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DOMESTIC DEBT DYNAMICS AND FISCAL SUSTAINABILITY IN NIGERIA: AN EMPIRICAL EVIDENCE

By

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Abstract:

The purpose of this paper is to examine the relationship between domestic debt dynamics and fiscal deficits over the period 1970-2006. We pretest the variables for stationarity by carrying out unit root tests. However, a variable may appear to exhibit non-stationary behavior when in actual fact it is stationary. Testing for unit root in the presence of structural break sometimes results in a stationary process. Thus a test for unit root utilizing ADF statistic may be insufficient to justify classifying a variable as stationary or non-stationary. Testing for unit root in the presence of structural break may give a clearer indication. This is what we have done in this study. As a result of these tests we find that all the variables of our model are integrated of order zero, that $I(0)$. This led to the estimation of a multiple regression model. The results of our estimation show that all the variables significantly affect the debt dynamics while the inflation rate bears no significant relationship with the debt dynamics. The empirical results indicate that deterioration of primary fiscal balance account for the worsening of the debt dynamics as domestic debt outstanding continue to grow even in the face of modest economic growth. We recommend that government should take all necessary steps to implement the Fiscal Responsibility Act and intensify its efforts in utilizing the capital market whenever it is in need of funds.

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DOMESTIC DEBT DYNAMICS AND FISCAL SUSTAINABILITY IN NIGERIA: AN EMPIRICAL EVIDENCE

Introduction

According to section 46(b) of the Fiscal Responsibility Act concerning the framework for debt management ‘The government shall ensure that the level of public debt as a proportion of national income is held at *a sustainable level*.’ In another section the Act further provides that fiscal deficit should not exceed three percent of the estimated Gross Domestic Product (GDP). The reasons for these provisions are not farfetched. Public debt expanded rapidly from the 1980s after the collapse of the oil market. The weak fiscal imbalances experienced beginning from the 1980s continues into the 1990s and beyond and led to a skyrocketing public debt which is unsustainable. This has the effect of increasing debt service cost which accounts for a large share of government spending contributing in its turn to chronic fiscal imbalances.

According to Casell, Giovanni and Lane (1998:4), ‘If the debt dynamics become unsustainable, some policy change will eventually be needed, and this can take the form of fiscal consolidation, inflation (and attendant currency depreciation) or default.’ The unsustainability of public debt usually put pressure on the Central Bank to monetize some debt an action that is inflationary. This in turn may constrain the monetary authorities in pursuing price stability. In Nigeria debts are accumulated at a rapid pace ‘far in excess of the debtor’s capacity to repay’ so that the magnitude of the debts and their servicing obligations pose serious problems to both the borrower and his creditors (Olashore, 1991: 221). The collapse of the world oil markets which began in 1981, saw public finances deteriorate remarkably. In addition an equally disturbing characteristic of most expenditures of government during the boom years was that they were consumption rather than investment-

oriented (Olashore, 1991: 224). The question is whether budget deficits can continually be financed through issuance of new debt or there is some limit to the process. This is the sustainability issue for debt finance.

Fiscal sustainability is achieved when the ratio of public sector debt to GDP is stationary (Edwards, 2002). However, fiscal policy may be subject to structural breaks which results in traditional tests of public debt sustainability being biased towards rejecting sustainability. The Nigerian economy is characterized by macroeconomics shocks such as the oil price shocks of the 1980s which is due to the country's heavy dependence on exports of crude oil. Oil's share in GDP and fiscal income is very high. This has made the country exposed to external macroeconomic shocks, especially oil price shocks. Little empirical work has quantified the effects of structural break on public debt dynamics. The purpose of this paper is to examine the relationship between fiscal deficits and aggregate public sector debt sustainability.

Section two examines the literature on debt dynamics and debt sustainability. In section three we present the empirical analysis. Section four is concerned with policy recommendation and section five concludes the paper.

Literature Review

Debt dynamics and fiscal sustainability is a matter of great concern to policy makers in developing economies. Developing countries are faced with increasing difficulty in obtaining external finance to drive their development efforts so that they have to rely on domestic debt. Domestic debt it has been argued can crowd out domestic private investment and become

unsustainable in the long run. The sustainability of domestic debt is usually measured by the ratio of domestic debt to Gross Domestic Product (GDP).

According to Edwards (2002) fiscal sustainability is achieved when the ratio of public debt to GDP is stationary. This suggests that a ratio of public debt to GDP which is non-stationary is unsustainable. This fact emerged when the time series properties of public debt are examined. Ojo and Okunroumu (1992) showed that as fiscal deficits financed by borrowing from the banking system increased, macroeconomic instability and the public debt burden escalates. So at the heart of domestic public sector debt increases is the mode of financing fiscal deficits. If borrowing thus continues unabated clearly domestic public debt could become unsustainable. According to Olashore (1991, p.221) 'Nigeria's domestic debt crisis has a history and a location. Its roots are traceable to the pattern and structure of government expenditure over the years.' The pattern and structure of government expenditure has led to persistent fiscal deficits which have to be financed. However, in the face of dwindling oil revenues, domestic debts are accumulated. 'Debts are accumulated at a rapid pace, far in excess of the debtor's capacity to repay...so that the magnitude of the debts and their servicing obligations pose serious problems to both the borrower and his creditors (ibid.:221).

