Estimation of Effects and the Threshold of Fiscal Deficit Financing for the Nigerian Economy: An Econometric Re-evaluation of Recent Trends

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Abstract: The study uses an instrumental variable estimator to econometrically re-estimate effects of fiscal deficit financing on output growth rate plus the threshold value of such deficit financing that is consistent with growth rate of national output in Nigeria based on a system specification and theThreshold Autoregressive (TAR) specification. Estimations were done with quarterly data from 2010:Q1 to 2017: Q2. Results of likelihood ratio test validated existence of threshold effect and this implies that link between fiscal deficit financing and long-run output growth is non-linear in Nigeria while empirics of threshold autoregressive results evidently upholds that changes in fiscal deficit negatively impact output growth exclusively if such deficit financing exceeds 3% of GDP. By implication, fiscal deficit financing that exceeds 3% of GDP injures output growth in Nigeria. In effect, 3% is the threshold at which the sign of existing link between fiscal deficit financing and output growth switches. At threshold of 4% and above, the link becomes negative. Henceforward, the Nigerian monetary authority (CBN) can be so advised to target not more than 3% fiscal deficit financing for determination of output growth while simultaneously reduce lending rate to boost domestic investment that links local production required to boost exportation and so generate the requisite foreign exchange desirable to steer economic growth.

Keywords: Fiscal Deficit Financing, Output Growth, Threshold Value, Nigeria
JEL Classification: E28, O46, A32

1. Research Background

Fiscal deficit refers to lag between fiscal receipts and fiscal expenditure at an exacting time. Discreet management of government finance requires government savings to finance developmental activities. However, recently in Nigeria, enormous fiscal deficit emanates such that deficit-GDP ratio rose from 1.3% in 2010 to 5.8% in 2015 (CBN, 2016). This became a pointer to government dissaving in Nigeria which culminated in unbearable excess demand with decline in monetary liquidity and hyper-inflation rate as consequences.

Such inflation level is contrary to growth. No wonder the country went into recession at end of 2016:Q2 when the economy experienced two sequential quarters of negative GDP triggered by the decline in oil

price from mid-2014. In fact, the economy contracted by 0.52% in 2017: Q1 from -1.73% in 2016: Q4. This led to an increase in national unemployment rate from 13.9% in 2016 third quarter to 14.2% in 2016 fourth quarter (NBS, 2017).

Government's borrowing serves as foremost avenue of financing fiscal deficit. For instance, capital expenditure allocation of N2.42 trillion in 2018 budget representing 30.8% would mostly be debt financed. This explains why in erstwhile years, fiscal deficits typically financed with domestic borrowing at the expense of tighter monetary policy crowds-out the private sector. This substantiates Omitogun and Ayinla (2007) who contrasted fiscal deficit to a fire which if unregulated produces havoc, while regulated it gives light and warmth.

A government could embark on deficit funding if economic recession or inadequate revenue exists. The relevant questions that arise are what level of fiscal deficit should Nigerian government incur to drive growth of output or should the Nigerian monetary authority target 20% of fiscal deficit financing? So, the study econometrically reestablished the threshold of deficit financing that is vital for output growth in Nigeria in contemporary time and also re-estimated the effects of fiscal deficit financing on output growth in Nigeria. Section 2 provides a synopsis of recent trends in Nigeria's fiscal structure, section 3 reviews previous studies that are related, section 4 specifies the model and confers the estimation methods, section 5 analyzes results and section 6 concludes the study.

2. Overview of Recent Trends in Nigeria's Fiscal/Budget Structure

In 2016, the Nigerian budget was predicated on oil price of U$38 per barrel, oil production of 2.2 mbpd, and an exchange rate of N197 to US$1.00. Based on these and other macroeconomic indicators including inflation of 9.81% and 4.37% real GDP growth rate, an aggregate revenue of N3.86 trillion was projected to fund budget of N6.06 trillion.

Lamentably, some economic indicators like revenues, GDP growth rate, exchange rate and inflation all fell below projections as shown in the Table 1. A deficit of N2.20 trillion was incurred and gross oil and gas revenue was N2, 695.43 billion which is 23.75% less than projected. The shortfall was essentially due to oil production cuts occasioned by annihilation of strategic oil facilities. This threw the economy into recession in 2016.

