

FISCAL POLICY SUSTAINABILITY IN NIGERIA: ARDL BOUNDS TESTING TECHNIQUE

Dauda Gbolagade
Adebisi^a † ,

Gbadebo Salako^b

^a † Department of Accounting and Finance, Bowen University, Iwo, Osun State, Nigeria

^b Department of Economics, Emmanuel Alayande College of Education, Oyo, Oyo State, Nigeria

† ✉ oyelekeolusola@gmail.com

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ABSTRACT

This study investigates fiscal policy's sustainability in Nigeria from 1961-2016, using annual data of public revenues and expenditure, all as a ratio of GDP. The study applies ARDL bounds testing cointegration technique to determine an equilibrium relationship between the variables. Also, Autoregressive Distributed Lag (ARDL) technique of data analysis is employed to examine the compliance of the government of Nigeria with the budget constraint equation. The results show no equilibrium occurs between public revenue and expenditure, indicating absence of sustainability in the government finances in Nigeria. It is expedient, therefore, that government expands the tax base, reduce tax rates and be cautious in her spending to avoid unproductive expenditure.

Contribution/ Originality

First and foremost, by and large, the study covers the longest period, compared to other studies that have attempted to examine sustainability in Nigeria. This study has examined the causality between government revenue and expenditure in sustainability determination of the economy of Nigeria. Again, this study covered the pre- and post-civil war periods which could have impact on government revenue and expenditure in Nigeria.

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1. INTRODUCTION

Sustainability of fiscal policy is essentially a macroeconomic concept which is related to the solvency of public's coffers. Solvency occurs if current public fiscal obligations do not lurk future responsibility of government. Fiscal policy is said to be sustainable when an economy is anticipated to finance its debts deprived of large imminent modifications to equilibrium of revenue and expenditure. Alternatively, sustainability denotes that government finances are not resorting to debts monetization or repudiation and a sizable level of external shock is unanticipated to bring the economy into unending debts (Kojo, 2010; Kaur *et al.*, 2018; Chibi *et al.*, 2019).

Issue of fiscal sustainability is central to measuring macroeconomic soundness. A sustainable policy provides steadiness for the macroeconomic environment and promotes monetary union relationships among economies Oyeleke and Ajilore (2014). It also encourages growth and development of an economy. On the other hand, an unsustainable fiscal policy threatens macroeconomic strength, balance of payment equilibrium and financial aptitude of government to supply indispensable goods and services. When fiscal strength of government is apparently unsustainable over time, the markets from which the government finances its debts react by triggering macroeconomic crises (Sudharshan *et al.*, 2012). Furthermore, unsustainable fiscal policy, in the long run, would jeopardize efforts of the monetary authority at attaining price stability. Operationally, an expansion in the money supply will increase the level of importation, thereby dipping the aggregate of foreign exchange available to domestic consumers and swelling pressure for exchange rate devaluation. In the literature, sustainable fiscal policy is augmenting the soundness of macroeconomic environment in promoting growth of economic and fiscal discipline, it is therefore central for policy makers, especially in Nigeria to focus attention on its attainment as a policy measure of good economic management.

Several studies have explored fiscal policy sustainability in Nigeria at various periods with a view to unveiling whether Nigerian public finances have violated the intertemporal government budget constraint model (For instance, Ariyo, 1993; Oshikoya and Tarawalie, 2010; Oyeleke and Ajilore, 2014). Obviously these studies do not provide information on the most crucial periods in the Nigerian history i.e. 1961-1979 and 2011-2016 respectively. The period 1961-1979 witnessed discovery and exportation of crude oil in commercial quantity, the civil war between 1967-1970, oil boom of early 1970s, and post war rehabilitation and reconstruction programmes that led to increasing in government spending. Again, the period 2011-2016 also witnessed oil boom, when in an international market a barrel of crude oil was sold, on average, \$110. This paper fills this gap in literature on sustainability of Nigeria's fiscal policy. Remaining sections are organised as follows; section two presents literature review, data and model specifications are covered in section three. Section four anchors estimation techniques, discussion of results comes in section five, while summary and conclusion are presented in section six.

