Does Debt Servicing Crowd-Out Federal Government Expenditures in Nigeria?

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Abstract
In the past few decades, trillions of Naira have been spent by Federal Government of Nigeria to services its domestic and foreign debts. In this regard, this study tested crowding out hypothesis among federal capital, non-debt servicing recurrent and debt serving expenditure components using Auto Regressive Distributive Lag (ARDL) Bound-Testing technique to Cointegration and Toda-Yomamota test of Granger non-causality over the period 1961-2018. Long-run and short-run parameters estimates show that, a 1 percent rises in debt servicing expenditure component decrease federal non-debt servicing recurrent expenditure by about 0.18 and 0.15 percent and capital expenditures by about 0.23 and 0.28 percent respectively; 1percent increase in federal non-debt servicing recurrent expenditure reduced capital expenditures by about 0.52 percent and a 1 percent increase in federal capital expenditure can increase federal non-debt servicing recurrent expenditure by almost 0.34 percent in the long-run. These results are further confirmed by Toda-Yomamota test of Granger non-causality, which suggest bidirectional causality among the three expenditure components. Overall, evidences are in support of crowding-out hypothesis among the three expenditure components in Nigeria. The policy implications are these: the current federal government fiscal stance (sustained increase in public debt stock and resultant debt servicing) can have short term and long-term adverse effect on capital and non-debt servicing recurrent expenditure. Thus, an optimal combination of increased revenue generation, debt and non-debt deficit financing are required.

Keywords: Debt Servicing, Expenditure, Federal Government, Nigeria
JEL Classification Codes: H50, H53, H54, H63

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1. Introduction

Keynesian economics established government expenditures as a key fiscal policy instrument that can be deployed to achieve desired economic and social objectives. However, Olofin (2001) argues that government expenditure is not a one size fit all instrument: developed economies with excess productive capacity can effectively utilise it for demand management objective while developing economies with limited productive capacity can use it to complement private investment in creating new and enhancing the utilization of the existing productive capacity. Also, the size, composition and efficiency of government's expenditure create different alternative incentive systems, which determine the ability and willingness of economic agents to; works, save and invest differently (Dalton, 1928).

A strand of literature has produced inconclusive results on crowding-out effect among various government expenditure components. (See Brazer & McCarty, 1987; Mintz & Huang, 1991; Fossett & Wycko, 1996; McCarty & Schmidt 1997; Marlow & Shiers, 1999; Stephens, 2001; Mahdavi, 2004; Lora & Olivera, 2007; Fosu, 2008; Sennoga & Matovu, 2010; and Bacchiocchi, Borghi & Missale, 2011). In Nigeria, explicit test of crowding-out hypothesis among government expenditure components have received less attention. However, Edeme and Nkalu (2016) have tried to examine crowding-out effects of government expenditure on human capital development, however, a cursory observation revealed methodological weakness of the study. For example the traditional pre-estimation and post-estimation diagnostic tests for time series analysis were not conducted. Thus, the regression results might be spurious and the inferences might likely be invalid (Yule, 1926; Granger & Newbold, 1974).

The behavior of actual Federal government expenditure with respect to capital, non-debt servicing recurrent and debt servicing (expressed in log scales) is shown in Figure 1: generally multiple episodes of high and low debt servicing are identified. With the exception of 1961-1968; periods with high debt servicing payments are usually preceded by negative oil price shocks and high stock of domestic and foreign debt as in the late-1980s to early-1990s, and mid-2000s. Interestingly, these periods coincided with a record low of both recurrent non-debt servicing and capital expenditure components. On the other hand, all periods with relatively low debt servicing correspond with a rising level of both recurrent and capital expenditures for examples: mid-1970s, early 1980s, late-1990s, and late 2000s.

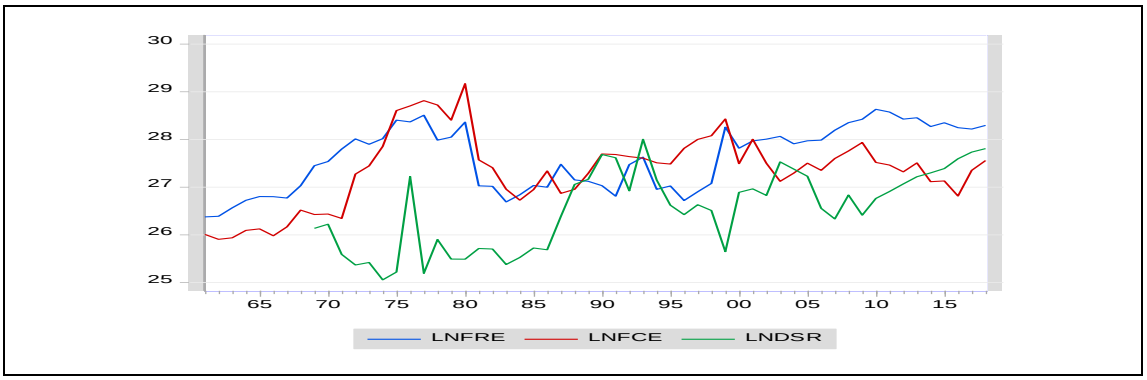


Figure 1: Trends of Federal Government Expenditure in Nigeria (1961-2018)
Sources: Author(s) Plot Based on Data from CBN Statistical Bulletin 2010, 2018