Table 1: Fiscal and Macroeconomic Indicators (2016)

Variables	Budget	Actual
Fiscal Deficit/GDP (%)	-2.14	-2.34
Inflation Rate (%)	9.81	18.55
Oil Price (US$)pb	38.0	42.09
Oil Production (mbpd)	2.20	1.82
Exchange Rate (N/US$)	197	305
Real GDP Growth (%)	4.37	-1.58
Debt Service/Revenue (%)	38.0	47.0
Gross oil & Gas Revenues	3,534.83	2,695.43

Source: Budget Office of the Federation (BOF), 2017

In 2017, Nigerian government designed a "Recovery and Growth" national budget to reinstate Nigerian economy to a path of viable and all-encompassing growth centred on the fiscal and macroeconomic indicators of Table 2. An appraisal of 2017 budget performance indicates rational progress on its execution and achievement of some fixed targets. In June 2017 consumer prices increased by only 1.58%.

Table 2: Fiscal and Macroeconomic Indicators (2017)

Variables	Budget	Actual
Fiscal Deficit/GDP (%)	2.18	2.36
Inflation Rate (%)	15.7	16.1
Benchmark Oil Price (US$)pb	44.5	49.8
Oil Production (mbpd)	2.20	1.90
Exchange Rate (N/US$)	305.0	305.7
Real GDP Growth (%)	1.50	0.55
Debt Service/Revenue (%)	38.0	47.0

Source: BOF, National Bureau of Statistics & Central Bank of Nigeria (2017)

Nevertheless, oil revenue realized was N960.87 billion against the budgeted N1, 061.09 billion, inferring a shortfall of 9%. Total non-oil revenues fell short of target by 49%. The 2017 budget of Nigeria with a policy thrust of enlivening the economy from recession and boosting economic growth was geared toward fiscal stimulus that stood at N7.29 trillion and it exceeded 2016 budget by about 20.4% with a fiscal deficit of US$7.5 billion (BOF, 2017).

While recurrent spending accounts for 35.3% (N2.6trillion) of aggregate expenditure, the budget appropriated N7.298 trillion to aggregate expenditure. Nonetheless, capital expenditure of 2017 budget had suffered as just N450 billion was disbursed out of N2.174 trillion. The 2017 fiscal structure planned a three-monthly fiscal deficit of N589.19 billion to be funded via privatization incomes of N2.5 billion, external borrowing of N266.88 billion, internal borrowing (FGN Bond) of N313.57 billion and trading of public assets of N6.25 billion (CBN, 2017; NBS, 2017). These were not realized.

In 2016 budget, Independent Revenue (IR) and Non-oil revenue were estimated at 39.1% and 38.2% of total revenue respectively, while oil revenue represented an infinitesimal value of 18.6%. This was meant to reduce over reliance on oil proceeds. Unfortunately, in the 2017 budget, Oil revenue was estimated at 40.0% of total revenue while Non-oil and Independent revenues represent 27.8% and 16.3% respectively (CBN, 2017).

According to BOF (2017), at end of 2017: Q2, no proceeds from the restructuring of government's equity in joint ventures and other sundry incomes had been remitted. As of September 2017, only N155.14billion IR had been remitted out of N605.87 billion. This represents a 74% shortfall. In spite of this, the FG had N847.90 billion as IR budget for 2018.

Budget of 2018 put aggregate expenditure at N8.612 trillion, signifying 16% rise over 2017 expenditure figure with retained revenue at N6.607 trillion, being 30% above the 2017 figure, but fiscal deficit is estimated to increase by about 25.0% from N2.36 trillion in 2017 (BOF, 2017). The aggregate revenue to fund 2018 budget is estimated at N5.65 trillion. This is 11.0% over the N5.08 trillion of 2017. Of the

aggregate expenditure, N2.60 trillion has been targeted at capital expenditure, signifying 30.0% of the budget. Taking ratio of 2018 planned expenditure to Nigerian population yields N47, 844 expenditure per head of a Nigerian. This is tremendously unsatisfactory. Besides, in the 2018 budget, deficit financing is N2.005 trillion and it is to be financed predominantly by borrowing N1.699 trillion from external and internal sources while the N306 billion deficit balance would be financed from privatization incomes (BOF, 2017).

In line with the MTEF, GDP growth is projected at 7% by 2020 as shown in Table 3, and the fiscal strategies to achieve this include expanding revenue receipts by blocking revenue leakages, refining adeptness and prudence of capital spending with countless prominence on infrastructure and streamlining recurrent expenditure.

