# Public Debt Sustainability in Nigeria after the Exit from Paris Club: The Role of Structural Breaks

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**Abstract:** The aim of this paper is to provide new evidence on public debt sustainability in Nigeria after the exit from Paris Club. The study contributes to the vast amount of literature by accounting for the role of structural breaks in the series. Data between 1988 and 2016 were collected and the modified Augmented Dickey-Fuller unit root test was used to account for the effect of structural breaks in the series. In addition, the Autoregressive Distributed Lag (ARDL) fiscal reaction function Bounds Cointegration technique was used to estimate the short and long run function of public debt sustainability in Nigeria. The results obtained show that fiscal actions by the Nigerian government are not sustainable. While we observed that government revenue has been declining over the years, its fiscal spending keeps rising. Essentially, we find a wide gap between government revenue and its fiscal spending. As a result, government has not been able to meet up with its fiscal obligations over the years. Therefore, we recommend that government should reduce its overdependence on crude oil revenue, and harness other potential revenue generating commodities such as the agricultural sectors in order to reduce its debt burden.

**Keywords:** Fiscal Sustainability; Public Debt Sustainability; Structural Breaks

**JEL Classification:** H60; H62; H63

## 1. Introduction

The study of fiscal sustainability in Nigeria, has generated serious debate among intellectuals in the field of public sector economics[4]. While most of these studies argued that fiscal sustainability in Nigeria is unsustainable[5] some other studies believed that it is sustainable[6]. Although, quite a number of these studies have

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[4] See for example the relevant literatures in the last decade or so, (Folorunsho & Folade, 2013; Ayinde, 2014; Oyeleke & Ajilore, 2014; Akanbi, 2015; Jubrilla, 2015; Otonne & Oyenuga, 2019).
[5] See (Ayinde, 2014; Oyeleke & Ajilore, 2014; Akanbi, 2015; Jubrilla, 2015; Otonne & Oyenuga, 2019)
[6] See (Folorunsho & Folade, 2013).

examined the issue of fiscal sustainability before exit from Paris Club, only very few of them have explored fiscal sustainability after the exit from Paris Club. Another common limitation of these studies is that most of them ignored the role of structural breaks in fiscal sustainability. The only few exceptions on this regard are Jubrilla (2015); and Otonne and Oyenuga (2019).

In this paper, we advance the body of literature on public debt sustainability in Nigeria by offering the following contributions. First, we examined the debt sustainability in Nigeria after the exit from Paris Club which has been largely ignored in the Nigerian public sector economics literature. Most studies in the literature focused on debt sustainability before the Paris club and hence, the need to explore debt sustainability after the exit from Paris club in order to broaden the body of knowledge and literature on the subject as it concerns Nigeria. Second, we account for the role of structural breaks which has been neglected by past studies with the exception of Jubrilla (2015); and Otonne & Oyenuga, (2019) which investigated the debt threshold and sustainability of public debt in Nigeria. However, this study differs from the aforementioned studies in that we examined debt sustainability using the Bonn (2007) fiscal reaction function approach as against the unit root and co-integration approach predominantly used in the literature.

Before the exit of Nigeria from the Paris Club debt, some of the debt and fiscal sustainability indicators were not sustainable. This was because the indicators were far above the internationally accepted standard set by the International Monetary Fund (IMF) and the World Bank (Omotosho et al. , 2016). The implication of this, was that fiscal policy was unsustainable, and therefore, necessitated the filing for debt relief by the Nigerian government in 2005. Examining the trend of public debt in Nigeria, before the exit from the Paris Club, specifically in the 1970s, Onuoha (2008) found it to be generally insignificant and negligible. The gap between government revenue and fiscal expenditure was very narrow during the period. The oil boom of the 70s contributed to narrowing this gap and hence, the Nigerian government at that time had enough revenue to embark on reckless expenditure. In 1981, the oil export earnings crashed depleting the external reserve. However, government spending kept rising, and was largely financed by external borrowings. The interest payment on the borrowed funds kept rising geometrically and Nigeria was plunged into a severe debt crisis (Rieffel, 2005; Onouha, 2008; Otonne & Oyenuga, 2019). As a result of the accumulation of arrears, constant fall in oil revenue and rising public debt servicing, the Nigerian government approached the Paris Club for debt rescheduling on four different occasions; 1986, 1989, 1991 and 2000 (Rieffel, 2005; Onuoha, 2008). After the payment made to Paris Club in 1992, the subsequent payments declined drastically. By 2005, over 86% of the total external debt was owed to the Paris club, which comprises the debt; interest arrears on the debt; interest charged on the interest arrears; as well as the penalty charges on the debt, since no repayment was made since 1992. This implies that the debt owed

to Paris Club by the Nigerian government during the period was not as a result of new borrowings but was as a result of its inability to service its debt as and when due (Rieffel, 2005). As a result, the financial resources that were meant for developmental purposes, were channeled into servicing debt (Otonne & Oyenuga, 2019).

