. Seminal work by Granger and Newbold (1974) and Phillips (1986) casts doubt on empirical evidence based on regression analysis of time-series data given any nonstationary variables. Thus, to avoid the problem of the spurious regression and the failure to account for the appropriate dynamic specification, we first performed unit roots tests on our variables.

The stationarity of the variables was tested by means of standard Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. As the power of these tests to distinguish between series that are purely non-stationary processes and those with near unit roots is limited, we have also run the KPSS (1992) test [see Kwiatowski *et al*. (1992)]. Contrary to the ADF type test the KPSS test has the null of stationarity. To determine the appropriate lag length of the tests, we used the Schwarz BIC model selection criterion as recommended by Stock (1994). As per Table 1, the results of the

ADF and PP tests do not allow for the rejection of the null hypothesis of non-stationarity for the levels of the variables with the reverse being observed for their first differences, while in the KPSS test we reject the null of stationarity for the levels of the variables but do not reject it for their first differences. Therefore, we conclude that our variables are integrated of the first order and we can then proceed with the simplest version of the Granger test using the variable in its stationary forms (i.e., their first differences) without incurring in the problem of the spurious regression.

Table 1.   Unit Root Tests for Levels and First Differences of the
Variables: 1981 to 2002

Variables	ADF	Phillips-Perron	KPSS η_μ	Lag Length
Log levels:				
ln G	-2.385	-2.841	2.767	1
ln T	-2.512	-2.264	21.798	1
First ifferences:				
Δ ln G	-2.800	-4.658	0.168	1
Δ ln T	-5.409	-6.076	0.812	1

Notes: The lag length was chosen by selecting the lowest Bayesian Information Criterion for each variable. The critical values for the different tests are: ADF and Phillips-Perron 1%(-4.53); 5%(-3.67) - KPSS 1%(0.739); 5%(0.574).

The results appear in Table 2 and were obtained with one lag for each variable. Using annual data for government expenditures and revenues over the period 1981 to 2002, we have found unilateral causality from expenditures to revenues in Guinea-Bissau. The same exercise was carried out for the case of government expenditures and grants and the results remained unchanged.

Table 2.   Granger-Causality Tests for Expenditures and Revenues: 1981 to 2002

Hypothesis	Test Statistic	Conclusion
Expenditures Granger-Cause Revenues	t-prob = 0.720	Do Not Reject
Revenues Granger-Cause Expenditures	t-prob = 0.069	Reject

4.   THE ERROR CORRECTION MODEL

We now assess potential long-run behavior and the short-run dynamics of expenditures and revenues in Guinea-Bissau. Since we have found that the variables are integrated of the first order, we begin by estimating the cointegrating vector between the

logs of expenditures and revenues to assess their long-run behavior and then we run a simple error correction model using the first differences of the variables to infer about their short-run dynamics.[1] The long-run cointegrating vector is estimated with revenues as the dependent variable, as we have found unilateral causality from expenditures to revenues in Guinea-Bissau:

$$Log\ T_t = -0.49 + 1.08\ Log\ G_t - 0.52\ War + \hat{u}_t$$
$$(0.558)\quad (0.155)\qquad (0.163)$$

(16)

For this equation, the key statistics were consistent with a well specified time series model ($R^2 = 0.73$ and DW = 1.71), and the residuals were found stationary ruling out the null hypothesis of spurious regression. The unit coefficient on government expenditures (G) confirms existence of cointegration between the two variables while the negative coefficient for the dummy variable (War - that assumed the value of 1 for 1998-99 and 0 otherwise) confirms the negative impact of the conflict that plagued the country between 1998 and 1999.

For the short-term dynamics we have estimated the following model:

$$\Delta T_t = \alpha + \beta \Delta G_t + \delta(G_{t-1} - \varphi T_{t-1}) + War + \varepsilon_t ,$$

(17)

Where, β, the coefficient of the contemporaneous change in G (ΔG_t) seizes the short-term effects while δ, the error correction coefficient, incorporates feedback in the relationship between T and G. The coefficient α is the intercept and ε_t is an error term with zero mean, and "War" is a vector of bivariate (0,1) dummy variables to control for periods of recession and war. The error correction term is represented by the residuals of the cointegrating vector (Equation 16) lagged one period $(\hat{u}_{t-1})$. The results for the error correction model with the variables both in levels and in logs are shown in Table 3.