Apparently, projected borrowing would exacerbate already high debt profile, as the 2018 deficit is 23.27% of aggregate expenditure and 30.35% of retained revenue with average oil price of US$45pb. In a nutshell, the major challenge of fiscal/budgeting structure in Nigeria is gargantuan expectations placed on revenue from oil. The projected oil production of 2.3mbpd in 2018 is unlikely, considering that out of 2.2mbpd appraised for 2017, actual production of 1.9mbpd was realized. So what variable would drive the production volume of 2.3mbpd?

The paltry performance of fiscal structure in Nigeria can be attributed to over reliance on autonomous debts to fund strategic infrastructure and excessive deficit financing of budgetary provisions. This is in line with AfDB (2015) that pitiable budget performance is result of lack of activated local resource mobilization in the economy and the repudiation to erect the fiscal design needed to harness human capital resources for development.

Table 3: Medium Term Fiscal Framework (2018-2020)

Fiscal Variable (s)	Projected Values		
	2018	2019	2020
Budget Oil Production Volume Net Incremental Oil Production for Repayment Arrears (mbpd)	2.3	2.4	2.5
Projected Budget Oil Price (US$ per barrel)	45.0	50.0	52.0
Average Exchange Rate (N/US$)	305.7	305.7	305.7
Special Intervention Programme (Recurrent)	350,000,000,000	350,000,000,000	350,000,000,000
Capital Expenditure (Exclusive of Transfers)	2,377,079,337,699	2,388,509,113,656	2,451,981,702,683
Fiscal Deficit	(2,948,777,905,500)	(2,652,027,265,295)	(2,247,849,437,933)
Real GDP Growth (%)	4.6%	5%	7%
GDP	113,088,878,152,768	124,438,730,249,469	134,715,369,764,605
Deficit / GDP	(2.61%)	(2.13%)	(1.67%)

Capital Expenditure as % of Non-Debt Expenditure	40.92%	41.28%	43.22%
Capital Expenditure (transfers inclusive) as % of total FGN Expenditure	30.22%	29.36%	30.00%
Recurrent Expenditure as % of total FGN Expenditure	69.78%	70.64%	70.00%
Debt Service to Revenue Ratio	35.91%	37.49%	37.41%
Deficit as % of total FGN Revenue	52.22%	41.92%	32.89%

Source: BOF, 2017

3. Review of Previous Related Studies

The 1998 collected literatures of John Maynard Keynes as regards theory of Employment, Interest and Money, showed why government should participate in economic activities to guarantee full employment since say's law failed to rescue the world from the depression of the 1930. To Keynes, fiscal deficit is primarily designed to have positive economic effect.

The study by Gemmel (2001) obtained harmful effect of fiscal deficit on output growth while Gale and Orszags (2002) favoured a deficit-financed tax cut policy of the government as a stimulant of growth. Vit (2004) views fiscal deficit as the net escalation in money supply, where such an increase result from a conscious governmental policy premeditated to encourage economic activities which would otherwise not have taken place.

Different studies reported positive link between economic growth and fiscal deficit financing (Adam & Bevan, 2004; Brauninger, 2002; De Castro, 2004; Perotti, 2004) while others reported mixed effects (Sulaiman & Azeez, 2012; Osuka & Achinihu, 2014; Onuorah & Ogbonna, 2014; Iram, Shadid, Mahpara & Fazli, 2011; Akinmulegun, 2014; Monogbe, Dornubari & Emah, 2015). Study by M'Amanja and Morrissey (2006) documented negative relationship between the two variables. Adam and Bevan (2004) found positive effect of 1.5 percent threshold of deficit on growth.

However, to Shojai (1999), deficit spending financed developing countries leads to wastefulness in financial markets with extraordinary inflation being the result. This seems to place credence on Friedman (1956) that money should be increased once government has a deficit and such increase must equal deficit amount. Study by Lozano (2008) shows that fiscal deficit crowd out domestic investment and increase trade deficit. Their findings cohere with Ahmad and Millar (2000) findings who establishes that deficits are negatively correlated to growth of real output and increased deficit retards investment.

Gulcan and Bilman (2005) working on Turkish data established a robust influence of budget deficit on the real exchange rate. Korsu (2009) reported that deficits based on simulation results were unfavourable to macroeconomic performance. Huynh (2007) study on emerging Asian Countries reveals negative impact of deficit financing on GDP growth of the countries in the study. In their study for Nigeria and South Africa, Ayadi and Ayadi (2008) shows evidence that debt financing and servicing negatively

impacted on output griowth of Nigeria and South Africa. Sulaiman and Azeez (2012) reported that budget deficit has positively impacted Nigerian economy.

