PUBLIC SPENDING, FISCAL SUSTAINABILITY AND MACROECONOMIC PERFORMANCE IN NIGERIA

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Abstract

This paper examines fiscal sustainability in Nigeria, vis-à-vis the economic performance in the country. Using the framework of an intertemporal budget constrain for the government, a fiscal sustainability equation is derived and the conditionality for establishing sustainability is ascertained. The empirical strategy applies the unit root test, cointegration test and dynamic OLS (DOLS) regression approach for testing the sustainability of the fiscal stance from 1961 to 2016. The empirical evidence shows evidence of weak sustainability especially as reported in the DOLS regression result. Similarly, the result for the effect of fiscal sustainability and economic performance also reports weak response of economic performance to fiscal sustainability. On the overall, the evidence from this study does not significantly deviate from extant studies in this strand of the literature. The main policy implication of this research is that the Nigerian government should ensure a more robust and systemic link between tax and expenditures policies and the evolution of public debt. In passing, a focus on determining a short-term government constrain framework and fiscal sustainability indicators for signaling short and medium term fiscal imbalances and to correct them will be a worthwhile direction for future research.

Keywords: Public Debt, Fiscal deficit, Fiscal Sustainability, Economic Performance, Intertemporal budget constraint

1.   Introduction

Fiscal sustainability has drawn so much attention, especially in developing countries, in terms of debt profiles and their impact on their growth trajectories. Discussions on fiscal sustainability have featured prominently among policy makers and mainstream economists in developing countries. This increased attention on fiscal sustainability is attributed to the fact that most developing countries often experience significant upswings and downswings in their revenue generation and thus leading to significant fiscal constraints in their development plans.

Nigeria's fiscal history presents a typical of this trajectory. Nigerians fiscal spending is substantial dependent on oil revenue. More than 90% of Nigerian government budgetary finances is sourced from revenue generated from oil. The fluctuations in oil

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prices therefore translate directly to fluctuation in government revenue. The fall in oil prices has consistently led to increased borrowing in financing the budget since 1980s when oil price experienced significant downward swing. Nigeria's total debt profile maintained a consistent increase, rising from per cent of gross domestic product in 1981 to 39.1in 1989. It further increased to a peak of 56.6 per cent in 1990, (CBN, 2016).

Following the debt cancellation package which the country negotiated and obtained from the Paris Clubs, there was a gradual reduction from the 56.6 % 1.5 percent debt/GDP in 2006. For the period 2006 to 2009 and remained at single digit till 20101 and marginally increased to an average of 10 per cent between 2011 and 2013. Following the swings in international oil prices, in 2014, the debt profile upward swing. It rose to 21.38 per cent in 2016 from 15.86 per cent and 14.20 per cent in 2015 and 2014 respectively though the debt rate is still less than the 56 per cent global benchmark for developing countries like Nigeria, the 2016 figure is higher than the DMO's benchmark of 20% and its prediction for 2016 of 13.5 per cent (DMO, 2016).

The preceding evidence gives much impetus for a more systematic study analysis of the sustainability of the fiscal policy and its effect on macroeconomic performance in Nigeria. Unlike previous studies that have traditional focused on the debt-GDP growth nexus only, this study push further to link the sustainability of government fiscal policies to macroeconomic economic performance, using a more robust construct of macroeconomic performance in Nigeria.

The paper is further motivated by the need to analyze the fiscal position of the country and to better understand the risk the country is facing, especially within the present economic context. Notwithstanding the relatively low debt to GDP ratio of the country in recent years, as debt continue to rise to historical levels, the risk premia begins to rise sharply, and so the economic situation may begin to deteriorate. Indeed, the debt servicing/revenue ratio which stood at 64 percent in 2016 compared with 32.7 and 29 percent for 2015 and 2014 respectively has exceeded the benchmark of 28 percent by DMO indicating a more vulnerable situation of the fiscal sustainability in the future.

Consequently, the current and future economic growth performance can be significant constrained as government may not have much resources to finance development projects. Finally, a fiscally sound economy will be able to finance public investment and at the same time attract foreign investment through its fiscal credibility.

The paper extends and contributes to the extant literature in two ways. It adopts a numerical expenditure rule as alternative to the conventional non numerical approached among previous studies on debt/growth nexus in Nigeria, (see Omotosho, Bawa and Dagura 2016, for instance). This empirical strategy follows the procedure employed in past studies (such as Baharumshah and Lau, 2007 and Miyazaki, 2011) that have dealt with the sustainability problem in other countries by considering structural change. The method not only established fiscal sustainability but also provide a general framework for analysis the dynamics of the fiscal sustainability

intertemporally over a given period. Secondly, the paper experiments with deriving a unique index for macroeconomic performance as against the use of economic growth common among previous studies. The new index provides opportunity to capture all aspects of economic performance indicators.

The remainder of the paper is structured as follows: sections 2 outlines the theoretical and empirical issues in fiscal sustainability. Section 3 presents the empirical methodology while section 4 discusses the empirical results and the concluding remarks are covered in the section 5.