2. LITERATURE REVIEW

It is critical to note that most of the empirical literature on fiscal policy sustainability for various countries are based on the exposition of either accounting or present value budget constraint model. For instance, Oshikoya and Tarawahie (2010) analysed the fiscal policy sustainability of the West African Monetary Zone from 1980-2008. Annual data for Gambia, Sierra Leone, Ghana and Nigeria were analysed. PVBC provided the technique adopted by the authors for analysing sustainability in an equilibrium context. The results showed that, for other countries except Sierra Leone with unsustainable fiscal policy, sustainability was weak. Furthermore, causality test results supported tax-and-spend hypothesis in Sierra Leone, Gambia and Guinea, but bi-directional causality existed in cases of Ghana as well as Nigeria.

Similarly, [Kuncoro \(2011\)](#) investigated the sustainability of the fiscal budget of Indonesia. His empirical estimates were based on econometric methods of unit root, cointegration and VAR. The findings showed that Indonesia’s economy was sustainable. [Jibao et al. \(2012\)](#) examined system variations and sustainability of fiscal policy for South Africa, using quarterly data from 1960(1)-2008(4). Analysing asymmetry association between government expenditure as well as revenue, the study discovered that fiscal policies had been consistent with the inter-temporal government budget limit.

[Saad \(2011\)](#) explored public debts sustainability in Lebanon from 1965-2008, using intertemporal budget constraint. Findings showed that Lebanese debts were not strongly sustainable. [Oyeleke and Ajilore \(2014\)](#) verified if the government of Nigeria had contravened intertemporal government budget constraint equation from 1980-2010. Employing error correction approach, findings showed that the sustainability was weak in the country. The findings corroborated the results of [Oshikoya and Tarawalie \(2010\)](#). Other authors that have worked on fiscal policy sustainability include [Quintos \(1995\)](#) for US, [Adams et al. \(2010\)](#) for Developing Asia, [Doh-Nani \(2011\)](#) for Ghana, [Collingnon \(2012\)](#) for European countries, and [Hye et al. \(2009\)](#) worked on money supply for Bangladesh, among others. Using quarterly data from 1963q1-2017q1 with nonlinear technique, [Chibi et al. \(2019\)](#) investigated sustainability of fiscal policy in Algeria. Empirical findings revealed that budget balances could not be sustained in Algeria over time.

3. DATA AND MODEL SPECIFICATION

Data for this study consist of the annual time series of government expenditure and revenue measured as a ratio of GDP from 1961-2016. The year 1961 was so sacrosanct in the history of the Nigerian economy. It could be called the year of financial liberation being the year crude oil was discovered in commercial quantity in Nigeria, thus it choose as base year. Data was obtained from [Central Bank of Nigeria Statistical Bulletin, 2016](#) issue. Following [Oyeleke and Ajilore \(2014\)](#), present value budget constraint (PVBC)/econometric method of analysing fiscal deficit sustainability is adopted in this study. According to this model, the most straightforward method to gauge fiscal policy sustainability relies on cointegration of intertemporal public budget limit model;

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

Deriving following equation from Equation 1:

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

where D_t represents public debts in period t , r_t stands for return on government debts, G_t is the public debts (debts discounting interest payments) in time t , and R_t is public revenues. From Equation (2), taking its first difference, the intertemporal budget constraint becomes:

$$G_t - R_t = \sum_{s=0}^{\infty} (1 + r)^{-s+1} (\Delta R_{t+s} - \Delta G_t + r \Delta D_{t+s-1}) \dots\dots\dots (3)$$

where $(1+r)^{-s+1}$ is discounting factor, ΔG_t and ΔR_{t+s} are first difference in expenditure and revenues. No-Ponzi game confines right hand side of equation (3) free of unit root as long as revenue, expenditure and debt stocks are stationary at 1st difference. Stationarity limits a magnitude to which G_t and R_t drift apart over time. When G_t and R_t are I(1) processes and cointegrated, its denotes the existence of error correction term, forcing public finance near obligatory level ([Jibao et al., 2012](#)). Hence, equation (3) becomes:

$$G_t = \gamma + R_t + \lim_{s \rightarrow \infty} \frac{b_{t+s}}{(1+r)^{s+1}} + \varepsilon_t \dots\dots\dots (4)$$

Equation (4) is the root of the hypothesis for testing sustainability in fiscal policy. Assuming that the transversality state for budget constraint is held, while the limit term in equation (4) is equal to nil, then, equilibrium relationship between revenue and expenditure becomes:

$$R_t = \gamma + \beta G_t + \varepsilon_t \dots\dots\dots (5)$$

where γ represents autonomous and β is the gradient of equation which displays the magnitude to which variations of public spending influence public revenue. R_t stands for public revenues, G_t for expenditure as described above and ε_t is disturbance term.