All the above point to the need for clear understanding of possible crowding-out effect among government expenditure components in Nigeria. Therefore, the purpose of this study is to test crowding-out hypothesis among federal capital, non-debt servicing recurrent and debt servicing expenditure components. The contribution of the paper is in two folds: (1) to complement existing literature on crowding-out hypothesis among government expenditure components and established whether Nigeria's Federal government debt servicing is crowding-out its capital and non-debt servicing recurrent expenditure (2) unlike in the previous studies, we tested long term time series using robust econometrics techniques: Auto Regressive Distributive Lag (ARDL) bound testing approach to cointergration developed by Pesaran and Shin (1998); Pesaran *et al* (2001) and Toda-Yomamota(1995) Granger non-causality test. The empirical result established the existences of crowding-out hypothesis; debt servicing exert statistically significant long-term and short- term negative effects on both federal capital and non-debt servicing recurrent expenditure components. However, the crowding-out effect is more pronounces on capital expenditure component.

The rest of the paper is organised under the following sub-headings: literature review is section two; theoretical framework and the model is section three; results of empirical analysis is section four and section five conclude the paper with policy implications.

2. Literature Review

This section reviewed existing literatures on debt overhang hypothesis, crowding-out hypotheses and determinants of government expenditures in Nigeria. The debt overhang literatures provide recent evidence on the existence or otherwise of the hypothesis in different countries; crowding-out literature shed light on the state of knowledge on the possibilities of trade-offs among various governments expenditure components. While, the drivers of government expenditures in Nigeria guides the study in choosing appropriate control variables that have consistently determine government expenditures empirically.

Substantial evidences existed on debt overhang and or implied inverse relationship between debt and economic growth. For instances, Afonso and Alves (2014) used five year average growth rates data of 14 European countries for the period 1970 -2012 to

examined linear and non-linear effect of public debt on growth. Results from panel estimation techniques show that a 1 percent rise in public debt decrease economic growth by about -0.01; debt service negative effect on growth is 10 times greater than that of debt stock; further, the negative effect of debt ratio set in at around 75 percent threshold. Benayed, *et al*. (2015) investigates the nature of the link between debt stock and domestic investment in10 African economies over the period 1981-2010; using panel threshold approach. The findings confirmed nonlinear causation running from debt stock to domestic investment and conclude that, debt ratio lower than 47.31 per cent of GDP is positively related with domestic investment. However, once the ration surpasses this threshold, the link between debt ratio and investment turns negative.

Jibir, *et al*. (2017) studied the causal link between different measures of public debt and growth in Nigeria over the period 1981-2016 within the frameworks of Solow growth model and Autoregressive Distributive Lag (ARDL) technique. The findings suggest that external debt has a decreasing effect on Nigeria short-run and long-run growth prospect. Kobayashi (2015) argued that these observed negative effects of debts on growth work through three main mechanisms: a reduction in private savings, reduction in public investments and change in total factor productivity. Other significant studies that support debt overhang hypothesis include: (Reinhart, Reinhart & Rogoff 2012; Izedonmi & Ilaboya 2012; Mitze & Matz 2013; Lee & Yan 2015; Abdullahi**,** Abubakar &Hassan 2016; Chinanuife, Eze & Nwodo 2018).

Two opposing evidences existed in the literature for or against crowding out hypothesis amongst different components of government expenditures. Landon, et al, (2006) tested the hypothesis that Canadian provincial health expenditure crowd-out other provincial expenditure components during 1988/ 89 to 2003/04 fiscal years. Panel regression estimates indicate that a rise in provincial health expenditure does not significantly decrease other provincial expenditure components. Moreover, Kim & Choi (2019) used Granger panel analysis and Beck & Katz panel model to examined crowding-out effect of social protection policies on social investment in 18 OECD countries from 1980 to 2010. Base on the results obtained the authors argued that, in general, social protection has not crowded out social investment policies but, rather, the positive link between the two is increasingly weaker in recent years. Other studies along this line are: (Brazer & McCarty, 1987; Mintz & Huang, 1991; Fossett & Wycko, 1996; McCarty & Schmidt 1997; Marlow & Shiers, 1999).

On the other hand, Shabbir and Yasin (2015) examined effects of external debt on social sector expenditure in Seven Asian countries; using panel data sets for the period 1980-2010 and GMM estimation technique. The evidence support the hypothesis that external debt stock and external debt servicing have a significant negative effect on public spending, especially on social infrastructures provisions. Tashevska and Trpkova-Nestorovska (2020) used panel regression analysis to test whether social protection expenditure has crowded-out expenditures on other purposes in the European Union over the period 1995-2018. The results provide some evidence of crowding-out of infrastructure and education spending. Additionally, deficit financing and rising government debt have a significant adverse effect on spending on infrastructure, education and core public services.

Furthermore, Picarelli, Vanlaer and Marneffe (2019) investigated whether an increased in the levels of public debt have reduced public investment for 26 EU countries, between 1995 and 2015. Results from instrumental variable base GMM estimation show that a 1percent increase in public debt in the EU brings about a reduction in public investment by 0.03 percent. Sie, et al. (2021) Investigated the effect of disaggregated public spending on Private investment in Malaysia from 1980 to 2016 via Vector Error Correction model. Empirical results suggested crowd-in effect of education and defense expenditure as well as crowd-out effect of health and transportation expenditure components on private investment respectively. Relatedly, Edeme & Nkalu (2016) tested crowding out effects of government expenditure on human capital development in Nigeria over 1977-2013 periods. Results from multiple regression estimates indicate that capital expenditure crowd-in, while, recurrent expenditure crowd-out human development. Other evidences along this line include: (Stephens, 2001; Mahdavi, 2004; Lora and Olivera ,2007; Fosu, 2008; Sennoga & Matovu 2010; Bacchiocchi, Borghi and Missale,2011).