After the debt relief, with the third phase of the exit structure completed, both the external debt and public debt dropped drastically owing majorly to the fall in external debt observed and compelled by the Paris Club debts becoming zero (Otonne & Oyenuga, 2019). Moreover, the fall in the global crude oil price in late 2014 starved the Nigerian government the necessary funds to finance its budget. Therefore, borrowing funds from both the domestic and foreign markets was the best option to finance its growing (DMO, 2012; Omotosho et al. , 2016). The volatility in the oil price, as well as the foreign reserve depletion have raised a lot of questions on the ability of the Nigerian Government to finance its inter-temporal budget without external or internal borrowings. This necessitated the re-examination of fiscal sustainability issue in Nigeria.

Furthermore, studies in the past have shown that time series data on fiscal variables overtime exhibit structural breaks from time to time and therefore, the inclusion of structural breaks is very essential in this paper as this ma give us a better and consistent results (Tanner & Liu, 1994; Cuddington, 1996). For instance, Tanner and Liu (1994) revisited the work of Hakkio and Rush (1991) by adding level shift dummy variables for post 1982:1 to the co-integration relationship involving tax revenue and government expenditure (interest inclusive). They argued for the inclusion of dummy to account for structural breaks in fiscal variables in the United States (U. S. ) during the period under review. According to Hakkio and Rush (1991) conclusion on the U. S. fiscal sustainability are misleading when structural breaks are not captured. This stress the importance of structural breaks in fiscal sustainability which should not be ignored. Therefore, this study will bridge this gap by accounting for the role of structural break (s) in debt sustainability in Nigeria after the exit from Paris Club. In addition, this paper adopted the fiscal reaction function recently developed by Bohn (2007) in the phase of the resurgence of fiscal sustainability issues globally. This function allows for the substitution of the standard stationarity and co-integration test used primarily under the present value constraints.

The rest of the paper is organized as follows: Section two discusses the time path of some fiscal sustainability indicators. Section three review the relevant literatures. Section four provides the theoretical frame work and methodology. Section five contains the data analysis and the discussion of the findings. Section six concludes the paper with relevant policy recommendations.

## 2. Time Path of Some Fiscal Sustainability Indicators

Figure 1 and 2 below shows the trend of external, domestic and public debt as a percentage of GDP, expenditure, revenue and primary balance before and after the exit from Paris Club. While examining Nigeria's public debt profile, Omotosho et al. , (2016) concluded that debt indicators in Nigeria are not sustainable. This however, is a necessary condition but not sufficient enough for fiscal unsustainability. This is because, a debt profile maybe rising, while its ratio to GDP is falling. When this occur, we may conclude that the growth of the economy is greater than the growth of the interest payment on debt. The observation of figure 1 and 2 shows that between 1998 and 2000, Nigeria's debt was strongly unsustainable. , The percentage of public debt profile to GDP, shows an increasing trend above the international and domestic sustainability threshold (Otonne & Oyenuga, 2019). This implies that the interest payment on public debt is greater than the growth of the economy. Between 2000 and 2005, the debt profile in Nigeria was weakly sustainable. However, between 2005 and 2007 following the period immediately after debt relief, it was strongly sustainable. Though an increase in debt profile was observed, yet, the growth rate of the economy was more than the growth of interest payment on debt hence a decreasing trend of the debt profile as a percentage of GDP. This is shown by the downward trend of the debt profile and the debt profile as a percentage of GDP. While between 2008 and 2016 the public debt in Nigeria was strongly unsustainable as increasing trend of the debt profile as a percentage of GDP was observed. This implies that the growth of the economy was less than the growth of the interest payment, which confirms that the current fiscal stance of the Nigerian government is strongly unsustainable.