2.   Theoretical and empirical issues in fiscal sustainability

The Treasury (2013) defines fiscal sustainability in relation to the affordability of government taxation and spending programmes. In simple terms, fiscal just refers to government spending and investing activities and how these are financed through taxes, debt and other liabilities. Sustainability means having the ability to maintain or support government programmes in the future. So, fiscal sustainability refers to whether the Government can maintain current policies without major adjustments in the future. Fiscal sustainability represents broadly the ability of government to sustain its current spending, tax and other policies in the long run without threatening government solvency or defaulting on some of its liabilities or promised expenditures. Tanner (2013) argues that for a government to meets all its present and future obligation, its streams of revenues must at least be enough over a period to offset and services its obligation to service its obligations to preclude either default or restructuring.

Several studies have rendered theoretical frameworks and empirical evidence on fiscal sustainability. Tanzi (2011) states that public debt is an important fiscal policy tool and sustaining a balance between revenue inflow and spending is key in fiscal management. According to the paper, the idea of tax smoothing, which is essential to provide a steady flow of public goods and services and run a countercyclical fiscal policy, depends on the capacity of government to borrow during recessions and repaying debt during booms. In this sense, "some economists have advocated borrowing to finance public investment, in which has been referred to as the "golden rule". This argument fundamentally relies on two basic assumptions: - first; "because public investment creates assets that favor future generations, thus the latter should pay for it and second; that public investment is always productive" (Tanzi, 2011).

Even though debt can be employed as a tool to bridge fiscal constrain, thus improving macroeconomic performance and promoting welfare, excessive debt accumulation can lead to a fiscally unsustainable situation, with severe negative effects on macroeconomic stability and economic growth performance. Reinhart and Rogoff (2011) documented large number of countries with historical "surges in public debt" episodes of excessive debt accumulation. The conclusion from this paper and many other subsequent studies that examined the issues was that countries faced chronic fiscal problems mostly because governments systematically overspend and do not have the political will or ability to tax effectively and efficiently or a combination of the

two. In this regard it is argued that significant asymmetry between expenditure and taxes has led to *fiscal illusion* when the public sector relies heavily on borrowing to finance fiscal deficits. A fiscal illusion arises when debt finance is substituted for tax finance thereby causing people to underestimate the real price of public goods and thereby increase their demand for more spending" (see Aronson and Ott, 1996)

In view of the large fiscal deficits and debt overhang that characterized most of the developing countries and the resultant retarded growth experienced by majority of the economies in Africa Studies have also examined the sustainability of fiscal policy and debt profile of developing countries. Most of these studies fundamentally explain the nexus between debt and growth, as well as setting a debt threshold upon which debt becomes inefficient for driving growth (Schneider (2006); Redzepagic (2008); Westerlund and Prohl, 2010; Omotosho, Bawa and Doguwa, 2016).

Other studies have focused on the relationship between fiscal rules, sustainability of fiscal policy and the outcome of economic performance (Fat´as ,2010; Franco and Zotteri, 2010; and Rose ,2010), the relationship between fiscal reform and fiscal sustainability and emphasize the role of fiscal rules in ensuring the sustainability of fiscal policy, (Franco and Zotteri, 2010). Some other studies have also extended the analysis to the sustainability of fiscal policy in general, (Bohn, 2008; Afonso and Rault, 2009; Legrenzi and Milas, 2010; Abdullah, Mustafa and Dahalan (2012).

The lack of consensus and a common benchmark for determining sustainable fiscal spending and borrowing, Burnside (2012) provided a new framework for assessing key indicators of the health and soundness of fiscal policy stands. This new approach which is adopted in this paper provide an alternative strategy to test for the robustness of existing framework and determine if the methodology approached adopted constitute a major factor in the divergent views expressed in the literature with respect to fiscal sustainability in terms of ; estimation of government's ability to borrow as well as finance its debt servicing and repayment; prediction of the onset of fiscal crises that may be lurking; assessment of the fiscal risk associated with contingent liabilities; and the assessment of prior fiscal policy record and discussion of future policy choices.

3.   Analytical Framework

3.1 Theoretical Model for Fiscal Sustainability Test

Following the theoretical argument of Bohn (2007) as adopted by (Silvestrini 2007; Deyshappriya, 2012; and Muzenda, 2014), the Nigeria's government fiscal stance can be construed in term of intertemporal budget constrain (IBC) which defines the extent to which government has exceeded it budget constrain and how this deficits can be financed. Thus, the nominal IBC can be written as;

$$\Delta D_t = G_t + r_t D_{t-1} - R_t \qquad (1)$$

In equation 1 above D_{t-1} is government total debt stock and thus ΔD_t denotes the change in stock of debt while $r_t D_{t-1}$ is the interest payment of debt financing; R_t is

government revenue while G_t is government total expenditure and r_t is the prevailing real interest rate. The right hand side of equation 1 represents the primary balance which can be expressed as n term of government spending to have:

$$G_t^* + (1 + r_t)D_{t-1} = R_t + D_t \qquad (2)$$

The debt profile can also be seen from future streams of income payment to be made if the debt is to be liquidated. Thus, the current debt stock could be expressed as equivalent of the discounted value of future streams of income that accrues from fiscal surpluses (S_{t+1}), calculated as $S_{t+1} = R_{t+1} - D_{t+1}$, for a period j. Similarly, if instead of surplus, the fiscal balance is in deficit and hence debt accumulates further. The net current debt stock will therefore be cumulative sum of the discounted surpluses and deficits of the given period. Hence, expressing equation 2 in term of present and future discounted fiscal surplus and debt values such that the debt yield for subsequent periods gives;

$$D_t = \frac{1}{1+r} S_{t+j+1} + \frac{1}{1+r} D_{t+j+1}, \qquad 3$$

Equation 3 specification builds on the assumption that (i) time is discrete, (ii) debt has a maturity of one period, (iii) debt is real (in other words, its face value is indexed to the prevailing price level) and (iv) debt issued at date $t-1$ pays a real interest rate r_{t-1}. (v)r_t is assumed to be stationary around its mean r.

Following Miyazaki 2011, by a simple iterative substitution, and taking conditional expectation, equation 3 was solved recursively such that equation 3, becomes;

$$D_t = \sum_{j=0}^{\infty} \frac{1}{(1+r)^{j+1}} E[S_{t+j+1}] + \lim_{j \to \infty} \frac{1}{(1+r)^{j+1}} E[D_{t+j+1}] \qquad (4)$$

As $j \to \infty$ the present value of expected debt to GDP ratio should converge to zero such that

$$\lim_{j \to \infty} \frac{1}{(1+r)^{j+1}} E[D_{t+j+1}] = 0 \qquad (5)$$

and the necessary condition for fiscal sustainability is derived by setting the current value of the outstanding government debt (D_t) to be equal to the expected present value of future budget surplus

$$D_t = \sum_{j=0}^{\infty} \frac{1}{(1+r)^{j+1}} E[S_{t+j+1}], \qquad (6)$$

Equations 5 & 6 guarantees that the intertemporal budget balance (IBB) holds and the government solvency constrain and transversality condition is also satisfied;

Equation 5 can also be used to articulate two cases of fiscal sustainability analysis.

(i)   If $\lim\limits_{j\to\infty} \frac{1}{(1+r)^{j+1}} E[D_{t+j+1}] < 0$, then expected discounted future primary surpluses exceed the present value of public debt suggesting that over time government accumulates a net tax revenue.

(ii)   If $\lim\limits_{j\to\infty} \frac{1}{(1+r)^{j+1}} E[D_{t+j+1}] > 0$, then the present value of government debt exceeds the expected primary surpluses and the government is under pressure to borrow persistently overtime to cover the shortfalls and hence accumulate debt to meet its interest obligation on past debt incurred.

The optimal condition is when equation 5 holds which suggests that debt is solvent when the transversality condition ensures the non-explosiveness of public debt condition (and when there No Ponzi Game, hereafter, NPG condition) is fulfilled. That is   (i) the present value of all future debt balances must be zero (ii) the current debt is offset by the sum of current and expected future discount surpluses and (iii) the budget constrain holds in present value terms as expressed in equation 6.

3.2   Empirical Model for Testing Fiscal Sustainability

Equation 4 can therefore be used to derive a baseline model for testing the fiscal sustainability condition. Since the study is time series, then equation 4 needs to be converted to a testable empirical equation by taking its first difference to yield:

$$\Delta D_t = \sum_{j=0}^{\infty} \frac{1}{(1+r)^{j+1}}\left[\Delta S_{t+j+1}\right] + \lim_{j\to\infty}\frac{1}{(1+r)^{j+1}}\left[\Delta D_{t+j+1}\right] \tag{7}$$

From equation 1, $\Delta D_t = D_t - D_{t-1}$, then equation 7 can be rewritten as:

$$G_t + r_t D_{t-1} - R_t = \sum_{j=0}^{\infty} \frac{1}{(1+r)^{j+1}}\left[\Delta S_{t+j+1}\right] + \lim_{j\to\infty}\frac{1}{(1+r)^{j+1}}\left[\Delta D_{t+j+1}\right]$$

Based on equation 5 & 6 and with the assumption that intertemporal budget balance condition holds, then equation 7 can be rewritten as;

$$G_t + r_t D_{t-1} - R_t = \sum_{j=0}^{\infty} \frac{1}{(1+r)^{j+1}}\left[\Delta S_{t+j+1}\right] \tag{8}$$

Equation 9 fundamentally, implies that the sum of the present value of discounted current and future budget surplus will be equal to the amount needed to just repay the principal amount of debt and the interest yield on the debt. Thus, equation 9 guarantees that IBC or NPG is attained and gives the condition to be met for the current expected path of government fiscal activity to be sustainable in the long run (Mahmood and Rauf, 2012)

The Equation 9 thus forms the basis for the empirical test for fiscal sustainability for existence of the IBC and NPG. The common approach of testing this sustainability condition is to test for the stationarity of the terms in the left hand side of equation 9 by imposing the cointegrating vector (1,1,-1) (Miyazaki 2011). In this sense, the

stationarity test is explicitly carried out on the discounted debt series D_t and to test for the cointegration between the government expenditure G_t and government revenue R_t. For empirical purpose the left-hand side of equation 8 can be subsumed into a single variable thus; $X_t = G_t + r_t D_{t-1}$, and the right-hand side be subsumed as streams of income from revenue such that equation 9 becomes:

$$Q_t = \sum_{j=0}^{\infty} \frac{1}{(1+r)^{j+1}} \left[\Delta S_{t+j+1} \right] \qquad (9)$$