In addition, various scholars have examined the determinants of government expenditures in Nigeria**.** For instance, Samson (2019) examined the most robust variables that affect public expenditure in Nigeria, using non-linear ARDL and Toda–Yamamoto causality test. The results show that rise in oil price, depreciation in Naira exchange rate, and government fiscal revenue are the robust determinants of public expenditure in Nigeria. Aregbeyen and Akpan (2013) examine the long-term determinants of public spending in Nigeria; estimating a single equation using 50 years annual time series data. The finding shows that foreign aid increase recurrent expenditure and decrease capital expenditure; debt servicing crow-out all components of expenditure; revenue exert significant long-term effect on government size; openness reduced government expenditure significantly; higher population translate to higher government expenditure; military regime favor capital expenditure more compare to civilian administration in Nigeria; election period accentuate government expenditure than would otherwise be the case. Other key studies on government expenditure determinants in Nigeria are: (Taiwo, 1989; Foye, 2014; Akanbi, 2014; Ukwueze, 2015; Aregbeyen and Kolawole, 2015; Aregbeyen and Fasanya, 2017).

In sum, three key insights emerged from the literature reviewed: (1) although no country is immune from incurring public debt, excessive debts can have a significant adverse effects on the economy;(2) the literature on crowding-out hypothesis among government expenditure components is inconclusive, there are at least, two opposing views; and (3) the key determinants of governments expenditures in Nigeria are governments revenue, oil price, debt servicing, real per capita income, exchange rate depreciation, aids, openness, population growth, and governances. Against this backdrop, this study used Nigeria's fiscal data from 1961-2018 to test the hypothesis that debt servicing is crowding-out federal capital and recurrent government expenditures over the sample period.

3. Theoretical Framework and the Model

The study employed public choice framework to examine how federal government choose to allocate its scarce resources among capital, non-debt servicing recurrent and

debt service expenditure components. The study assumed that, federal government seeks optimal or maximum level of welfare subject to national, economic and political constraints. In other words, its attempt to maximized capital and recurrent expenditure components and minimized its debt servicing expenditure components. This approach is similar to that used by Akanbi (2014) where he investigate government capital and recurrent expenditure component determinants by modelling the choice on the size of capital and recurrent expenditure as government optimization problems. Following this approach, the total federal government expenditure is decomposed into federal capital expenditure, federal non-debt servicing recurrent expenditure and federal debt servicing as follows:

$$TE \equiv FCE + FRE + DSR \quad (3.1)$$

Equation one is an identity and implies that total government expenditure (TE) is given by the sum of Federal capital expenditure (FCE); Federal Non Debt Servicing Recurrent Expenditure (FRE) and Federal Debt Servicing (DSR).The study hypothesize a trade-off to occur between the three categories of expenditure, the choice of an expenditure level for one category affect the amount of money available to the other category, such that spending in one comes at the expense of the others. To test the above hypothesis two expenditure equations are considered from the structural model and the state variables are allowed to enter in each equation as follows:

$$FCE = F1(FRE, DSR, Z) \quad (3.2)$$

$$FRE = F2(FCE, DSR, Z) \quad (3.3)$$

Equation two represents federal capital expenditure as a function of federal non-debt servicing recurrent expenditure, debt servicing and the state variables (Z). While, equation three represent federal non-debt servicing recurrent expenditure as a function of federal capital expenditure, debt servicing and the state variables. To focus attentions and estimate the most parsimonious models, vector of state variables are chosen from the robust determinants of government expenditure in Nigeria as outline in the literature review section. In line with Akanbi (2014) and ease of interpretation equation two and three above were transformed in to natural logarithms form as follows:

$$lnFCE = F(lnDSR, lnFRE, lnFRR, lnOILP, lnYPC, OD, GOV) \quad (3.4)$$

$$lnFRE = F(lnDSR, lnFCE, lnFRR, lnOILP, lnYPC, lnAID, GOV) \quad (3.5)$$

Where:
DSR = Debt Servicing
FRR = Federal Retained Revenue
OILP= Oil Price in Naira terms
YPC = Real Per Capita income
AID = Official Development Assistant as a percentage of Gross National Income

OD = Overall Deficit
GOV = governances indicators

Federal Retained Revenue measure the liquidity level of government and its ability to pay for goods and services, it's expected to have a positive sign in both capital and recurrent expenditure model as it have been repeatedly found in other studies such as (Aregbeyen & Akpan (2013); Akanbi (2014)). Significant shares of federal government revenue comes from crude oil export, oil price is expected to effects capital and recurrent expenditure components positively, this was earlier confirm in the study by (Aregbeyen & Fasanya ,2017; Samson, 2019). Real Per Capita income measures the level of economic development; determine the demand for government goods and services and the resources at its disposal. It's expected to have positive sign in line with Wagner's hypothesis, even though there are mixed findings in the literature as reported in (Taiwo,1989; Akanbi, 2014) and Commander, Davoodi & Lee,1999). Official Development Assistance as a percentage of Gross National Income is used as a proxy for inflow of foreign aid is expected to supplement government revenue thereby increasing the supply of government goods and services; theoretically, it affects both components of the expenditure positively. However, Aregbeyen and Akpan (2013) found that it affects recurrent expenditure positively and not capital expenditure, that is why in our specification it appears only in the recurrent expenditure model.