To Glannaros and Kolluri (2010), an indirect effect of deficit on interest rate significantly exits. Ekperiware and Oladeji (2012) empirically found that the 2005 budget deficit break triggered a structural break effect in linking fiscal deficit and output growth in Nigeria. Faraji and Makame (2013) reported also that budget deficit positively influenced Tanzanian economy with about 0.4 units growth while debt service payment impacted negatively. Ejigayehu (2013) reported that budget deficit negatively affects growth through crowding out effect.

4. Model Specification and Methodology

In the study, we had two model specifications, system specification and the specification of Threshold Autoregressive (TAR) equation. We specify the following system of GMM equations in matrix representation as follows:

$$\begin{bmatrix} y_t \\ . \\ y_T \end{bmatrix} = \begin{bmatrix} Z_t & & \\ & & \\ & & Z_T \end{bmatrix} \begin{bmatrix} \Phi_1 \\ . \\ \Phi_M \end{bmatrix} + \begin{bmatrix} \ell_1 \\ . \\ \ell_T \end{bmatrix} \tag{1}$$

In our GMM model, we assume a balanced system that is same number of observations, in each equation, no cross equation error correlation, no cross equation parameter restrictions on $\Phi_m\,(m=1,2,3,...,M)$ and variables could be common across equations.

Given that:

$$\Phi=(\Phi_1^{'},\Phi_2^{'},\Phi_3^{'},...,\Phi_M^{'})^{'},\ H=\sum_{m=1}^{M}H_m \tag{2}$$

The coefficient vector is identified if $\overline{\Phi}=\Phi$ if is the only unique solution to the system of multiple GMM equations. Thus, our moment conditions for purpose of model identification become:

$$\begin{aligned} &E[g(t)\Phi]=0 \ \ \forall \ \ \overline{\Phi}=\Phi \\ &E[g(t)\Phi]\neq 0 \ \ \forall \ \ \overline{\Phi}\neq\Phi \end{aligned} \tag{3}$$

Such that:

$$g(t)\Phi=\begin{bmatrix} g(t)\Phi_1 \\ . \\ g(T)\Phi_T \end{bmatrix}=\begin{bmatrix} X(t)\ell_t \\ . \\ X(T)\ell_T \end{bmatrix}=\begin{bmatrix} X(t)[y(t)-Z_1^{'}(t)\Phi_1] \\ . \\ X(T)[y(T)-Z_1^{'}(T)\Phi_T] \end{bmatrix} \tag{4}$$

$$\Rightarrow E[g(t)\Phi]=\begin{bmatrix} E[X(t)y(t)] \\ . \\ E[X(T)y(T)] \end{bmatrix}-\begin{bmatrix} X(t)Z'(t) & \ldots & 0 \\ & & \\ 0 & \ldots & X(T)Z'(T) \end{bmatrix}\begin{bmatrix} \Phi(t) \\ . \\ \Phi(T) \end{bmatrix} \tag{5}$$

The absolute specification of our multiple GMM equations models is thus derived as:

$$\begin{bmatrix} E[X(t)y(t)] \\ . \\ E[X(T)y(T)] \end{bmatrix} = \begin{bmatrix} X(t)Z'(t) & \dots & 0 \\ & & \\ 0 & \dots & X(T)Z'(T) \end{bmatrix} \begin{bmatrix} \Phi(t) \\ . \\ \Phi(T) \end{bmatrix} + \begin{bmatrix} \ell_1 \\ . \\ \ell_T \end{bmatrix}$$

$$RGD(t) = \Im_1 + \eta_1 DCFT(t) + \zeta_1 GDV(t) + \Theta_1 EXP(t) + \ell_{1t},\ H_1 = 4 \quad (6)$$

$$\Rightarrow Z_1'(t)\Phi_1 + \ell_{1t} \quad (7)$$

$$DCFT(t) = \Im_2 + \eta_2 MGD(t) + \zeta_2 EXT(t) + \Theta_2 CPI(t) + \ell_{2t},\ H_2 = 4 \quad (8)$$

$$\Rightarrow Z_2'(t)\Phi_2 + \ell_{1t} \quad (9)$$

$$GDV(t) = \Im_3 + \eta_3 RGD(t) + \zeta_3 GEX(t) + \Theta_3 LNT(t) + \ell_{3t},\ H_3 = 4 \quad (10)$$