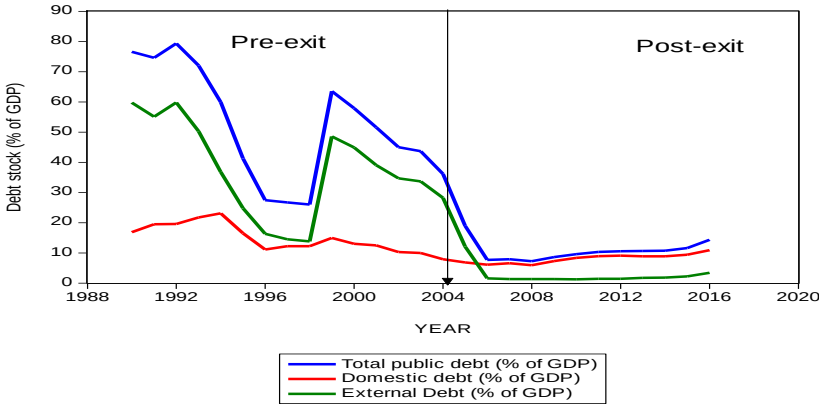


**Figure 1. Trend of Nigeria's External, Domestic and Total Public Debt profile as % of GDP (1990-2016)**

*Source: Central Bank of Nigeria (CBN) Statistical Bulletin, (2016)*

Also, figure 2 depict the relationship between government revenue, expenditure and balance of payment. The total expenditure with interest payment stood at ₦ 60. 27 billion in 1990. In 1991 the total expenditure stood at N40. 17 billion, accounting for about 11. 2% of GDP, while debt service was about N26. 4 billion which is more than half of both the recurrent and capital expenditure put together. Following the arrears of interest payment and the huge amount paid to the Paris Club, in 1992, the amount paid to service debt dropped by about N7 billion leaving expenditure at N73. 397 billion, which is 10. 2% of GDP. In 1993 the total expenditure increased to N191. 229 billion, representing 15. 2% of GDP. This could be due to the election that ushered in the civilian government after the third military regime. Also, after the exit, there was a rise in total expenditure between 2006 and 2016.

The trend in government revenue as a percentage of GDP was less erratic than the trend in government expenditure as a percentage of GDP, in spite of an increase in government revenue during the period. Government revenue (% of GDP) shows a decreasing trend from 1990 to 1992. It decreased from 7. 63 % in 1990 to an average of 5% in 1991 and 1992. However, in 1993 the revenue increased to 10% and subsequently decreases to 8. 6% of GDP in 1995. The fluctuation continued for over a decade on an average of 7% of GDP even after the exit from the Paris club. In 2008 during the global financial crises, there was a rapid fall in revenue and this trend continued until 2010 when the revenue began to increase due to the rapid rise in oil price at the international market. However, in 2014 the revenue began to decline rapidly due to the fall in oil price thereby taking Nigeria into an economic recession in 2016. With respect to fiscal actions, we observed a continuous rise in government expenditure amidst fall in government revenue. As a result, the fiscal deficit has been on the increase since 1998.