This increasing accumulation of debt is caused by government recourse to unbridled deficit financing to fill the financing gap, rather than streamline expenditure with resource flows. This problem is exacerbated when getting external finance becomes difficult. This is because the burden of financing budget deficits will shift to the domestic sector. Depending on how this is done, it can lead to increasing inflation (if the printing of money, for example, is involved) and higher domestic interest rate (Sachs, 1989).

Empirical evidence suggests that rapid increase in fiscal deficits is the major cause of inflation in Nigeria, which is financed by expansionary monetary policy and this have the effect of fuelling inflationary pressures (see Fashoyin, 1996). Several studies also focus their attention on the effects of fiscal deficits (see Morrison, 1982; Yekini, 2001). These studies however did not consider whether domestic debt arising out of the need to finance fiscal deficits is sustainable. Besides the fact that macroeconomic shocks such as the oil shocks of the early 1980s could have devastating effect leading to structural break in many macroeconomic time series has not been taken into account by these studies. The present paper addresses this lacuna.

Methodology

According to Arghrou (2005) ‘fiscal policy may be subject to structural breaks, which may result in traditional tests of public debt sustainability being biased towards rejecting sustainability.’ Accordingly, we test for unit root for the fiscal variables entering our model in two ways: first, we test for unit root without structural break using Dickey-Fuller approach, and second, we test for unit root in the presence of structural break. This strategy ensures that we do not reject the null hypothesis of no unit root when in fact the presence of structural break may have shifted the mean only. In addition, the test for structural break is conducted if only to recognize the fact that the Nigerian economy has been subjected to macroeconomic shocks since the early 1980s. The effect of these shocks might have changed the course of several macroeconomic variables including fiscal ones.

The variables that determine the debt dynamics are primary fiscal balances, outstanding debt, inflation and growth. The debt dynamics are often expressed as a simple accounting relationship as follows:

$$D_t = D_{t-1}(1 + i_t) - (T_t - G_t) - m_t \quad (1)$$

where

D_t = debt outstanding at the end of period t

i_t = the average interest rate

T_t = total revenue

G_t = noninterest expenditure

$T_t - G_t$ = primary fiscal balance

m_t = monetary financing.

Abstracting from monetary financing the debt dynamics for the debt-to-GDP ratio d_t is expressed as

$$d_t - d_{t-1} = d_{t-1}(i - (g_t + \pi_t)) - f_t$$

or

$$\Delta d_t = d_{t-1}(i - (g_t + \pi_t)) - f_t \quad (2)$$

where f_t is the primary fiscal balance as percentage of GDP, g_t represents the growth rate of real GDP, π_t is the rate of inflation so that $(g_t + \pi_t)$ is the growth rate of nominal GDP. The debt dynamics is influenced by primary fiscal balance. The effect of this factor is straight forward. A weak fiscal balance is an indication of a strong mismatch between government expenditure and revenue. Where expenditure is growing at a faster rate than revenue growth rate, the gap can only be filled through borrowing or inflation tax. Borrowing comes with cost as government has to service debt which raises the share of interest expenditure and repayment of principal reducing resources meant for developmental purposes. Debt service cost may also lead to the expansion of public debt as increase in interest rate further

compounds the problem. Our a priori expectation is that as the primary fiscal balances deteriorates, the debt dynamics becomes explosive.

The growth rate of real GDP affects the debt dynamics in the sense that higher growth rate leads to increased revenue via increased taxes. This will have the effect of reducing borrowing on the part of the government. As a result of reduction in borrowing, future interest cost arising from servicing debt will be reduced and to that extent debt dynamics. Thus we expect the relationship between growth rate and debt dynamics to be an inverse one.

Higher inflation rate may reduce the cost of debt servicing. The repayment of principal and interest will be easier for government during inflationary periods. This is a well known fact. Whenever inflation is on the rise, debtors gain and creditors loose. Thus as inflation rate increases the debt dynamics is expected to fall.

The Model

The functional form of our model can thus be written as

$$d_t = f(f_t, g_t, \pi_t).$$

The debt dynamics is hypothesized to depend on the aforementioned variables and our linear multiple regression model is formulated as follows:

$$d_t = \beta_0 + \beta_1 f_t + \beta_2 g_t + \beta_3 \pi_t + \varepsilon_t \quad (3)$$

where the β_j 's are the coefficients of the regression model, t indexes time. The *a priori* expectations imposes the following restrictions: $\beta_1 > 0, \beta_2 < 0$, while $\beta_3 < 0$.