$$\Rightarrow Z_3'(t)\Phi_3 + \ell_{3t} \quad (11)$$

$$EXP(t) = \Im_4 + \eta_4 EXT(t) + \zeta_4 WYN(t) + \Theta_4 OPE(t) + \ell_{4t},\ H_4 = 4 \quad (12)$$

$$\Rightarrow Z_4'(t)\Phi_4 + \ell_{4t} \quad (13)$$

For respective equation, variables in $Z(T)$, that is, instruments are predetermined and the vector is given by:

$$Z_1(t) = [1, EXP(t-1), DCFT(t-1), GDV(t-1)]',\ \phi_1 = [\Im_1, \eta_1, \zeta_1, \Theta_1]' \quad (14)$$

$$Z_2(t) = [1, MGD(t-1),\ EXT(t-1),\ CPI(t-1)]',\ \phi_2 = [\Im_2, \eta_2, \zeta_2, \Theta_2]' \quad (15)$$

$$Z_3(t) = [1, RGD(t-1), GEX(t-1),\ LNT(t-1)]',\ \phi_3 = [\Im_3, \eta_3, \zeta_3, \Theta_3]' \quad (16)$$

$$Z_4(t) = [1, EXT(t-1), WYN(t-1),\ OPE(t-1)]',\ \phi_4 = [\Im_4, \eta_4, \zeta_4, \Theta_4]' \quad (17)$$

Where *X(t)* is a vector or regressors, *y(t)* is the vector of regressand and *z(t)* is the vector of instruments and *RGD* is real output growth rate, *DCFT* is fiscal deficit financing, *GDV* is gross domestic investment and *EXP* is exports, *MGD* is financial depth, *EXT* is exchange rate depreciation, *CPI* is consumer price index, *GEX* is government expenditures, *LNT* is domestic lending rate, *WYN* is world income and *OPE* is openness. Following Li (2005), specification of our TAR equation becomes:

$$Ln[RGD(t)] = h_0 + h_1 DCFT(t) < M^* + h_2 DCFT(t) > M^* + h_3 Ln[RGD(t-1)] + h_4 Ln[GDV(t-1)] + h_5 Ln[EXP(t-1) + Error(t) \quad (18)$$

Where *M** is threshold level of fiscal deficit financing, h_1 is effect of fiscal deficit below threshold level, h_2 is effect of fiscal deficit above threshold level and *t* indicates time series period. We utilized least square technique to estimate threshold autoregressive equation by adjusting the parameters of the *TAR*

function to best fit our data and so obtain *error sum of squares (ESS)* as depending threshold value *(M*)* such that the coefficient estimates became generated under the guide of *M** that minimizes ESS (Khan et al., 2001).

To test for existence of threshold effects, in link concerning fiscal deficit and output growth rate, we utilized likelihood ratio (LR) test given in equation (19).

$$LR = \frac{ESS(0) - ESS(1)}{\sqrt{\sigma^2}} \tag{19}$$

Where *ESS(0)* is the error sum of squares under the null (H_0) without threshold effects, *ESS(1)* is the error sum of squares under the alternative (H_1) with threshold effects, $\sqrt{\sigma}2$ is the standard error of regression with threshold estimate (s.e.e). The methodology entails an estimation of TAR equation to generate the *error sum of squares (ESS) for threshold levels of deficit ranging from M to M-bar (1, 2, 3, 4, 5, …,17) such that the optimal threshold value becomes the threshold that minimizes the array of ESSs.* The underlying hypothesis is thus specified:

$$\begin{aligned} H_0 &: h_2 = 0 \\ H_1 &: h_2 \neq 0 \end{aligned} \tag{20}$$

The GMM estimator was used to estimate the system GMM model. Given the data consists of *T* observations (A_n) *with* $n = 1,\ldots, T$, where respective observation A_n is an n-dimensional multivariate random variable, we measure up to an unknown parameter $\partial \in \Theta$. Estimation was geared at finding "true" value of this parameter, or a close estimate.