3.1. Estimation procedure

Verifying fiscal policy sustainability in Nigeria, this study employs Autoregressive Distributed Lag (ARDL) Bounds Testing technique as well as ARDL method of analysis. Then, equation (5) is re-specified in the ARDL form:

$$\Delta (REV/GDP)_t = \alpha + \sum_{i=0}^n \delta_i \Delta (REV/GDP)_t - i + \sum_{j=0}^n \beta_j \Delta (EXP/GDP)_t - j + \theta_0 (REV/GDP)_t - 1 + \theta_1 (EXP/GDP)_{t-1} + \varepsilon_t \dots\dots\dots (6)$$

Where (REV/GDP) is revenues/GDP, (EXP/GDP) expenditure/GDP, n is number of lag length, δ_i and β_i are coefficients of lagged variables. Also, θ_0 and θ_1 are long run slopes of error correction models, while Δ is the symbol of first difference.

ARDL is a general dynamic process which determines if past value of the variables in the study has an effect on the current status of itself along with other explanatory variable(s). Process in ARDL Bounds testing cointegration approach includes computing F-statistic and comparing the statistic with upper and lower bound table values in Pesaran *et al.* (2001). If calculated F-statistic is below lower bound values, it is concluded there is no equilibrium. The development implies fiscal policy is unsustainable in the economy of Nigeria. However, if calculated F-statistic is larger than upper bound values, it confirms the existence of equilibrium, implying evidence of sustainability in Nigeria.

On strength of fiscal policy sustainability, as proposed by Quintos (1995), it has become essential to use coefficient restriction to determine if $0 < \beta < 1$, $\beta \leq 0$ or $\beta = 1$ and draw conclusion that policy is either strong, weak or unsustainable. Specifically, if cointegration exists, but $0 < \beta < 1$, then, fiscal policy is adjudged weakly sustainable. However, when cointegration exists and $\beta = 1$, fiscal policy is strongly sustainable, but unsustainable when $\beta \leq 0$.

4. RESULTS AND DISCUSSION

This study analyses fiscal policy’s sustainability in Nigeria, following these steps in econometric analysis; Stationarity property of the variables are first examined using Augmented Dickey-Fuller (ADF) as well as Phillip-Peron (PP) unit root tests to determine the existence of unit root in the variables. The test is carried also to guarantee that none of the variable is I(2) as required by ARDL procedure. Next bounds test cointegration test is performed and the result is compared with Pesaran *et al.* (2001)’s table values, both lower and upper bounds.

Table 1: Results of ADF unit root test

| Variable | Level | First Difference |
|----------|--------|------------------|
| LREV/GDP | -1.116 | -7.903* |
| LEXP/GDP | -1.623 | -10.227* |

Note: * represents 1% level of significance

From Table 1, the ADF test results reveal public revenues to GDP and expenditure to GDP are stationary at levels, meaning I(0) process. However, the results of PP test show that only public revenues is I(0) at 10% significance level, while public expenditure is a first difference series at 1% level of significance. Adjudged by PP's results, it is obvious the variables are combinations of I(1) and I(0). It is, therefore, concluded that both public revenues and expenditure are different order of integration. Hence, the applicability of ARDL Bounds Testing method of cointegration.

Selecting lag length, there are two suggestions bore in mind. According to [Pesaran et al. \(2001\)](#), it is argued that lag 2 are enough with annual data to preserve the degree of freedom. Again, the system is allowed to choose the appropriate lag length orders to ensure adequate number of lag length in the analysis.