Unit Root Tests with Structural Breaks

The test for structural break in the data was pioneered by Perron (1989) who showed that when an 'exogenous' break is included in the unit root test, this may lead to greater likelihood of rejecting a unit root. However, Zivot and Andrews (1992) argue that the break point in time series should be determined 'endogenously' from the data. By using a search procedure to determine the point of structural break, Zivot and Andrews show that Perron's (1989) exogenous break test may lead to spurious rejection of the unit root hypothesis. However, Zivot and Andrews test has been criticized for (1) using a data generating process with no structural break under the null hypothesis. This assumption has been shown to lead to spurious rejection of the null, (2) in the determination of the break point, Zivot and Andrews select the break point where the t-statistic testing the null of a unit root is minimized. (See Lee and Strazicich,1999). Lee and Strazicich (1999), however, show that these sequential DF type tests tend to estimate the break point incorrectly, and lead to spurious rejection of the null. The Zivot and Andrews procedure tends to select the break point where the bias in the parameter testing for a unit root is maximized and spurious rejection are greatest.

We apply the minimum Lagrange Multiplier (LM) test employed by Lee and Strazicich (1999) which is free from the bias on annual data on primary fiscal balance, real growth rate, inflation and debt outstanding for Nigeria over the period 1970-2006. The data comes from the Central Bank of Nigeria Statistical Bulletin.

To identify a structural break and test for unit root, we employ the augmented version of the minimum LM test. The minimum LM test is used to endogenously determine a structural break and test the null of a unit root in time series. This test is found to have many desirable properties in terms of size and power and, in addition, tends to identify a structural

break correctly. On the contrary, the Zivot and Andrews test suffers from problems of bias and spurious rejection of the null, both of which increase with the magnitude of the break. The minimum LM test is found to be free from problems of bias and spurious rejections, and is invariant to both the magnitude and location of the break. (Lee and Strazicich, 1999).

To test for unit root in the presence of one structural break we employed the Lagrange Multiplier (LM) test of Lee and Strazicich (1999), which allows for one structural break determined endogenously from the data in contrast to Perrons' (1989) method where the break point has to be determined exogenously by the researcher. We carried out the test for structural break in two ways. First, we test whether there is a unit root in the presence of one time jump in the mean of the series with model (5) below:

$$y_t = \theta_0 + \theta_1 t + \theta_2 B_t + \phi y_{t-1} + \sum_{j=1}^k c_j \Delta y_{t-j} + e_t \quad (5)$$

Second, to test for unit root and simultaneously test for the case in which there is a shift in the mean of the series and change in its intercept, we used the following model (6) below:

$$y_t = \theta_0 + \theta_1 t + \theta_2 B_t + \theta_3 D_t + \phi y_{t-1} + \sum_{j=1}^k c_j \Delta y_{t-j} + e_t \quad (6)$$

where $B_t = 1$ for $t = T_B + 1$ and zero otherwise, and $D_t = t$ for $t \geq T_B + 1$ and zero otherwise. T_B is the period in which structural break occurs. B_t represents a dummy variable signifying structural break in the mean of the series, while D_t is a dummy variable that is used in capturing possible change in the intercept of the series.

We then test for the case where y_t is a unit root process with a one-time jump in the level of series in period $t = T_B + 1$ (model 5) and where y_t is both a unit root and trend

stationary process with a one-time change in the intercept (model 6). The aim is to test whether $H_0 : \phi = 1$, or $H_1 : \phi < 1$.

Empirical Tests

We apply the minimum LM test on annual data on real GDP, primary fiscal balance and inflation rate for Nigeria over the period 1970-2006. The data comes from Central Bank of Nigeria statistical bulletin, various issues. All series are in logs except the inflation rate. To identify a structural break and test for unit root, we employ the augmented version of the minimum LM test.

The number of lagged augmented k terms and the break point, TB are determined endogenously. k is determined via a recursive sequential t-test. The optimal value of k determined is shown below for all the series.

Empirical Results

Series	Model 5			Model 6			Order of Integration
	k	τ_b	Stat	k	τ_b	Stat	
Real GDP	4	1999	-1.9964	6	1996	-3.7685	I(0)
Primary Fiscal Balance	1	1990	-4.3446	5	1989	-5.4712	I(0)
Outstanding Domestic Debt	8	1995	0.7772	7	1982	-4.6544	I(0)
Inflation	1	1998	-4.5845	1	1998	-4.8646	I(0)

Source: Computed using GAUSS

LM test critical values at 1%, 5% and 10% level of significance are -4.239, -3.566 and -3.211, respectively.