The LHS of the equation 9 expresses the budget balance captured by Q_t (that is $Q_t = R_t - X_t$) while the RHS is the discounted debt stock. To explicitly test for the cointegration in the regression equation 9 is simplified as follows:

$$R_t = \delta + \varphi X_t + u_t \qquad (10)$$

Following Leonte (2012) the necessary and sufficient conditions for sustainability will be confirmed by testing whether X_t and R_t are cointegrated with $\varphi = 1$ and checking whether the I(1) processes of X_t and R_t are cointegrated in equation (10). The null hypothesis to be tested here is that the $\varphi = 1$ and u_t is a stationary process. Hence, a necessary and sufficient condition for sustainability is that X_t and R_t are stationary and cointegrated variables of order one with the cointegrating vector being (1,-1) for the IBB to hold. Though, the proportionality between revenue and spending does not mean that R and X are equal, it only shows that they covariate by the same amount. Hence may suggest that budget balance in current periods implies no surpluses are generated to pay off old debts. The cointegration between revenue and spending provides a mechanism however, provide a mechanism to track fiscal stances of government over time. In addition to the cointegration test for sustainability, the Dynamic OLS (DOLS) method was also experimented with. The DOLS estimator technique is asymptotically equivalent to the Johansen's (1988) maximum likelihood estimator and is considered appropriate in both large and small samples. The DOLS regression equation can be specified by making some amendments to the equation 10, takes the following form:

$$Q_t = \delta + \varphi X_t + \sum_{i=-r}^{r} \gamma_t \Delta X_t + u_t \qquad (11)$$

Equation 11 is a standard augmented OLS regression models with addition of a few lead and lag differences of the regressor. According to Baharumshah and Lau (2007), using the DOLS estimation, a more efficient estimate of the coefficient of the cointegration vector than by simple OLS can be derived. Under the DOLS approach, two alternative hypotheses of fiscal sustainability can be tested:

(i)   fiscal policy is sustainable if there is cointegration relationship between X_t and R_t, with $0 < \varphi < 1$;

(ii)   fiscal policy is unsustainable even if there is cointegration relationship between X_t and R_t, with $\varphi < 1 \ or \ \varphi > 1$

(iii)

Derivation of Fiscal Sustainability Index

The time series index for fiscal sustainability in line with Polito and Wickens (2005) is derived by rearranging equation 4 in a way to equate fiscal balance to the present value of future primary deficit as represented by Equation 12.

$$D_t - \lim_{j \to \infty} \frac{1}{(1+r)^{j+1}} E[D_{t+j+1}] = \sum_{j=0}^{\infty} \frac{1}{(1+r)^{j+1}} E[S_{t+j+1}] \tag{12}$$

. The fiscal sustainability index is then constructed by comparing the two sides of equation (12) based on the assumption that fiscal deficit and discount rate are endogenous and time-varying variables while the target level of the debt-GDP ratio is a choice. The index derived is then compared with the current debt-GDP ratio and **n** periods ahead with given fixed values of the deficit and discount rate. If, for example, the aim is to decrease discounted debt then the left-hand side should be negative, and the right-hand side gives the present value of the primary surplus required to achieve this reduction in debt. An increase in discounted debt requires a lower primary surplus. The measure of fiscal sustainability is therefore based on an n-period horizon on the metric specified as follows:

$$FS_{t,n} = D_t - \lim_{j \to \infty} \frac{1}{(1+r)^{j+1}} E[D_{t+j+1}] - \sum_{j=0}^{\infty} \frac{1}{(1+r)^{j+1}} E[S_{t+j+1}]$$
$$\lessgtr 0 \tag{13}$$

Equation (13) above is the measure of fiscal sustainability proposed in this study. The index provides a comparison with the current level of the debt-GDP ratio. As $j \to \infty$ the second term (i.e. $\lim_{j \to \infty} \frac{1}{(1+r)^{j+1}} E[D_{t+j+1}]$) in $FS_{t,n}$ tends to zero and the index can be interpreted as comparing the existing level of the debt-GDP ratio with the resources to pay it off hence we have:

$$FS_{t,n} = D_t - \sum_{j=0}^{\infty} \frac{1}{(1+r)^{j+1}} E[S_{t+j+1}] \lessgtr 0 \tag{14}$$

The NPG holds and fiscal policy stance is sustainable if at least $FS_{t,n} = 0$ which implies the debt-GDP ratio is forecast to be on target. But when only $FS_{t,n} > 0$ then the forecasted present value of the primary surplus is insufficient to achieve the desired change in the debt-GDP ratio. In this case the current fiscal stance is said to be unsustainable.

3.3   Constructing an Economic Performance Index

One of the challenges in measuring performance is determining which macroeconomic variable best captures the overall economic situation and dynamics. While GDP has remained popular, measure of fiscal performance, it failure to capture other measures of macroeconomic performance indicators led to developing a broader and more integrative index for measuring macroeconomic performance.