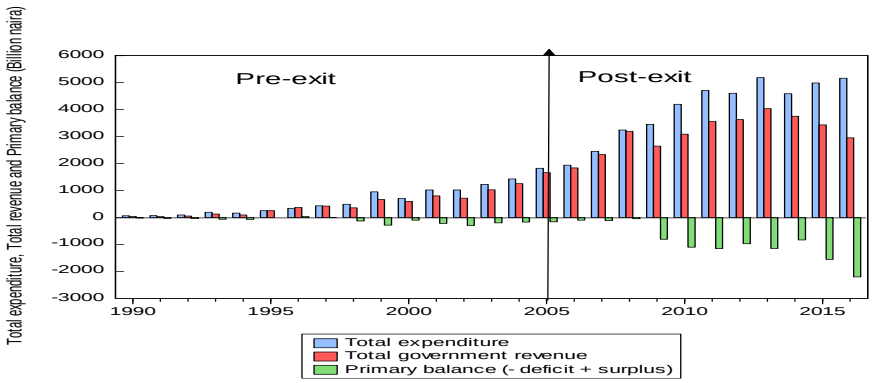


**Figure 2. Government Expenditures, Revenue and Balance of Payment in Nigeria (1990-2016)**

*Source: Central Bank of Nigeria (CBN) Statistical Bulletin, (2016)*

## 3. Review of Previous Literatures

Studies on debt sustainability in Nigeria, have been well examined by a substantial body of literature in public sector economics[1] and the results of their findings are mixed. For instance, while Akanbi (2015) in his study found fiscal sustainability in Nigeria to be unsustainable, Jubrilla (2015) on the other hand, found a weak fiscal sustainability in Nigeria. The study confirms a co-integration relationship between government revenue a nd expenditure and the slope of the long run elasticity is less than one, which indicates weak sustainability and the fact that the country might face debt financing problem in the long run. Also, Oyeleke and Ajilore (2014) investigated the fiscal deficit sustainability between 1980 and 2010 in Nigeria and found fiscal policy to be weakly sustainable. Further, Ayinde (2014) examine the sustainability of fiscal management in Nigeria between 1970 and 2011. Findings from the study reveal that fiscal policy is weakly sustainable when capital expenditure and revenue is considered and strongly unsustainable when recurrent expenditure and revenue is considered. The empirical result also implies that the government is faced with liquidity problem. In contrast, Folorunsho and Folade (2013) who investigated the relationship between fiscal deficit and public debt between 1970 and 2011 in Nigeria found public debt to be strongly sustainable for Nigeria.

Past studies on debt sustainability reveals that, ARDL cointegration technique has been widely used to analyze fiscal sustainability especially with regards to Nigeria[2]; very few studies in the literature employed the fiscal reaction function approach. This approach examines if government primary balance responds positively to rise in debt to GDP ratio. Other techniques that have been employed in literature include ordinary Least Square (OLS); Error Correction Model (ECM) and Autoregressive Distributed Lag (ARDL) approach. [3] However, most of these papers ignore the role of structural breaks in fiscal sustainability with the exception of Jubrilla (2015) and Otonne and Oyenuga (2019). This paper will therefore, contribute to the existing literature on public debt by accounting for the role of structural breaks in the series used.

[1] See (Ayinde, 2014; Oyeleke & Ajilore, 2014; Akanbi, 2015; Jubrilla, 2015; Otonne & Oyenuga, 2019; Folorunsho & Folade, 2013).

[2] See for example (Wickens & Uctum, 1993; Ahmed & Rogers, 1995; Quintos, 1995; Neaime, 2004; Oshikoya & Tarawalie, 2010; Fedje, 2012).

[3] See (Bohn, 1998; Bohn, 2007; Jibao et al., 2010; Deyshappriya, 2012; Camarero et al., 2013; Folorunso & Folade, 2013; Oyeleke & Ajilore, 2014; Liliaine, 2015; Shatri & Sahrawat, 2015; Jubrilla, 2015; Shastri et al., 2017).

## 4. Methodology and Data Analysis

### (i) Theoretical Framework

The theoretical framework for this study is rooted on the fiscal reaction function frame-work which incorporates factors that affect the government inter-temporal budget constraint used in these studies[1] According to Quintos (1995), and Cuddington, (1996) the theoretical derivation is done under the assumption of constant real returns on government debt, one period government budget constraint, and the "no ponzi game scheme". Thus, following Quintos (1995), the one period government budge constraint is stipulated below:

$$\Delta B_t = G_t^r - T_t \text{.....(1)}$$

Where,

$B_t$ = Market value of federal government debt

$G_t^r$ = Government expenditure,

$T_t$ = Revenue from taxes.

The government expenditure is further expressed as:

$$G_t^r = G_t + r_t B_{t-1} \text{.....(2)}$$

Where,

$r_t B_{t-1}$ = Government interest payment expenditure

$G_t$ = Non-interest payment expenditure.

Equation (1) holds in every period. Substituting equation (2) into (1), we obtained,

$$\Delta B_t = G_t + r_t B_{t-1} - T_t \text{.....(3)}$$

Equation (3) gives budget deficit as the rate of change of government stock of debt. The rate of change of government debt equals the difference between government revenue and expenditure, plus the real interest on its debt. With some algebraic manipulation, equation (3) becomes,

$$B_t - B_{t-1} = G_t + r_t B_{t-1} - T_t \text{.....(4)}$$

[1] See (Hamilton & Flavin, 1985; Quintos, 1995; Cuddington, 1996; Neaime, 2004; Oshikoya & Tarawalie, 2010).

$$B_t = (G_t - T_t) + (1 + r_t)B_{t-1} \text{.....(5)}$$

Where;

$G_t - T_t$ = Primary balance (+ primary deficit and – primary surplus)

$r_t$ = Real interest rate at time t, and it is stationary around the mean value of $r$ .