Overall federal government deficit as a percentage of GDP measure the level of deficit. The variable appears only in the capital expenditure model because the study assumed federal government strictly follow "golden fiscal rule" that is its only borrows to finances its capital expenditure. Poor governance (weak institutions, corruption, and ineffectiveness) symbolizes bad management of a country's resources. For instance, corruption can inflate the level of government expenditure and lower the level of tax revenue which by implications can influenced government expenditure.

3.1 Data and Variable Measurements

Table 1 described the variables, data sources and measurement. All the data used for the analysis was obtained from Central Bank of Nigeria (CBN) statistical bulletin; the World Bank: World Development Indicators, and the Worldwide Governance Indicators covering the period between 1961 and 2018. In practice debt servicing comprises interest and principals repayment. However, due to data paucity this study used total interest payment for domestic and foreign debt as proxy for debt servicing. All variables were adjusted to 2010 constant price. While, the average value of the six elements of the quality of governance indicators developed by Kaufmann, Kraay and Zoido-Lobaton (1999a) was used in the estimation to capture governance in a broader context. In addition, a moving average was use to fill-in the missing value for the period 1961-1996. This is similar to the strategy used by (Akanbi, 2012). Moreover, Aregbeyen and Akpan (2013) argued that, nature of regime: civilian or military, elections years, war and internal security effort might affect the trajectory of government expenditure variables; we construct and allow dummy variables to enter the two models as fixed repressors in order to accommodate these possibilities.

Table 1: Summary of Data Description and Sources

Variables	Description	Expected Sign	Sources
lnFCE	Natural logarithm of federal government expenditure on acquisition of capital goods for the purpose of creating future stream of values such as spending on infrastructure, research and development etc.	-tive	CBN
lnFRE	Natural logarithm of federal government expenditure on current goods and services that do not contribute to fixed capital, but aid day to day running of the government. They include: overheads, payments of salaries and wages etc.	-tive	CBN
lnDSR	Natural logarithm of federal government total interest payment for domestic and foreign debt	-tive	CBN
lnFRR	Natural logarithm of federal government independent revenue plus its share from the federation account	+ tive	CBN
lnOILP	Natural logarithm of 12-month average of oil price in Naira Value	-tive	CBN
lnYPC	Natural logarithm of Nigeria's Per-capita GDP	+ tive	WDI
lnAID	Natural logarithm of Official Development Assistance as a ratio of Gross National Income	+ tive	WDI
OD	Overall federal government fiscal deficit as a percentage of GDP	+ tive	CBN
GOV	the average value of the six elements of the quality of governance indicators developed by Kaufmann, Kraay and Zoido-Lobaton (1999a)	+ tive	WGI
Election_Dummy	1 for the years 1979, 1983, 1993,1999,2003,2007,2011 and 2015; 0 for rest of the years	-	Authors construction
Regime_Dummy	1 for civilian administration; 0 for Military regime	-	Authors construction
War_Dummy	1 for the civil war years 1967-1972 and Boko Haram insurgency period 2009-2018; 0 for the other years	-	Authors construction

Sources: Author(s) Summary from Various Sources

3.2 Unit Root Test

The order of integration of the series was examined using conventional Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests. ADF test used regression equation (3.6) to test the hypothesis that yt contains a unit root, against an alternative that yt is stationary. While, the PP test statistics corrected for auto-correlated errors term with a non –parametric methods can be implemented using regression equation (3.7). Lags length were chosen base on Schwarz information criteria (SIC).

$$\Delta yt = \alpha + \theta t + (\rho - 1)yt_{-1} + \sum_{i=1}^{k} \delta \, \Delta yt_{-1} + u_t \qquad (3.6)$$

$$\Delta yt = +\alpha + \theta t + \varphi yt_{-1} + u_t \qquad (3.7)$$

3.3 ARDL Bound Testing Approach to Cointegration Technique

To test the trade-off hypothesis among federal capital expenditure, federal non-debt servicing recurrent expenditure and federal debt servicing; ARDL bound testing approach to cointergration techniques was utilised. The technique as developed in Pesaran and Shin (1998) and Pesaran *et al* (2001) conveniently accommodate the combination of *I*(0) and *I*(1) variables as confirmed from the unit root test of the study variables, other inviting features of the technique is that, it is simple to implement through a single equation set-up and different variables can enter the model with a different lag. Following this an unrestricted error correction model for capital expenditure model is specified below and utilised for bound testing cointegration test; The test involves testing a null hypothesis of no cointegration equilibrium relationship between the variables, that is H0: $\emptyset 1 = \emptyset 2, \ldots, \emptyset 8 = 0$; against the alternative that H0 is not true. A rejection of H0 implies the existences of cointegration relationship between the variables. An important assumption of Auto Regressive Distributive Lag-Bounds Testing technique to cointegration of Pesaran et al. (2001) is that the errors in equation (3.8) must be serially independent and well behave.