To capture a more inclusive measure of macroeconomic performance, the paper followed the approach adopted by Khramov and Lee (2013). As stipulated by Khramov and Lee (2013), the economic performance index hereafter, (EPI) is a macroeconomic indicator that captures the overall performance of a country's economy and reports any deviation from the desired level of economic performance. The EPI comprises variables that simultaneous influence the decision of the household, firms and government, this include: the inflation rate as a measure of the economy's monetary stance; trade balance as a measure of the country's external viability; the budget deficit as a percentage of total GDP as a measure of the economy's fiscal stance; the change in real GDP as a measure of the aggregate performance of the entire economy.

The calculation of the EPI score here is done annually by taking a total score of 100 percent and subtracting the inflation rate, the trade balance, budget deficit, and adding the percentage change in real GDP, all weighted and calculated as deviations from their desired values. Usually a grade is assigned to this score to further communicate economic performance.

To begin with the construction of the index, an optimal EPI score is normalized to 100 percent and any score below 100 percent is defined as a decrease in economic performance. Next is a definition of the desired values for each of the sub-components of the indicator which is as follows;

  i.   The desired rate of inflation is 0.0 percent
  ii. The desired trade balance is 0.0 percent
  iii. The desired level of government deficit as a percentage of GDP is 0.0 percent, which is consistent with the long term balanced budget;
  iv. The desired change in GDP is a healthy real growth rate of 4.75 percent.

The deviations or convergence from/to these values show how an economy has performed holistically. The EPI score is constructed such that its value relates with the sub-indicators thus; falls when the inflation rate (IF) deviates from its desired value; rises when the trade balance (TB) is positive; falls when the government deficits (DF) rises from its desired values; and rises when the GDP (YD) growth rate is positive. The formula for calculating the weighted EPI is given as follows:

$$EPI = 100 - IF - IF^*) + (TB - TB^*) - (DF - DF^*) + (YD - YD^*) \qquad (15)$$

Where IF* is the desired inflation rate, TB* is the desired trade balance, DF* is desired fiscal deficit while the desired GDP I YD* . Equation 12 above can be rewritten in lower case to denote the deviation thus;

$$EPI = 100 - if + tb - df + yd, \qquad\qquad (16)$$

The EPI is calculated as 100 minus the absolute value of inflation, plus the trade balance, minus the budget deficit, plus the percentage change in real GDP all expressed deviations from their desired values. Khramov and Lee (2013) stipulates that changes in the economy affects the EPI in a straight forward manner. For example, if inflation rate increases from 2 percent to 3 percent, the EPI falls by 1 percent and vice versa. Similarly, a 1 percentage point increase in deficit causes the EPI to fall by 1 percentage point. The opposite direction will be the case for a positive

trade balance and GDP growth. Thus, while the former variables affect EPI negatively, the latter variables are positively related to the EPI. This paper deviates from the convention of examining debt and growth by regressing the stationary fiscal sustainability series on the new index derided from equation 15 denoting macroeconomic performance[1].

To provide a more concrete argument on the link between FFSI and EPI indices, the study carries out some empirical analysis including correlation, regression and causality. The regression result is done using an OLS method to obtain the empirical parameter estimates to show how EPI responds to FSI. This exercise is done by specifying a typical regression equation as follow;

$$EPI_t = \alpha + \beta_1 FSI_t + \beta_2 Y_t + v_t \qquad (17)$$

All the variables remain as earlier defined. Y_t is the growth rate in real GDP used to proxy the level of growth in economic activities in the economy. The inclusion latter two variable is also meant to reduce the estimation error that could arise from estimating a simple OLS model and its attendant problems.

Data for the study are obtained from various sources including: World Development Indicators; central bank of Nigeria statistical bulletin for various years, and the national bureau of statistics. The data covers the period 1961 to 2016. The stationarity test, cointegration as well as other analysis are carried out on the logarithm of the fiscal sustainability variables discussed in the previous section. Using the logarithm of the variables wipes off any outline that may significant lead to spurious analysis

4.   Empirical Results and Discussion

The process of establishing the fiscal sustainability in line with the framework above starts with, an integration (i.e. stationarity) test and a cointegration test between government revenues and expenditures is conducted. The estimation of the cointegration vector is used to establish sustainability of fiscal based on stipulated criterion. To examine the influence of fiscal sustainability on a new measure of macroeconomic performance, (i.e. calculating the coefficient of the fiscal sustainability variable), the paper employs the dynamic ordinary least squares (DOLS) approach developed in Stock and Watson (2001).

4.1 Unit Root and cointegration Tests

The result of unit root tests is reported in table 1. All the variables were expressed in difference form after it was established that they were non stationary at levels. With this result, it is established that the fiscal policy variables were established to be integrated of the same order I(I) as required.   To establish if there exist any cointegration relationship between the fiscal policy variables. The Johansen's (1995) cointegration test and the unit-root test for the budget deficit $Xt - Rt$. The unit-root

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[1] See Khramov and Lee (2013) for more detail discussion.

test for $Xt - Rt$ is equivalent to the test of the cointegration relationship between $Gt, rtDt - 1$, and R.