The estimated error-correction coefficient is negative and highly significant in both models, confirming the existence of a stable long-run relationship between government expenditures and revenues in Guinea-Bissau. At any given time *t,* when the government deficit has overshot in the previous period $t-1$ ($G_{t-1} > T_{t-1}$), as $\delta < 0$, the error correction term works to push G back towards the equilibrium.[2] The high absolute value of the error-correction term means that the adjustment is very fast. In the case of the model with the variables in levels, roughly 75% of any deviation from long run equilibrium is made up in a year; in the case of the log-model, the adjustment is of 87% in the same year. The coefficient of the contemporaneous change of G is positive in

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[1] For simplicity, we consider an ECM that does not include the lags of ΔG_t and ΔT_t .

[2] This long-term stability however does not rule out the possibility of short-term budget deficits.

both cases confirming the spend-tax hypothesis. In the log-model, this coefficient was positive and greater than 1 pointing to the fact that the effort to generate revenues after each dollar spent is more than proportional. One other possible explanation is concerned with the inefficiency of public spending and the associated difficulty to increase tax revenues in Guinea-Bissau. That is, lack of control of public spending and an overall weak institutional framework governing public financial management imply that the government must raise more than one dollar in revenues to match an equivalent expenditure.

In light of these findings, one can safely conclude that Guinea-Bissau follows the "spend-tax" scheme, and that there exists a stable long-run relationship between government expenditures and revenues. The "spend-tax" hypothesis means that the government seems to spend first and then raise tax revenues and/or request/receive grants to finance its expenditures, rather than adopting the approach of raising funds first to finance spending later. Under this scenario, the government of Guinea-Bissau should try to control spending in order to restore fiscal discipline and control the size of its public deficit, in the short-run.

Table 3.   OLS Estimates of the Error Correction Model 1981-2002
Dependent Variable: ΔT_t

	Levels	*Log*
α	-0.004	-0.0001
	(1.344)	(0.048)
ΔG_t	0.758	1.004
	(0.146)	(0.213)
$\hat{u}_{t-1}$	-0.639	-0.873
	(0.269)	(0.239)
War	-9.752	-0.359
	(8.477)	(0.272)
Adj. R^2	84%	86%
Durbin-Watson	1.7	1.6
Prob(F-stat.)	0.0	0.0
Number of obs.	21	21

Notes: Δ denotes the first difference of the variable. In the levels model, the error correction term was derived from a long-run model (not reported but available upon request) with the variables in levels. Standard Errors in parentheses

5. CONCLUSIONS

Fiscal policy is a short-run issue that can have long-run growth implications. Within the framework of endogenous growth models, for example, fiscal deficits can impact long-term growth positively if they are used to finance growth enhancing expenditures on, for instance, public infrastructure, research and development, education and health. On the other hand, if economic agents are non-Ricardian due to credit constraints and overlapping generation, public deficits can have a negative impact on long-term growth as public deficits can hamper growth by competing with private physical capital for individual savings.

In this paper, we have assessed the intertemporal relationship between government expenditures and revenues for the case of Guinea-Bissau - a low income country under stress that has struggled to achieve fiscal discipline. Understanding this relationship is relevant as it can shed light on the way the government interferes in the allocation of resources in the economy. The underlying hypothesis of the paper is that government expenditures are determined ahead of government revenues, which is known in the literature as the spend-tax hypothesis.

To achieve this objective, we have first presented a simple macroeconomic model outlining the postulated relationship between government expenditures and revenues in Guinea-Bissau. Using annual data for government expenditures and revenues over the period 1981 to 2002 and modern time series econometric techniques we were unable to reject the spend-tax hypothesis. The results suggest that while government expenditures and revenues exhibit a stable relationship in the long run, there exists unilateral causality from expenditures to revenues in Guinea-Bissau. That is, although the risk of budget deficit explosion in the long-run is limited, the government seems to spend first and then raise tax revenues and/or request/receive grants to finance its expenditures, rather than adopting the approach of raising funds first to finance spending later.

The policy recommendation for Guinea-Bissau can be summarized as follows. In order to achieve fiscal sustainability the government should try to face up the implication of policies up to this point. In a first moment, government expenditures should be re-examined with the view to assess (i) their contribution to an efficient allocation of resources within the economy and (ii) their potential to finance growth enhancing spending categories (such as, for example, those considered in the framework of endogenous growth models - i.e., infrastructure, research and development, education, and health). In a second moment, the government should 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 pave the way for a sound medium-term budgeting framework and help the government to control its expenditures rather than increasing its fiscal revenues, thus reestablishing fiscal discipline without jeopardizing the accumulation of factors and affecting the country's long-term growth potential.

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