Therefore, equation (5) becomes,

$$B_t = (G_t - T_t) + (1 + r)B_{t-1} \text{.....(6)}$$

The above expression gives the government budget constraint in level form, as against expressing the constraint as a ratio of GDP. Thus, to further capture the framework for the study, the budget constraint is expressed as a ratio of GDP. Expressing (6) as a ratio of Gross domestic product ($Y_t$), we have:

$$\frac{\Delta B_t}{Y_t} = \frac{(G_t - T_t)}{Y_t} + \frac{rB_{t-1}}{Y_t} \text{.....(7)}$$

Using the identity $Y_t \equiv (1 + g_t)Y_{t-1}$ on the right-hand side, equation (7) becomes,

$$\frac{B_t}{Y_t} = \frac{(G_t - T_t)}{Y_t} + \frac{(1 + r)B_{t-1}}{(1 + g)Y_{t-1}} \text{.....(8)}$$

Where;

$g_t$ = Growth rate of GDP between t and t-1, and it revolves around its mean value.

Using the change in the debt to GDP ratio given as;

$$\Delta(\frac{B_t}{Y_t}) \equiv \frac{B_t}{Y_t} - \frac{B_{t-1}}{Y_{t-1}} \text{.....(9)}$$

Substituting equation (4. 8) into (4. 9), we have,

$$\Delta(\frac{B_t}{Y_t}) \equiv \frac{B_t}{Y_t} - \frac{B_{t-1}}{Y_{t-1}} = \frac{(G_t - T_t)}{Y_t} + \frac{(1 + r)B_{t-1}}{(1 + g)Y_{t-1}} - \frac{B_{t-1}}{Y_{t-1}} \text{.....(10)}$$

With algebraic simplification, and setting the change in debt to GDP ratio to zero, we have (10):

$$0 = \frac{(G_t - T_t)}{Y_t} + (\frac{(1 + r)}{(1 + g)} - 1)\frac{B_{t-1}}{Y_{t-1}} \text{.....(11)}$$

$$-\frac{(G_t - T_t)}{Y_t} = \frac{(r-g)B_{t-1}}{(1+g)Y_{t-1}} = \partial \frac{B_t}{Y_t} \text{.....(12)}$$

Where;

$$\frac{(r-g)}{(1+g)} = \partial$$

$Y_t \equiv (1+g_t)Y_{t-1}$ and

$B_t \equiv (r-g)B_{t-1}$

Therefore,

$$-\frac{(G_t - T_t)}{Y_t} = \partial \frac{B_t}{Y_t} \text{.....(13)}$$

Equation (13) above gives the mathematical expression for fiscal reaction function which explains the level of primary surplus (deficit) that would keep the debt to GDP ratio constant. This expression is what Bohn (1998) described as the fiscal reaction function which he proposed as a substitute for the standard stationarity and co-integration analysis used primarily under the present value constraints or econometric approach. Thus, equation (13) is the *fiscal reaction function.* According to this approach, sustainability is assessed when the debt to GDP ratio grows at a constant rate. That is, when the debt to GDP ratio increases, there is a corresponding increase in the primary surplus or decrease in the primary deficit to cover for the increase in debt to GDP ratio thus ensuring that the fiscal stance of the government is sustainable.

**b. Model Specification**

Bohn (2007) procedure allows testing if a government is implementing a corrective action to comply with the inter-temporal budget constraint by examining the relationship between budget surplus (deficit) and debt to GDP ratio. If primary surplus react positively to an increase in debt to GDP ratio, this means that the government satisfies the inter-temporal constraints, and it has taken necessary actions to maintain or ensure fiscal sustainability, and if primary surplus does not react positively to increase debt to GDP ratio, the inter-temporal budget constraint is not satisfied and that implies fiscal un-sustainability. Therefore, from equation (13), analyzing the fiscal policy reaction function requires the specification of equation (14). The dummy variables are included to capture any possible structural breaks in the series.