The first step in the cointegration test is to determine the optimal lag length. This is done with the aid of the SIC, AIC and FPE lag selection criteria. The result from the lag selection test shows that an optimal lag of 1 is appropriate to carry out the test. The result of the cointegration test is reported in table 3. The trace test statistic is used to evaluate the existence of cointegration based on the null hypothesis of no cointegration. The test is carried out under the linear deterministic trend specification which is to remain in tandem with the theoretical model earlier outlined.

Table 1: Unit Root and cointegration Test Result

Augmented Dickey Fuller (ADF) Test Statistics			
	X_t	R_t	rD_{t-1}
LAGS	**Ist. Diff.**	**Ist. Diff.**	**Ist. Diff.**
0	-7.878**	-10.15**	-11.73**
1	-4.426**	-6.172**	-8.976**
2	-3.489*	-4.050**	-7.322**
Test of Cointegration Statistics			
Hypothesized No. of CE	Trace Statistic	Critical Value	Prob.**
$r = 0^*$	66.85409	47.85613	0.0003
$r \leq 1^*$	33.38732	29.79707	0.0185
$r \leq 2$	14.43633	15.49471	0.0717
$r \leq 3$	1.621096	3.841466	0.2029

Note: *The critical values of the ADF test at 0, 1 and 2 are 3.555, 3.557 and 3.546 respectively* r is the hypothesized number of cointegrating equations. * indicates rejection of H_0 of no cointegration

This result from the cointegration test reported in the table 1 shows that there is at least one cointegration vector. The cointegration test supports a long run relationship between fiscal spending and revenue generation in Nigeria, thus indicating that there is potential for a long run fiscal sustainability in Nigeria. The Engel-Granger cointegration test was also carried out as a robustness test. The Engel-Granger cointegration test begins first by carrying out a regression such as specified in equation 10, thereafter the residuals from the regression are extracted and then the unit root is applied to this test. The application of the unit root test on the residual obtained from the estimation of equation 10 also showed that the errors in the estimation of revenue and expenditure converges back to an equilibrium value over a long-run horizon. The result of the Engel-Granger test is as reported in table 2.

Table 2: Engle Granger Cointegration Test Result

Variable	OLS Regression Result for R_t and X_t			Engle-Granger Cointegration Test	
	Coefficient	t-Statistic	Prob.	ADF	DF-GLS
Constant	0.019027	0.036316	0.9712	-9.3653	-3.7237
GEX	1.012367	56.66399	0.0000		
D-W Statistics	0.901688			-6.6779	-1.9002
R-squared	0.98346				
Adjusted R-squared	0.983154			-4.6579	1.0171
F-statistic	3210.808		0.0000		

4.2 Test for Fiscal Sustainability

Having established the result of the unit root and the Johansen and Engel and Granger cointegration test, the next course of action is to estimate equation (11) using the DOLS regression approach. The key coefficient in equation (11) is φ which measures the response of the primary balance to the debt accumulation. The value of this coefficient is expected to be between zero and unity to be consistent with a stabilizing or sustainable fiscal policy response to rising debt. On the other hand, a negative or greater than unity coefficient denotes a destabilizing or unsustainable response. The result of the DOLS regression is reported in table 4. The regression is done using linear and quadratic trend specification. The DOLS is used here to estimate the cointegration vector and check whether the debt stock affects the sustainability of fiscal policy. The result from the DOLS regression confirms the case of fiscal sustainability and thus lends credence to that obtained earlier in the cointegration test.

Based on the estimations, the fiscal policy responses to rising debt levels are entirely captured by simple linear decisions hence the inclusion of the non-linear trend. The estimated result suggests that fiscal balances in the country do respond in a stabilizing manner to increases in debt ratios. That is fiscal surpluses tend to increase in response to rising debt ratios. It can be inferred that fiscal surpluses tend to increase systematically to match rising debt accumulation. Hence, it can be said that the fiscal response to debt stock in Nigeria is sustainable. Though the coefficients of fiscal balance to current, lagged and squared debt ratios are small and statistically insignificant as denoted in the relatively marginal magnitude which include 0.019, -0.018 and 0.007 for current, lagged and squared debt ratios respectively, they are broadly in line with a few previous studies such Leonte, 2012; Franco and Zotteri, 2010; and Legrenzi and Milas, 2010 which also established lower response of fiscal balance to debt stock other developing countries' economies in European and Latin American countries.

Table 4: DOLS result for Fiscal Sustainability test

| Variable	Parameter Estimate	T-stats.	P-value
Dep. Variable Budget Balance			
Q		-	
Constant Term	-0.72126	0.250354	0.8036
Debt to GDP ratio (D_t)	0.019073	0.921386	0.3622
		-	
Debt to GDP ratio (D_{t-1})	-0.01878	0.060842	0.9518
Squared Debt to GDP ratio (D_t^2)	0.007397	1.391293	0.1716
R-squared	0.7416		
Adjusted R-squared	0.703786		

The inclusion of the lag and squared debt trend provides information on how fiscal balance response to debt stock at different levels. This allows to check for the possibility of a non-linear response of fiscal balance to debt stock. On the overall, the results suggested some evidence of "slight u-shaped" effects whereby the fiscal balance responds negatively to lag debt stock and later turns positively to positive debt stock.