4.1. Cointegration analysis

Table 2: Results of ARDL bounds test

| Test Statistic | Value | k |
|-----------------------|----------|----------|
| F-statistic | 1.548 | 1 |
| Critical Value Bounds | | |
| Significance | I0 Bound | I1 Bound |
| 10% | 4.04 | 4.78 |
| 5% | 4.94 | 5.73 |
| 2.5% | 5.77 | 6.68 |
| 1% | 6.84 | 7.84 |

Table 2 displays system based ARDL bounds test cointegration outcomes for measuring equilibrium. From Table 2, value of calculated F-statistic is (1.549). Comparing the value with the critical lower bounds F-Statistics (4.04), (4.94), (5.77) and (6.84), summarises no rejection of the null hypothesis. This empirical evidence reveals the absence of equilibrium between public revenues and expenditure in Nigeria. It is concluded, therefore, that fiscal policy is unsustainable in Nigeria from 1961 to 2016. This finding is consistent with the result of [Ariyo \(1993\)](#) for Nigeria, deviated from [Oyeleke and Ajilore \(2014\)](#) who found sustainability for the same economy, and [Kaur et al. \(2018\)](#) for states in India.

Table 3: Results of ARDL model

| Variable | Coefficient | Std. Error | t-Statistic | Prob.* |
|-----------------|-------------|------------------------|-------------|--------|
| REV(-1) | 0.508 | 0.111 | 4.567 | 0.000 |
| REV(-2) | 0.334 | 0.112 | 2.975 | 0.004 |
| GEXP | 0.469 | 0.100 | 4.680 | 0.000 |
| GEXP(-1) | -0.464 | 0.101 | -4.592 | 0.000 |
| C | 0.019 | 0.015 | 1.287 | 0.204 |
| R-sq. | 0.707 | Mean dependent var. | | 0.144 |
| Adj R-sq. | 0.684 | S.D. dependent var. | | 0.059 |
| S.E.reg. | 0.033 | Akaike info criterion. | | -3.868 |
| Sum sqd resid. | 0.056 | Schwarz criterion. | | -3.686 |
| Log likelihood. | 111.390 | Hannan-Quinn criter. | | -3.798 |
| F-stat. | 30.268 | Durbin-Watson stat. | | 2.122 |
| Prob. | 0.000 | | | |

*Note: p-values and any subsequent tests do not account for model selection

From Table 3 above, however, ARDL long run analysis provides useful results. Expenditure variable, both current and one-year lag influenced the variation occurred in revenue, given the t-statistic values (4.680633 and -4.591868). Particularly, in the current year, a billion naira expended

in economy exerts 47% increase in revenue generated that same year. This empirical evidence is in consonance with Keynesian’s postulation that encourages government to spend more for the economy to grow, especially during a recession. However, a billion naira spent in economy previous year reduces the current year revenue by 46%. This implies that, to a reasonable extent, the previous year government spending is not enhancing government present revenue generation. The evidence suggests that government has not been spending on productive activities in Nigeria.

4.2. Causality test

Table 4: Granger causality tests

| Null Hypothesis | Obs. | F-Statistic | Prob. |
|---------------------------------|------|-------------|-------|
| GEXP does not Granger Cause REV | 55 | 2.655 | 0.080 |
| REV does not Granger Cause GEXP | | 3.421 | 0.040 |

From Table 4, result shows that, given the F-statistic and probability value (3.421, p <0.05), total public revenues granger caused to total public expenditure and there is no feedback. This implies a uni-directional causal relationship exists between the variables during the period reviewed. The policy implication is that government of Nigeria has been implementing tax-and-spend policy over time.

5. CONCLUSION

This study examined fiscal policy sustainability of Nigeria from 1961-2016 with a view to determining whether fiscal authorities had adhered strictly to the principle of intertemporal government budget constraint. Using ARDL Bounds Testing cointegration technique, the results showed evidence of no cointegration between public revenues and expenditure in Nigeria. It was, therefore, concluded that Nigeria’s fiscal policy was unsustainable during the period covered by the study. Again, empirical evidence suggested that the government has not been spending adequately on productive activities to serve as investment/pay back for the economy. Equally, the result showed a uni-directional causality running from public revenues to expenditure in Nigeria.

The implication of unsustainable fiscal policy is that government cannot continue with its deficit financing policy without incurring adverse response from its lenders in the long term. The development of which portends a great danger to growth and development of the economy. We therefore recommend that government should embark on policies that have the capacity to expand the revenue base and reduce unproductive expenditure in order to achieve sustainable fiscal policy.

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