$$\Delta lnFCE_t = \alpha_0 + \sum_{i=1}^{n} \alpha 1i \, \Delta lnFCE_{t-i} + \sum_{i=0}^{n} \alpha 2i \Delta lnFRE_{t-i} + \sum_{i=0}^{n} \alpha 3i \, \Delta lnDSR_{t-i} +$$

$$\sum_{i=0}^{n} \alpha 4i \, \Delta lnFRR_{t-i} + \sum_{i=0}^{n} \alpha 5i \Delta lnOILP_{t-i} + \sum_{i=0}^{n} \alpha 6i \, \Delta lnYPC_{t-i} + \sum_{i=0}^{n} \alpha 7i \Delta \, OD_{t-i} +$$

$$\sum_{i=0}^{n} \alpha 8i \Delta GOV_{t-i} + \emptyset 1 lnFCE_{I-1} + \emptyset 2 lnFRE_{t-1} + \emptyset 3 lnDSR_{t-1} + \emptyset 4 lnFRR_{t-1} +$$

$$\emptyset 5 lnOILP_{t-1} + \emptyset 6 lnYPC_{t-1} + \emptyset 7 OD_{t-1} + \emptyset 8 GOV_{t-1} + \emptyset 9 \text{Election} + \emptyset 10 \text{Regime} +$$

$$\emptyset 11 \text{War} + \varepsilon 1_t \qquad (3.8)$$

Table 2: ARDL Bound Test Results

	(5%) Critical Values			
Dependent Variables	**I(0)**	**I(1)**	**F-Statistics**	**Outcome**
F(lnFCE, lnFDSR, lnFRE, lnFRR, lnOILP, lnYPC, OD, GOV, Election, Regime, War)	4.94	5.73	17.24*	Cointergration
F(lnFRE, lnDSR, lnFCE, lnFRR, lnOILP, lnYPC, lnAID, GOV, Election, Regime, War)	-	-	9.28*	Cointergration

Note: * denotes the presences of cointegrating at 5% level of significances
Source: Author(s) Summary from Eviews 10 output

The applicable model estimated and specified did not include a linear trend in the ECM term and the intercept is not constraint, such that the appropriate table is table CI (iii) of Pesaran et al. (2001). The lower and upper bounds for the F-test statistic at the 5 percent significance levels are [4.94, 5.73] respectively. Results from table 2 suggested that the computed F-statistics for the two models are higher than the upper bound at the 5 percent significant level and there are enough evidences to conclude that there are log-run or cointegrating relationships between the variables in the two models. After confirming the existing of cointergration among the variables, the long-run or equilibrium relationship can be extracted from equation (3.8). While, the short-run dynamic can be estimated from the restricted error correction model specify in equation (3.9) below. However, note that, Federal non-debt servicing recurrent expenditure model can also be specified accordingly, though the later specification was not reported herein to save space.

$$\Delta lnFCE_t = \alpha_0 + \sum_{i=1}^{n} \alpha 1i\, \Delta lnFCE_{t-i} + \sum_{i=0}^{n} \alpha 2i \Delta lnFRE_{t-i} + \sum_{i=0}^{n} \alpha 3i\, \Delta lnDSR_{t-i} + \sum_{i=0}^{n} \alpha 4i\, \Delta lnFRR_{t-i} + \sum_{i=0}^{n} \alpha 5i \Delta lnOILP_{t-i} + \sum_{i=0}^{n} \alpha 6i\, \Delta lnYPC_{t-i} + \sum_{i=0}^{n} \alpha 7i \Delta\, OD_{t-i} + \sum_{i=0}^{n} \alpha 8i \Delta\, GOV_{t-i} + \gamma 1 ECT_{t-1} + \epsilon 1_t \quad (3.9)$$

Where Δ and ECT_{t-1} denote difference operator and lagged value of the error correction term respectively. The ECT_{t-1} is derive from the cointergration relationships and was employed to capture the short-run dynamics in the model.

3.4 Toda-Yamamoto Approach to Granger-Causality

Toda-yamamota (1995) modified wald (MWALD) test to Granger non-causality was used to test the existences of causality among the three federal government expenditure components. The test procedures involve augmenting the correct VAR order, k, by the maximal order of integration, say d_{max}. Then, a $(k+d_{max})$th order of VAR is estimated and the coefficients of the last lagged d_{max} vector are ignored (Wolde-Rufael, 2005). This approach was preferred over the traditional Granger Causality due to the following reasons (1) it accounts for unit root and cointegration properties of the series. (2) It ensures the test statistic for Granger causality has the standard asymptotic distribution

for valid inference. The modified wald (MWALD) test to Granger non-causality test was implemented with the following expenditure components VAR system[1].

$$lnFCE_t = \alpha_0 + \sum_{i=1}^{k} \alpha_1 lnFCE_{t-i} + \sum_{j=k+1}^{k+dmax} \alpha_{2j} lnFCE_{t-j} + \sum_{i=1}^{k} \delta_1 lnFRE_{t-i} + \sum_{j=k+1}^{k+dmax} \delta_{2j} lnFRE_{t-j} + \sum_{i=1}^{k} \gamma_1 lnDSR_{t-i} + \sum_{j=k+1}^{k+dmax} \gamma_{2j} lnDSR_{t-j} + \varepsilon 1_t \quad (3.10)$$

$$lnFRE_t = \beta_0 + \sum_{i=1}^{k} \beta_1 lnFRE_{t-i} + \sum_{j=k+1}^{k+dmax} \beta_{2j} lnFRE_{t-j} + \sum_{i=1}^{k} \theta_1 lnFCE_{t-i} + \sum_{j=k+1}^{k+dmax} \theta_{2j} lnFCE_{t-j} + \sum_{i=1}^{k} \emptyset_1 lnDSR_{t-i} + \sum_{j=k+1}^{k+dmax} \emptyset_{2j} lnDSR_{t-j} + \varepsilon 2_t \quad (3.11)$$

4.0 Empirical Results and Analysis

The empirical strategy proceeds as follows: Firstly, the historical behaviors of the series was examine using figure 1 presented above. Secondly, unit root and Stationarity status of all the variables was checked using the augmented Dickey-Fuller (ADF) and the Phillips and Perron (PP) tests (see appendixes Table 4). Finally, bound testing approach to cointegration was conducted and base on the results, long-run and short-run parameters of the two models were estimated and post estimation diagnostic tests performed.