More importantly from the estimates, it is possible to set a limit to the extent of increase in debt profile, based on simple calculation, a limit of 28 per cent is established. This consistent with similar estimated derived earlier for Nigeria. The Debt Management Office in Nigeria sets a benchmark of 19.39 percent for the external debt ratio while the IMF set a benchmark of 56% for developing countries. Omotosho et al(2016) estimated a threshold of 73.7% for total debt/GDP ratio while a 30.9 per cent and 49.4 per cent for domestic and external debt respectively. The DMO estimates seems unrealistic in view of the fact since 2015, the debt ratio has consistently been above this less than 20 percent benchmark. The Omotosho et al (2016) estimate on the other hand portents danger for fiscal sustainability. Therefore, a conservative estimate of less than 30 per cent seems more realistic and encourage fiscal discipline

4.3 Fiscal Sustainability and Economic Performance

Having established the notion of fiscal sustainability in this study, the next objective is to examine the link or interaction between fiscal sustainability and economic performance. The next course of action in examining the link between fiscal sustainability and economic performance index. Figure 1 depict a graphical representation of the two series. This is meant to present a pictorial evidence and to see if a clear pattern of co-movement can be established between the two indices. The graph in figure 1 and 2 show some mild resemblance between the FSI and the EPI. The EPI index shows a somewhat *topsy-turvy* pattern of economic performance in the Nigerian economy. The graph shows that the first decade preceding independence the country recorded some progress in economic performance the country also maintained a positive value of FSI. This pattern remained the same for most of the years in the decade preceding the end of the civil war.

Figure : Fiscal Sustainability and Economic Performance Indices in Nigeria (1961-2016)
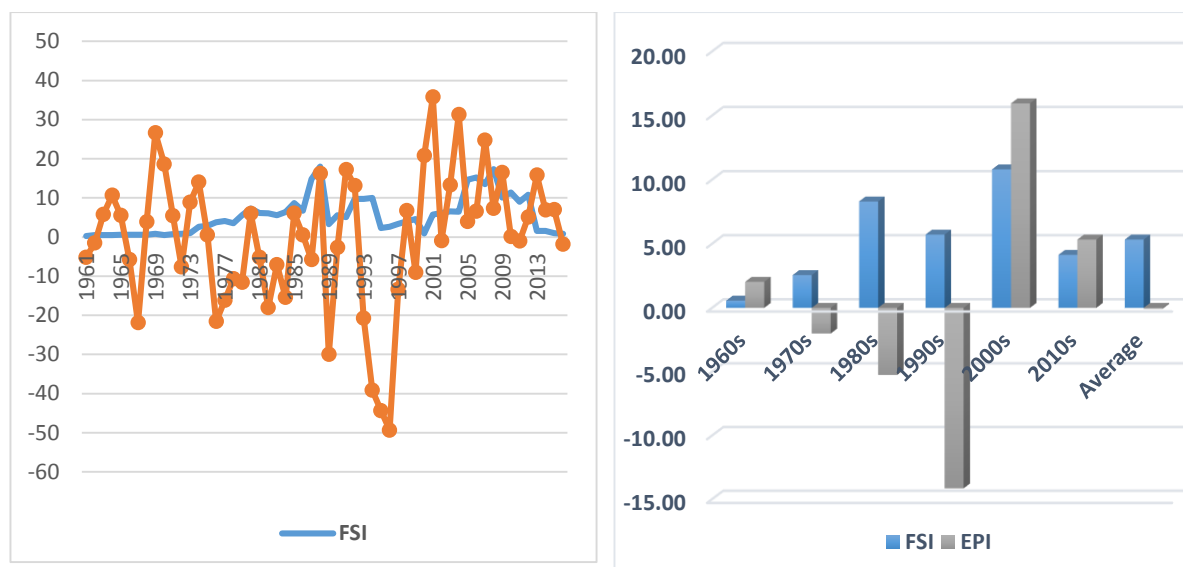
Except for the period immediately preceding the end of the civil for most of the decade. However, the fiscal balance became unsustainable towards the tail end of the decade and continue into the early 1980s and this was attributed to the *oil-glut* that the resultant nose-diving of the price of the crude in the international market. Post-civil war era which was characterized by massive rehabilitation program of the government. On the other hand, the EPI shows a contradictory movement in the (1971-1980) depicting an unimpressive economic performance. The inconsistency in the stability of the FSI continued in the 1991 to 2000 episode. However, the case has been different, since the turn of the century and the return to democracy. This has been further attributed to the debt relief package the country obtained country and the adoption of major economic reforms by the government. It can also be alluded though intuitively that the positive FSI for this period may have been as result of the steady increase in the price of crude oil in the global market. As evidence in the graph, the FSI index persistently maintained a positive value throughout the period 2011 to 2016, though it dropped slightly. During the same period the EPI index also maintained the steady positive and significant value for most of the years.