Thus, equation (13) can be written explicitly as;

$$\Delta SGDP_t = \partial_1 + \phi_1 DGDP_{t-1} + \phi_2 GDPGAP_{t-1} + \phi_3 EGDP_{t-1} + \partial_2 D_t + \partial_3 TB_t$$

$$+\sum_{i=1}^{p} \beta_i \Delta SGDP_{t-i} + \sum_{j=0}^{q_1} \alpha_{j,i} \Delta DGDP_{t-j} + \sum_{k=0}^{q_2} \varphi_k \Delta GDPGAP_{t-k} + \sum_{l=0}^{q_3} \eta_l \Delta EGDP_{t-l} + \varepsilon_t \text{.....(14)}$$

Equation (14) can further be expressed as (15) which show the representation of the long run components in error term.

$$\Delta SGDP_t = \partial_1 + \gamma V_{t-1} + \partial_2 \Delta D_t + \partial_3 \Delta TB_t + \sum_{i=1}^{p} \beta_i \Delta SGDP_{t-i} + \sum_{j=0}^{q_1} \alpha_{j,i} \Delta DGDP_{t-j} + \sum_{k=0}^{q_2} \varphi_k \Delta GDPGAP_{t-k}$$

$$+\sum_{l=0}^{q_3} \eta_l \Delta EGDP_{t-l} + \varepsilon_t \text{.....(15)}$$

Where;

$GDPGAP$ = Gross domestic product gap

$EGDP$ =Government spending ratio of GDP.

$DGDP$ =Public Debt ratio of GDP

$SGDP$ =Primary Surplus ratio of GDP

$D_t$ =Dummy Variable for structural breaks

$$\text{Break} = \begin{cases} 1, \text{period after the breakpoint} \\ 0, \text{period before the break point} \end{cases}$$

$V_{t-1}$ =Error correction term

$TB_t$ =Break Date identified

$$\text{Break} = \begin{cases} 1, \text{t} + \text{TB} \\ 0, \text{for other periods} \end{cases}$$

$p \text{ and } q_1 q_2 q_3$ are lag length on dependent and independent variables respectively.
$\varepsilon$ =Error term.

Furthermore, controlling for some variables helps in accounting for the potential impact of omitted variables. The study controlled for business cycle fluctuation by using Gross domestic product gap (GDPGAP) and temporary government expenditure by using the government spending as a ratio of GDP. It therefore follows from equation (13) that $\sum_{j=0}^{q_1} \alpha_{j,i}$ should be positive if fiscal policy is complying with

the inter-temporal budget constraint, while the $\sum_{k=0}^{q_2}\varphi_k, \sum_{l=0}^{q_3}\eta_l$ (Coefficient of the control variables) are expected to be negative. That is the surplus will decrease if government is spending more than necessary or if the economy is contracting.

## 5. Estimation and Discussion of Results

### (i) Stationarity Test

Table 1 present the results of the unit root test. We test for stationarity using the conventional unit root test (Augmented Dickey Fuller (ADF) test and Philip Peron), and the modified ADF unit root test which account for structural breaks. The results of the conventional ADF and Philip Peron test show that all our variables of interest are stationary at first difference. However, using the Modified ADF test (see Table 1) we observed that all the variables are stationary at levels with the exception of SGDP and GDPGAP which are stationary at first difference. The series exhibits trend break (an unexpected and sudden shift in trend) in the second quarter of 2008 and fourth quarter of 2010, though the break is only significant in 2010. Also, DGDP is stationary at level, with a structural break in the third quarter of 2015. This means that the variable in its original form without differencing has a constant mean and variance overtime when structural breaks is accounted for. GDPGAP exhibits mean reversion (stationary) at first difference and a shift in intercept and trend break in first quarter of 2009. Further, EGDP is stationary at levels, and exhibits a trend break in the third quarter of 2008.

**Table 1. Unit Root and Stationarity Tests**

| Unit Roots with Structural Breaks (Modified ADF Test) | | | | | | |
|---|---|---|---|---|---|---|
| | Level | | | First Difference | | |
| Variable | *Break Date* | *T. stat* | *P-value* | *Break Date* | *T-stat* | *P-value* |
| $SGDP$ | 2008Q2 | -2. 977965[b] | 0. 9178 | 2010Q4 | -6. 736986***[b] | < 0. 01 |
| $GDPGAP$ | 2010Q4 | -2. 881579[b] | 0. 9413 | 2009Q1 | -7. 508337***[a] | < 0. 01 |
| $EGDP$ | 2008Q2 | -5. 383998***[c] | < 0. 01 | 2008Q3 | -5. 750329***[a] | < 0. 01 |
| $DGDP$ | 2015Q3 | -5. 391261***[c] | < 0. 01 | 2007Q2 | -6. 839209***[c] | < 0. 01 |

*, ** and *** denote the rejection of the null hypothesis of a unit root at 10%, 5% and 1% respectively. 'a' implies break point test equation with constant and trend, 'b' implies break point test equation with constant only, and 'c' implies break point test equation with trend only.