4.1 Summary Results of Unit Root Tests

Base on the results of ADF and PP unit root tests reported in appendixes table 6 there is statistically significant evidences at the five percent level of significance to accepts the null hypothesis that all the variables have a unit roots with the exception of log of federal retained revenue (lnFRR) and overall deficit as a percentage of Gross Domestic Product (OD) that are stationary at level *I*(0). In addition none of the variables are *I*(2). This informed the decision to utilised bound testing approach to cointegration as the techniques of analysis.

4.2 Long-Run and Short- Run Parameters Estimates

Sequel to the confirmation of cointegration relationship, we proceeds to estimate long-run and short-run parameters for federal capital expenditure and federal non-debt servicing recurrent expenditure models and the results are reported in table3.

[1] Note that only Capital and Recurrent Expenditure components model are specified. While, the Debt servicing components model was not specify for brevity reason.

Table 3: Summary of Long-Run and Short- Run Parameters Estimates

Regressors	Model One: (ARDL 1,2,0,3,3,0,0,2)	Model Two: (ARDL 3,0,3,1,3,3,0,0)
	Panel A: Long-run Coefficients	
C	-2.09[0.602]	4.58[0.31]
lnDSR	-0.23[0.008]*	-0.18[0.06]**
lnFCE		0.34[0.03]*
lnFRE	-0.52[0.002]*	
lnFRR	1.43[0.000]*	-0.10[0.63]
lnOILP	-0.071[0.561]	-0.020[0.84]
lnYPC	1.00[0.045]*	1.60[0.000]*
lnAID		0.005[0.88]
OD	-0.12[0.000]*	
GOV	2.38[0.000]*	-1.45[0.017]*
@TREND	0.019[0.001]*	0.0055[0.357]
	Panel B: Short-run Coefficients	
@TREND		0.005[0.011]
ΔlnDSR	-0.28[0.000]*	-0.15[0.000]*
ΔlnDSR-1	0.13[0.003]*	0.13[0.000]*
ΔlnDSR-2		0.21[0.000]*
ΔlnFRE-1		0.71[0.000]*
ΔlnFRE-2		0.43[0.000]*
ΔlnFRR	0.96[0.000]*	0.70[0.000]*
ΔlnFRR-1	-0.30[0.001]*	
ΔlnFRR-2	-0.29[0.000]*	
ΔlnOILP	0.21[0.001]*	-0.12[0.086]**
ΔlnOILP-1	0.11[0.098]**	0.025[0.679]
ΔlnOILP-2	0.08[0.211]	0.18[0.007]*
ΔlnYPC		0.12[0.838]
ΔlnYPC-1		-0.90[0.054]
ΔlnYPC-2		1.080[0.010]*
ΔGOV	1.019[0.005]*	
ΔGOV-1	-1.64[0.000]*	
REGIME	-0.25[0.000]*	0.30[0.000]*
ELECTION	-0.15[0.038]*	0.04[0.503]
WAR	-0.53[0.000]*	0.08[0.145]
ECT_{t-1}	-0.94[0.000]*	-0.70[0.000]*
R	0.93	0.93
F-Stat	33.71	24.11
D.W-Stat	2.2	2.3

Note * and ** denotes parameters are statistically significant at 5% and 10% significance level respectively
Sources: Author(s) Summary from Eviews 10 output

The results for federal capital expenditure model show that in both the long-run and short-run federal capital expenditure has a statistically significant negative relationship with federal debt servicing expenditure. An increase in debt servicing expenditure components by 1percent will on average decrease capital expenditure by 0.23 and 0.28 percent respectively. Similarly, an increase in non-debt servicing recurrent expenditure by 1 percent will cause a decrease in capital expenditure by 0.52 percent in the long-run but not in the short-run. These evidences confirmed the existence of trade-offs in federal government expenditure components, that is an increase in both debt Servicing and non-debt servicing recurrent expenditure components crowded out capital expenditure with non-debt servicing recurrent expenditure exerting higher crowding-out effect; similar findings were also reported by (Stephens, 2001;Fosu,2008; Bacchiocchi, Borghi & Missale, 2011); and Shabbir &Yasin ,2015).

Others statistically significant variables in the model include: federal retained revenue, per-capita income and governance's indicators. Increase in federal retained revenue by 1 percent will lead to about 1.43 and 0.96 percent increase in federal capital expenditure in the long-run and short-run respectively; increase in the level of income and improvement in governance's indicators (e.g. reduction in corruption) will increase the level and quality of capital expenditure in the long-run. However, the statistically significant negative relationship of overall deficit was contrary to the study a priori that federal government strictly adhere to "golden fiscal rule". Also, the sample evidence does not support the hypothesis that oil price was influential in determining federal government capital expenditure in Nigeria. Finally, civilian regime, election years, war and internal security effort are associated with a significant higher level of capital expenditure, further; the model error correction term (ECT_{t-1}) coefficient conforms to a priori, negative and significant at 1 percent. This means any deviations from the model long-run equilibrium will be corrected within one year at speed of about 94 percent.