A wide-ranging conjecture of GMM is that the data A_n be spawned by a weakly stationary ergodic stochastic process for the case of independent and identically distributed (iid) variables *Y(t)* is a distinct item of this condition. Thus, to apply GMM, we needed "moment conditions", i.e. a vector-valued function *f(X, ∂)* as given in equation (21):

$$G(\partial_0) = E\left[f(X_n, \partial_0) \right] = 0 \tag{21}$$

where *E* symbolizes expectation, and A_n is a standard observation. Besides, the function $g(\partial_0)$ vary from zero for $\partial \neq \partial_0$, if not the parameter ∂ will not be point-identified with sample average given as:

$$G(\partial_0) = \frac{1}{T} \sum_{t=i}^{T} f(X_t, \partial_0) \tag{22}$$

and then to minimize norm of this expression *w. r. t* to ∂. The minimalizing value of ∂ is our estimate for ∂_0. Mathematically, it minimizes a certain norm denoted ||g||, which measures the distance between m and zero. The GMM estimator takes on optimum weighting matrix which is asymptotically efficient.

We treated our data for stationarity using the ADF test and Johansen's (1998) co-integration technique was utilized to test for co-integration given the fact that the study adopted a multivariable model. Quarterly data (QD) of January, February and March (Q1); April, May and June (Q2); July, August and September (Q3); and October, November and December (Q4) were utilized in the study.

QD on deficit financing and domestic investment were obtained from periodicals of Nigerian Ministry of Finance. QD on oil exports, lending rates, exchange rate depreciation and broad money as a ratio of GDP were computed from the CBN statistical publications, consumer price indices and openness quarterly

data were computed from the periodicals of NBS of Nigeria. Quarterly data on world income proxied by US's real GDP were computed from the data base of WEO.

5. Results

5.1 Data Treatment

Table 4 reports results of Ljung-Box Q-Statistics for autocorrelation test of deficit-output equation. Evidently, only Ljung-Box $Q^{0.5}$ statistics for lag 6 had significant autocorrelation effect at 5% endorsing incidence of heteroskedasticity in deficit financing data. The Ljung-Box $Q^{0.5}$ and $Q^{0.75}$ statistics are all insignificant at 5% making it safer to reject absence of homoscedasticity in the residual series of deficit financing.

Table 4: Ljung-Box Q Statistics for Autocorrelation Test

Ljung-Box $Q^{0.25}$	*Q (1)*	*Q (6)*	*Q (12)*	*Q (20)*
	0.027 (0.995)	*0.0571 (0.875)*	*0.053 (0.935)*	*0.006 (0.524)*
Ljung-Box $Q^{0.5}$	*Q (1)*	*Q (6)*	*Q (12)*	*Q (20)*
	0.327 (0.756)	*0.154 (0.002)**	*0.013 (0.698)*	*0.012 (0.935)*
Ljung-Box $Q^{0.75}$	*Q (1)*	*Q (6)*	*Q (12)*	*Q (20)*
	0.539 (0.435)	*0.296 (0.000)*	*0.430 (0.927)*	*0.235 (0.911)*
p- values are in parentheses. ** indicates significance at the 5% level*				

Source: Authors' results

The study utilized ADF and Philips-Peron tests (PP) to investigate the order of integration of the variables. Table 5 reports the results. Both ADF and PP test results shows that all the eleven variables in our study are I(1).

Table 5: Stationarity Test Results

Variables	*ADF Test Results*			*Inference*
	Drift &Trend	*Critical Value @ 5%*	*Integration order*	
lnrgd	*-5.142*	*-3.452*	*I(1)*	*Stationary*
lnexp	*-6.927*	*-3.452*	*I(1)*	*Stationary*
lndcft	*-7.528*	*-3.452*	*I(1)*	*Stationary*
lnpnv	*-9.156*	*-3.452*	*I(1)*	*Stationary*
lnmgd	*-6.343*	*-3.452*	*I(1)*	*Stationary*
lnext	*-4.527*	*-3.452*	*I(1)*	*Stationary*
lncpi	*-4.190*	*-3.452*	*I(1)*	*Stationary*
lngex	*-6.258*	*-3.452*	*I(1)*	*Stationary*
lnlnr	*-3.545*	*-3.452*	*I(1)*	*Stationary*
lnope	*-9.933*	*-3.452*	*I(1)*	*Stationary*

lnwyn	*-8.124*	*-3.452*	*I(1)*	*Stationary*
Variables	*Philips-Peron Test Results*			*Inference*
	Drift &Trend	*Critical Value @ 5%*	*Integration order*	
lnrgd	*-10.497*	*-5.326*	*I(1)*	*Stationary*
lnexp	*-12.692*	*-5.326*	*I(1)*	*Stationary*
lndcft	*-9.830*	*-5.326*	*I(1)*	*Stationary*
lnpnv	*-16.357*	*-5.326*	*I(1)*	*Stationary*
lnmgd	*-11.123*	*-5.326*	*I(1)*	*Stationary*
lnext	*-14.002*	*-5.326*	*I(1)*	*Stationary*
lncpi	*-9.230*	*-5.326*	*I(1)*	*Stationary*
lngex	*-17.470*	*-5.326*	*I(1)*	*Stationary*
lnlnr	*-13.115*	*-5.326*	*I(1)*	*Stationary*
lnope	*-18.234*	*-5.326*	*I(1)*	*Stationary*
lnwyn	*-15.451*	*-5.326*	*I(1)*	*Stationary*