For the real GDP, the lag selected is 6 and structural break occurred in 1996. The computed t-statistic is -3.7685 which is greater in absolute value than the LM_{τ} critical value at 5% level of significance. The lag length selection is carried out via a recursive process, endogenously. This result indicates that we can reject the hypothesis of unit root in favour of the alternative hypothesis that it is a stationary process. The growth rate of primary fiscal balance is also a stationary process going by the fact that the computed ADF statistic of -5.4712 is greater in absolute value than the critical value at the conventional level of 5%. The endogenously selected lag is 5. The null hypothesis of unit root is rejected in the case of growth in outstanding debt. At the 5% level of significance the calculated value of -4.6544 is greater in absolute value than the LM_{τ} critical value. For the inflation rate, the lag length selected is 1 and the calculated value of -4.8646 is greater in absolute value than the critical value at the 5% significance level. However, only the real GDP appears to be non-stationary at 1% level of significance. These variables are now utilized in a multiple regression framework as determinants of domestic public debt dynamics.

We then estimated the form of the regression model in equation (3) above using ordinary least squares method. The results of our estimation are rendered below in Table 1.

Variable	Coefficient	Standard Error	t-statistic	Prob.
GDP	0.4183	0.0972	4.3023	0.0026
INF	-0.0024	0.0043	-0.5705	0.5840
PRFBAL	0.2076	0.0632	3.2175	0.0123
C	7.0379	1.2809	5.4943	0.0006
$R^2 = 0.9506$				
$R^2 = 0.9197$				
F-statistic = 30.8036				

DW = 1.6975				
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Source: Computed using E-views.

The estimates in Table 2 shows that only the coefficient of the inflation rate is not statistically significant although it has the correct sign. Moreover, the coefficient of determination is high showing a very good fit. The regression is free from serial correlation and all diagnostic tests showed that it is a good fit.

The results of the regression show that the growth rate of GDP is positively related to debt outstanding. The growth rate of real GDP accounts for over 40% of the growth of domestic public debt outstanding debt. The coefficient of the real GDP is positive and significant at the conventional 5% level. A 1-percentage point increase in GDP is associated with a 0.41 percentage point increase in debt. This result is puzzling. The rate of growth of the economy should expectedly lower outstanding debt. As economic growth proceeds government revenue expectedly should increase. In the case of Nigeria, however, the result may be plausible given the developmental needs of the state which calls for increases in expenditure. Higher growth rate fueled by expansion in the oil sector may have wetted the appetite of Government for more spending without taking into consideration the vulnerability of the economy to external shocks. Government deficits have persistently remained a problem even during the oil boom years. Iyoha finds that most studies indicate that government expenditures usually exhibit a tendency to rise faster than the GDP irrespective of the level of development (See Iyoha in Okol, 2005). Consequently although increase in real GDP is expected to lead to reduction in outstanding debt and bring about sustainable debt, the rise in expenditure faster than growth of real GDP continues to be a problem. In this vein, although our result shows that a percentage increase in real GDP contributes to over 40% increase in debt outstanding, this may not be

unconnected to growth in oil GDP fuelling expansion in government expenditure which is unsustainable in the long run.

The result indicates that inflation rate does not bear significant statistical relation to the debt outstanding. The coefficient of the inflation rate however has the expected sign. A percentage increase in inflation rate leads to reduction in debt outstanding by 0.002 percentage points. Thus higher inflation all other things remaining the same improves the debt dynamics via the usual Fisher effect. The effect of inflation is however very small indicating that higher inflation has not been helpful in reducing the debt dynamics.

The primary fiscal balance bears a positive and statistically significant relation to the outstanding debt. It contributes up to 20 percent of outstanding debt. This is not unexpected as fiscal balances have deteriorated over the years from the 1980s upward culminating in persistent fiscal deficits.

Conclusion

Although most macroeconomic variables tend to trend over time, a variable which is characterized by a unit root process may be a stationary process once account is taken of structural break. In our study of the dynamics of domestic debt, we test for stationarity by taking into account the occurrence of structural break in the data. This as we have pointed out is most likely going to happen given the fact that the Nigerian economy is usually confronted with macroeconomic shocks. The major determinant of increased domestic debt according to our study is none but primary fiscal balance. This indicates that efforts at controlling government expenditure using the fiscal responsibility act are a step in the right direction.

Policy Recommendation

We recommend that government must endeavour to implement the fiscal responsibility act of limiting the level of domestic debt to 3 percent of GDP. This action it is hoped will serve to additionally discipline the government in carrying out its fiscal responsibility. The contribution of primary fiscal balance to the growth rate of domestic debt still remains high. This is clearly unsustainable. Current effort at mobilizing resources through the capital market by issuing bonds should be intensified so that government can achieve the twin objective of financing its programmes while at the same time helping to achieve a sustainable level of domestic debt in the medium to long term.

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