Evidences from federal non-debt servicing recurrent expenditure model show that a 1 percentage increase in debt servicing expenditure component will decrease non-debt servicing recurrent expenditure by 0.18 and 0.15 percent in both long-run and short-run respectively. While, a 1 percentage increase in capital expenditure will increase non-debt services recurrent expenditure to about 0.34 percent in the long-run. Similarly, a 1 percent increase in the level of income will increase the long-run level of non-debt service recurrent expenditure by about 1.6 percent. An improvement in governance's indicators (e.g. reduction in corruption) will significantly reduce the level of non-debt serving recurrent expenditure this may be possible through the elimination of ghost workers in the federal civil service. On the other hand, federal retained revenue, oil price and official development assistance (aid) doesn't seem to have statistically significant effect on federal non-debt servicing recurrent expenditure. Estimate of the error correction term concord with that of model one with deviation from long-run equilibrium corrected within one year at speed of about 70 percent. Overall, the evidences suggest that debt servicing expenditure component crowd-out both capital and non-debt servicing recurrent expenditure with higher significant effect on capital expenditure; a number of existing literature argue that government find capital

expenditure more appealing to fiscal adjustment to avoid resistance on welfare and social spending cuts as suggested by Loko, et al., (2003) governments find it easier to decrease their spending on other sectors compare to making cuts in social sectors (health, education, safety nets, and sanitation, etc.).

Toda–Yamamoto approach to Granger causality test Result

Result of Toda and Yamamoto (1995) technique to granger causality reported in table 4 complimented the cointegration test result reported earlier. Base on the modified Wald (MWALD) statistics and their corresponding P-values; the hypotheses of non-Granger causality between lnDSR to lnFCE and lnDSR to lnFRE are rejected at 5% and 10% respectively. Thus, the existences of bidirectional causality (feedback) between lnDSR to lnFCE and lnDSR to lnFRE are established in Nigeria within sample period. The established causality further confirmed the existences crowding-out effect among the three federal government expenditure components thereby validating the results of the cointegration test.

Table 4: Toda-Yamamoto Causality (modified WALD) Test Result

Hypothesis	Chi-sq	Prob.	Conclusion
LnDSR→lnFCE	21.432*	0.006	causality
lnFCE→ lnDSR	25.549*	0.002	causality
lnDSR→ lnFRE	14.286**	0.075	causality
lnFRE→ lnDSR	39.703*	0.000	causality
lnFRE→ lnFCE	11.111	0.196	No causality
lnFCE→ lnFRE	17.024*	0.030	causality

Note: * & ** indicate statistically significance and rejection of the null hypothesis at 5% and 10% respectively with references to the P-values
Sources: Author(s) Summary from Eviews 10 output

4.3 Summary of Models Diagnostic Tests Results

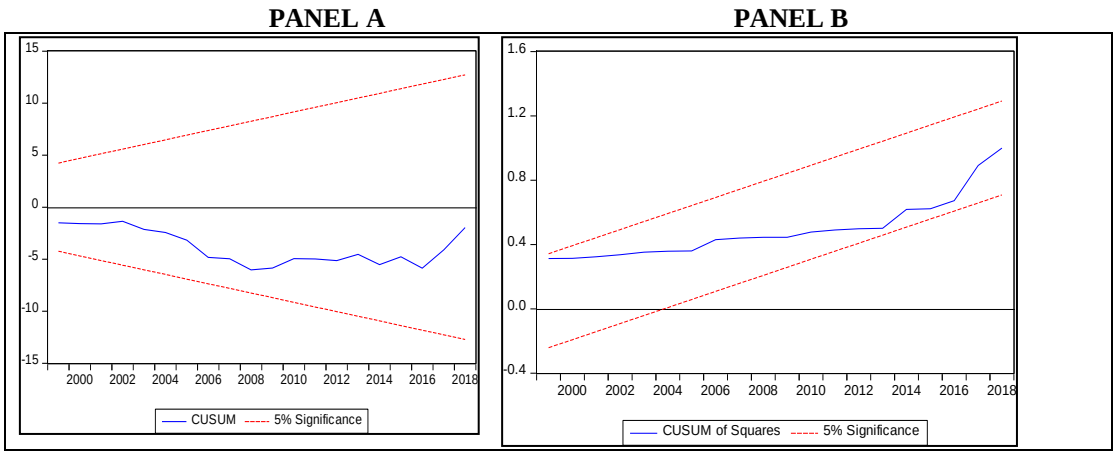
Post estimation diagnostic tests results on serial correlation, heteroscedasticity and normality are reported in table 5. Both federal capital expenditure model and federal non-debt servicing recurrent expenditure model pass the prescribed tests, this means that, the finding are valid and reflect the true situations within the sample periods.