Table 1C presents the summary of the Unit root test from table 1A and 1B. The table shows that the result of the unit root test using the conventional unit root (ADF and PP) are consistent with the unit root with structural breaks test for SGDP and DGDP. Both series are integrated at order one while the unit root test for GDPGAP and EGDP are inconsistent as unit root with structural breaks and conventional ADF test shows that GDPGAP is integrated at order one while PP shows that GDPGAP is integrated at order zero. Also, the unit root with structural breaks test and PP shows that EGDP is integrated at order zero while ADF sshows that EGDP is integrated at order one. This mixed stationarity result given by the unit root tests employed is what necessitated the use of Autoregressive Distributed Lag model technique of analysis.

**Table 2. Summary of Unit Roots Test**

| | Unit root with structural Breaks Results (Modified ADF) | | Conventional Unit root Test Results | | Comparison |
|---|---|---|---|---|---|
| Variable | *Break Date* | *I(d)* | *(ADF) Result* | *(PP) Result* | *Remarks* |
| $SGDP$ | 2010Q4 | I (1) | I (1) | I (1) | *Consistent* |
| $GDPGAP$ | 2009Q1 | I (1) | I (1) | I (0) | *Inconsistent* |
| $EGDP$ | 2008Q2 | I (0) | I (1) | I (0) | *Inconsistent* |
| $DGDP$ | 2015Q3 | I (0) | I (0) | I (0) | *Consistent* |

### (iii) Test for Co-Integration

Table 3 shows the results of the co-integration test for model one following the stationarity test. This test is necessary before estimating the primary surplus reaction function. The bounds test of co-integration which allows for mixed order of integration is employed. Also, Quandt-Andrews unknown breakpoint test was employed to identify unknown break point in the model. The test at 15% trimmed data indicates a break point at third quarter of 2009, significant at 1% level of significance. Therefore, an exogenous break point of 2009Q3 is accounted for as a fixed regressor using dummy variables DU and TB. Schwartz information criterion (SIC) and Alkaike information criterion (AIC) were employed for the lag selection. The results of the co-integration tests show that there is a long run co-integrating relationship, with the f-statistics of 5. 662 higher than the critical values of the upper bound at 1%, 2. 5%, 5% and 10% level of significance.

**Table 3. Result of Bounds Cointegration Test**

| Growth Model: $SGDP = f(DGDP, EGDP, GDPGAP)$ | | |
|---|---|---|
| F-stat | 5. 66162 | |
| Critical Values | | |
| Significance levels | I0 Bound | I1 Bound |
| 1% | 4. 29 | 5. 61 |
| 2. 50% | 3. 69 | 4. 89 |
| 5% | 3. 23 | 4. 35 |
| 10% | 2. 72 | 3. 77 |

*Source: Authors' Computation from E-views*

### (iv) Results and Interpretation

Additionally, we also used the Autoregressive Distributed Lag technique to estimates the primary surplus fiscal reaction function. Table 4 presents the short run dynamics and long run coefficients of the primary surplus reaction function. The Quandt-Andrews unknown breakpoint test was employed to identify unknown break point in the model. The result at 15% trimmed data indicates a break point at third quarter of 2009, significant at 1% level of significance. Therefore, an exogenous break point of 2009Q3 is accounted for as a fixed regressor using dummy variables DU and TB. The results of the ARDL estimation show that there is a negative relationship between debt to GDP ratio (DGDP) and primary surplus to GDP ratio (SGDP) in the short run and long run with coefficient of -0. 013 and -0. 060 respectively. This is however not significant at the conventional level of significance. The implication of the result obtained is that primary surplus does not respond positively to government debt in the short run and long run, and government is not complying with its budget constraint. This means that the debt to GDP ratio does not grow at a constant rate. Also, the results show that GDPGAP is positively significant to primary surplus to GDP ratio in the long run and short run. The coefficient of the GDPGAP is 0. 000361 in the short run and 0. 001 in the long run. Thus, implies that a 1% increase in the GDPGAP generates 0. 000361% increase in primary surplus to GDP ratio (SGDP) in the short run, and 0. 001% in the long run. This means that primary surplus to GDP ratio (SGDP) is countercyclical, that is primary surplus to GDP ratio (SGDP) has a countercyclical fiscal response to GDPGAP. Also, the dummy variable parameter is negative and significant at 5% and 1% level of significance in the short run and long run respectively. The coefficients are -0. 204 and -0. 948 respectively. The implication of this is that the trend break identified reduces primary surplus by 0. 204% in the short run and 0. 948% in the long run. Also, the error correction term is negative and significant at 1%. This conforms to our a priori expectation, and validates the presence of co-integrating relationship among the variables in the model. The magnitude of the error correction term is -0. 216; meaning that about 21. 6% of the disequilibrium caused by a disturbance in the previous year is corrected for in the current year. This suggests a speed of adjustment