Thought the preceding evidence does not show a clear pattern of relationship between FSI and EPI a major point that can be deducible in this analysis is that except for the period immediately preceding the end of the civil war, the country's unsustainable fiscal policy episodes are often occurring during periods of significant reduction in the international oil prices. This evidence well supports the analysis provided by Reinhart and Rogoff (2011).

The result shows a weak but positive relationship with overall macroeconomic performance and level of economic activities in Nigeria. It shows specifically that EPI vary by approximately 0.42 for any unit change in FSI. The weak linkage notwithstanding, the estimate shows that macroeconomic performance improves as the government becomes more solvent and attain long run fiscal sustainability. As

expected the parameter estimate for growth rate of real GDP takes on a positive and statistically value, thus indicating that the real GDP robustly affects EPI .The results also show that improvement in economic activities is key to sustaining a strong fiscal sustainability and sound macroeconomic performance in Nigeria. Although there is no theoretically stipulated or empirically established direction of the link between FSI and any EPI, the result is broadly in line with evidence obtained from previous studies (see IMF, 2003 and Adams, Ferrarini, and Park, 2010. The relevant statistics used to evaluate the soundness and consistency of the model are reported in the second part of table 5. The R-squared and Adjusted R-squared are low which is quite understandable in view of the nature of the model specified. In general, the soundness of the model is indicted by some of the statistic, however, this does not significant derail the result and conclusion derived here since the specification is not guided by any theoretical framework

Table 4: Effects of Fiscal sustainability on Macroeconomic Performance Result

Variable	Parameter Estimate	T-Statistic	Prob.
Dependent Variable: (EPI)			
Constant	-2.29959	-0.72027	0.4745
LOG(FSI)	0.422848	0.953603	0.3446
LOG(GDPR)	0.9147**	3.571052	0.0008
R-squared	0.202904		
Adjusted R-squared	0.172825		
F-statistic	6.745682		
D-W Stat	1.116747		
Serial Correlation Test	6.8023**		0.0024
Homoscedasticity Test	0.127286		0.8808
Ramsey RESET Test	0.642981		0.4263

Note *** denote asymptotic significance at 1 per cent level.

5.   Conclusion and policy implication

This paper attempts to provide empirical illumination to the argument of fiscal sustainability vis-à-vis economic performance in Nigeria. The study starts by providing the theoretical formulation of a simple tool: the long-run version of the government's lifetime budget constraint. This tool links the size of the primary balance the government must run to maintain fiscal sustainability to the size of its debt, the flow of seigniorage it raises, the real interest rate. Using this formulation, the study articulates the conditionality for ascertaining if the Nigerian fiscal policy stance and activities has been sustainable. This study sets itself apart from previous studies by constructing a more elaborate index of economic performance and then using it to examine how economic performance responds to dynamics in a calibrated fiscal sustainability index.

The empirical strategy for testing for fiscal sustainability begins by examining the unit root (i.e. stationarity) properties of government expenditure, government revenue and real interest rate using the ADF and DF-GLS unit root test framework. Next, the test for cointegration among the series is also carried using the Trace test developed by Johansen (1988) and the Engle-Granger cointegration test. To firmly concretize the outcome of the cointegration test, the DOLS method was used to estimate the cointegrating parameters inherent in the long run fiscal sustainability equation. Finally, the study also examines the linkage between fiscal sustainability using some statistical and regression analysis.

On the overall, it can be inferred that the result from this study does not deviate from that of extant empirical studies. Evidence based on the unit root and cointegration test exercise suggest that fiscal policy is still within permissible sustainable range for Nigeria. The result from the DOLS estimation also lends support to that obtained from the unit root and cointegration test. The statistical analysis reveals a trend that has been well documented in the literature for other countries. Specifically, it shows that except for the period immediately preceding the end of the civil war, unsustainable fiscal policy episodes have largely been outcomes of significant decline in crude oil prices. The regression result for the responds of EPI to changes in FSI shows positive but only marginal respond which implies that significant asymmetry between government revenue and expenditure are often reverted through counter-cyclical fiscal policy stance.

The main policy implication of this finding is that the Nigerian government should ensure a more robust and systemic link between tax and expenditures policies and the evolution of public debt. It must ensure that the fiscal debt/GDP ratio is always with the established realistic benchmark. However, the current debt/GDP benchmark adopted by debt office seems unrealistic and a more conservative estimate of 28 percent is suggested instead of the 19 percent debt/GDP ratio by DMO (2016) and 49 percent by Omotosho et al(2006). In passing while political consideration always encourages fiscal expansion through increased borrowing especially during periods of economic downturn and revenue short-fall the long-term sustainability of such fiscal stance will depend significantly on the items such funds are expended on. If borrowing is used to finance capital projects such as productivity and efficiency enhancing infrastructure that creates wealth then this is sustainable, however, if funds are used for recurrent expenditure, this may jeopardize the sustainability of fiscal policy.

Despite the results and conclusions reached in this study, there are still potential opportunities for extending the analysis presented here. A focus on determining a short-term government constrain framework and fiscal sustainability indicators for signaling short and medium term fiscal imbalances and to correct them will be a worthwhile direction for future research.

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