Table 5: ARDL-ECM Models Diagnostic Tests

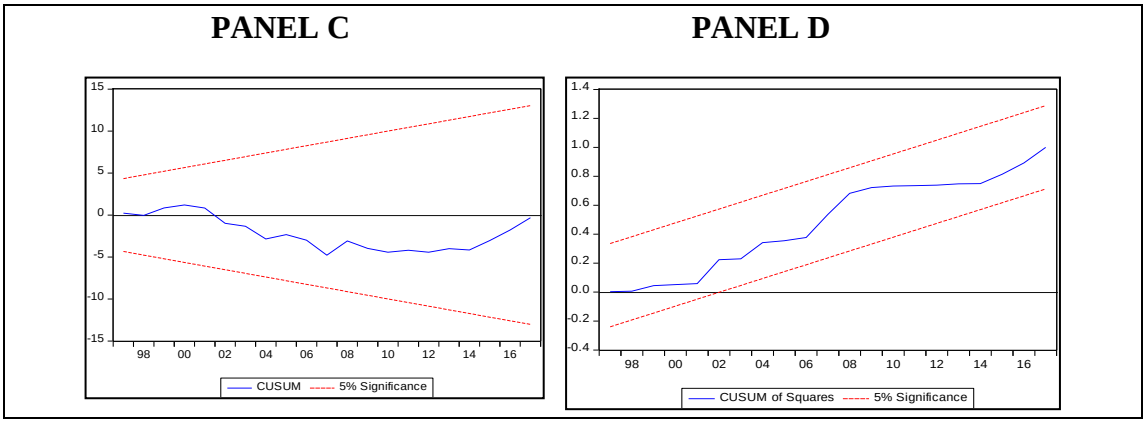
Test Statistic	Model One	Model Two
Serial Correlation: F(3,22)	2.01[0.14]	1.34[0.29]
Normality: Jarque-Bera	0.88[0.64]	1.33[0.51]
Heteroscedasticity: F[22;25]	1.35[0.23]	1.06[0.45]

Sources: Author(s) summary from Eviews 10 output

With regards to models stability both cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMQ) tests conducted for the two models shows that the estimated parameters are within the five percent boundaries as seen below in (Figure1: Panel A –B) and (Figure 2: Panel C-D) respectively. Overall, this implied that the models are stable in the long-run.



Source: Author(s) Plot Using Eviews 10
Figure 2: Model One, Plots of Cumulative Sum of Recursive Residuals and Sum of Squares Recursive Residual



Source: Author(s) Plot Using Eviews 10
Figure 3: Model Two, Plots of Cumulative Sum of Recursive Residuals and Sum of Squares Recursive Residuals

5.0 Conclusions and Policy Implications

The paper used Auto Regressive Distributive Lag (ARDL) bound testing approach to cointergration and Toda-Yomamota Granger non-causality techniques to test crowding out hypothesis among three federal government expenditure components in Nigeria: debt servicing, capital and non-debt servicing recurrent expenditures. Evidences suggested that debt servicing expenditure component crowd-out both capital and non-debt servicing recurrent expenditure with larger adverse significant effect on capital expenditure component. Furthermore, the level of income affects both capital and non-debt servicing recurrent expenditure positively; retained revenue affects only capital

expenditure; improvement in governances' indicators increases capital expenditure and reduces non-debt servicing recurrent expenditure. These evidences corroborated the following previous findings: (Stephens,2001;Fosu, 2008; Bacchiocchi, Borghi & Missale ,2011; Shabbir &Yasin,2015; and Loko, Mlachila, Nallari & Kalonji, 2003).

On the basis of the sample evidence, the paper concludes that, federal debt servicing expenditure component crowded-out both capital and non-debt servicing recurrent expenditure in Nigeria. The policy implications of the findings is that, current federal government fiscal stance (sustained increase in public debt stock and resultant debt servicing) can have short term and long-term adverse effect on capital and non-debt servicing recurrent expenditure. Thus, an optimal combination of increased revenue generation, debt and non-debt deficit-financing are required. A key limitation of the study is that debt servicing in principle consist of interest plus principal re-payment. However, available data on interest payment was used as proxy for debt servicing. Future study could construct comprehensive debt servicing data that consist of interest and principal re-payment. Furthermore, crowding-out hypothesis can be tested among other federal government expenditure components such as social spending, personnel, infrastructures and security.

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APPENDIX

Table 6: Unit Root Tests Results Summary

Variables	ADF		PP		Stationary Status
	At Level	First Difference	At Level	First Difference	
OD	-2.507 (0.323)	-5.908***** (0.000)	-4.597***** (0.003)	-16.481***** (0.000)	I(1)
GOV	-3.696* (0.031)	-10.485***** (0.000)	-3.696* (0.031)	-12.475***** (0.000)	I(0)
LogYPC	-2.065 (0.554)	-4.649***** (0.003)	-1.604 (0.779)	-4.608***** (0.003)	I(1)
LogOILP	-3.354 (0.068)	-7.532* (0.000)	-3.531 (0.046)	-7.532***** (0.000)	I(1)
LogAID	-1.890 (0.647)	-6.480***** (0.000)	-2.018 (0.579)	-6.425***** (0.000)	I(1)
LogDSR	-4.060* (0.013)	-10.447***** (0.000)	-4.195* (0.001)	-10.768***** (0.000)	I(0)
LogFRR	-3.265***** (0.083)	-9.680***** (0.000)	-3.417***** (0.059)	-9.774***** (0.000)	I(1)
LogFRE	-2.461 (0.346)	-8.709* (0.000)	-2.487 (0.333)	-8.705***** (0.000)	I(1)
LogFCE	-2.312 (0.421)	-8.783***** (0.000)	-2.375 (0.388)	-8.688***** (0.000)	I(1)

Notes: Intercept and time trend are included in the estimated equation
*** denotes rejecting the null hypothesis that the variable has a unit root at 5% significant level.**
Sources: Author(s) summary from Eviews-10 output