of SGDP to the long run equilibrium following a particular shock or disequilibrium in the short run.

**Table 4. Primary Balance Reaction Function**

| **Short Run Coefficient** | | | |
|---|---|---|---|
| **Variable** | **Coefficient** | **T − Statistic** | **P − Value** |
| D(SGDP(−1)) | 0. 373** | 2. 204 | 0. 035 |
| D(SGDP(−2)) | 0. 255 | 1. 222 | 0. 231 |
| D(DGDP) | -0. 013 | -0. 594 | 0. 557 |
| D(EGDP) | 13. 271 | 1. 660 | 0. 107 |
| D(GDPGAP) | 0. 000361*** | 8. 494 | 0. 000 |
| D(GDPGAP(−1)) | 0. 000041 | -0. 401 | 0. 692 |
| D(GDPGAP(−2)) | 0. 000040 | -0. 511 | 0. 613 |
| D(GDPGAP(−3)) | 0. 000065 | -1. 501 | 0. 144 |
| D(DU) | -0. 204** | -2. 315 | 0. 028 |
| D(TB) | 0. 206 | 1. 344 | 0. 189 |
| ECT(−1) | -0. 216*** | -2. 801 | 0. 009 |
| **Long Run Coefficients** | | | |
| **Variable** | **Coefficient** | **T-Statistic** | **P-Value** |
| DGDP | -0. 060 | -0. 657 | 0. 516 |
| EGDP | 8. 394 | 0. 423 | 0. 675 |
| GDPGAP | 0. 001 | 2. 048 | 0. 049 |
| DU | -0. 948*** | -3. 673 | 0. 001 |
| TB | 0. 954 | 1. 421 | 0. 166 |
| C | -0. 623 | -0. 297 | 0. 769 |
| **Post Estimation Test** | | | |
| Breusch-Godfrey Serial Correlation LM Test: | | 0. 9984 [0. 3812] | |
| Heteroskedasticity Test: Breusch-Pagan-Godfrey | | 0. 44986 [0. 9356] | |

Note: ***, **, * indicate the statistical significance of coefficients at 1%, 5% and 10% respectively; the values in parentheses and block brackets are, respectively, the f-statistics and the probabilities

The findings from this study reveal that the Nigerian government is not implementing a corrective action to comply with the inter-temporal budget constraint as debt to GDP ratio does not positively and significantly affect the primary surplus. Thus, primary surplus does not react positively to an increase in debt to GDP ratio, and the debt to GDP ratio is not growing at a constant rate. This suggests that the government does not satisfy the inter-temporal constraints, and does not take necessary actions to maintain or ensure fiscal sustainability.

## 6. Conclusion and Policy Implication

This paper provides useful insight on public debt sustainability in Nigeria. We account for the role of structural breaks, using the modified ADF unit root test and ARDL fiscal reaction function. The study found that government borrowings and fiscal policy actions are not sustainable because government spending grow faster than its revenue. The study found a wide gap between the growth of government revenue and its fiscal expenditure which makes it impossible for government to meet its spending obligation including the interest payment on debt. These findings have implications on the current fiscal stance for Nigeria. As a result, we recommend the need for government to diversify its revenue base from crude oil and explore other promising sectors, such as agriculture, tourism, entertainment, mining of mineral resources, among others for its revenue and foreign exchange. In addition, we also recommend that government should minimize its borrowings in the economy which contribute to crowding out private sector investment.

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