Source: Authors' results

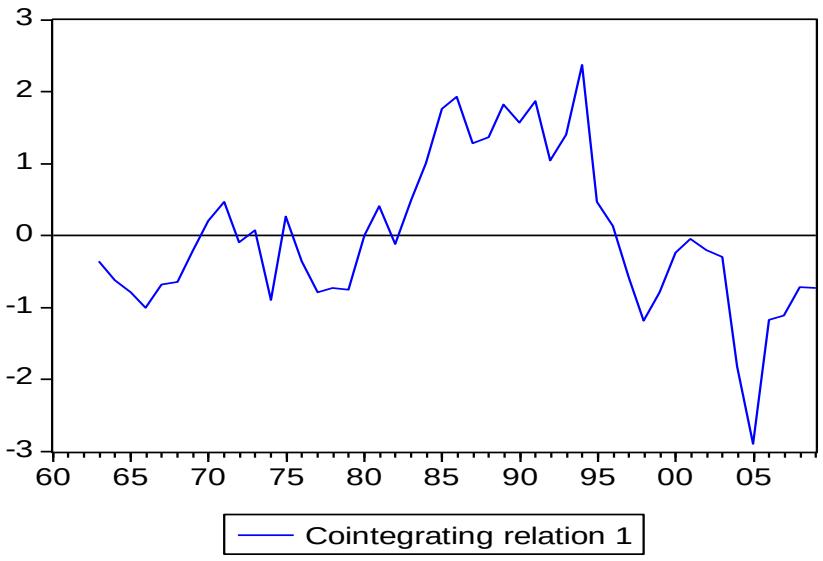

Figure 1: Co-integration Graph
Source: Authors' Results

The figure below shows that a plot of co-integration vectors is stationary. Remarkably, with the Johansen statistics, inexistence of co-integration amongst the variables in each equation is rejected and one co-integrating relation exists at 5% (1%) levels respectively. Basically, our co-integration results indicate a significant evidence of long-run link between fiscal deficit financing, exports and gross domestic investment.

Table 6: Co-integration Test Results

Eigen value	*Trace Statistic*	*Critical value*	*Hypothesized No of CE(s)*
0.9672	*96.23*	*87.26*	*None**
0.6523	*77.46*	*59.54*	*At most 1**
Eigen value	*Max Statistic*	*Critical value*	*Hypothesized No of CE(s)*
0.752	*142.39*	*134.94*	*None**
0.734	*136.54*	*116.52*	*At most 1**
**denotes the rejection of the hypothesis @ 5% level, **MacKinnon-Haug-Michelis p-values*			

Source: Authors' results

The VIF were estimated to ascertain the degree absence of multicollinearity. The VIF results are in Table 7 below. Basically, a variable with a VIF above 10 induces multicollinearity in estimation. As observed, no variable has a VIF that is revealing of multicollinearity.

Table 7: Variance Inflation Factor [VIF] Test Results

Variable	*Coefficient [Variance]*	*Centered [VIF]*
C	*27.23*	*NA*
lnrgd	*3.95*	*1.00*
lnexp	*-2.64*	*1.00*
lndcft	*1.38*	*1.00*
lnpnv	*2.48*	*1.00*
lnmgd	*5.11*	*1.00*
lnext	*7.12*	*1.00*
lncpi	*11.01*	*1.00*
lngex	*4.36*	*1.00*
lnlnr	*9.00*	*1.00*
lnope	*2.15*	*1.00*
lnwyn	*3.07*	*1.00*

Source: Authors' results

No multicollinearity amongst the variables as shown by the low VIF coefficient. For example, VIF for fiscal deficit is 1.38 while that of investment is 2.48. These are extremely low VIF coefficients. Only VIF of *cpi* exceeded 10 signifying excessive variance in inflation level in Nigeria. In effect, adjustment impact of variables on growth rate is isolatable. Stability of the empirical estimates, that is, parameter constancy is validated by figures below:

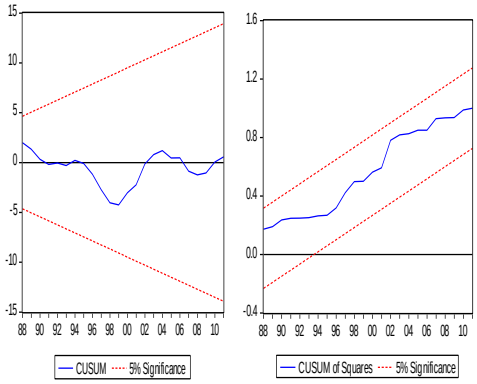

Figure 2: Stability graphs
Source: Authors' results

5.2 Econometrics Results

GMM results of output growth rate equation are in Table 8, adjusted R^2 value is 0.771. This shows that over 71% of the systematic variations in output growth were explained by fiscal deficit financing, gross domestic investment and oil export even after taking the loss in degree of freedom into cognizance. The F-test reads 534.926. However, F (4 19) at 5% level is 2.90. This therefore denotes that estimated F exceeds tabulate F. In effect, all the slope co-efficients are jointly different from zero.

Table 8: Econometric Estimates of Growth Equation

Regressand	*Regressors*	*Coefficient*	*t-ratio*
lnrgd	*D(C)*	*7.840* *(0.000)*	*4.781*
	Dln(exp)	*0.015* *(0.000)*	*11.736*
	Dln(dcft)	*-0.006* *(0.000)*	*-5.018*
	Dln(gdv)	*0.074* *(0.000)*	*16.939*
	J-statistic = 0.000 *Instruments: exp(t-1), dcft(t-1), gdv(t-1), C* *Adjusted R^2 = 0.771,* *F-stat = 534.926,* *p-value in parenthesis below estimate*		

Source: Authors' results

For the t test, it is clear that computed t exceeds table t for deficit financing, total exports and private investment given 5% level. In effect, deficit financing, export and private investment variable are statistically significant, hence exact substantial influence on GDP. Subsequently, ten percent increase in exports positively affected output growth by 0.15%, ten percent increase in deficit financing negatively affected output growth by 0.06% while domestic private investment positively influenced real output growth in Nigeria by 0.74%.

Worth mentioning is the negative and significant effect of fiscal deficit on output growth rate in Nigeria. Hence, changes in fiscal deficit causes resilient loss in growth of output. The co-efficient therefore suggests that a ten percent increase in fiscal deficit financing generates about 0.06 percent degeneration in growth rate.

GMM results of deficit equation are in Table 9 with adjusted R^2 of 0.56 and this shows that over 50% of the systematic variations in deficit financing in Nigeria were explained by financial depth, exchange rate and consumer price level, a measure of inflation.

Table 9: Econometric Estimates of Deficit Equation

Regressand	*Regressors*	*Coefficient*	*t-ratio*
lndcft	*D(C)*	*1.023 (0.000)*	*2.531*
	Dln(mgd)	*-0.092 (0.000)*	*-5.923*
	Dln(ext)	*-0.115 (0.000)*	*-5.978*
	Dln(cpi)	*0.003 (0.000)*	*9.123*
	J-statistic = 0.001 *Instruments: mgd(t-1), ext(t-1), cpi(t-1), C* *Adjusted R^2 = 0.56,* *F-stat = 113.027,* *p-value in parenthesis below estimate*		

Source: Authors' results

The results exemplify significance of the three variables in determining deficit financing in Nigeria. Ten percent rise in financial depth causes 0.92% decline in deficit financing, ten percent depreciation in exchange rate negatively induces deficit financing by 1.15% while similar percentage rise in consumer price level escalates fiscal deficit financing in Nigeria by 0.03% .

Table 10 reports the GMM results of domestic investment function with adjusted R^2 of 71 percent, indicating a good fit of the data to the investment equation. In effect, over 70% of the systematic variations in domestic investment in Nigeria are as determined by changes in output growth, government spending and the domestic lending rate.

Table 10: Econometric Estimates of Domestic Investment Equation

Regressand	*Regressors*	*Coefficient*	*t-ratio*
lngdv	*D(C)*	*10.287 (0.000)*	*2.935*
	Dln(rgd)	*0.130 (0.000)*	*16.245*
	Dln(gex)	*0.354 (0.000)*	*2.627*
	Dln(lnr)	*-0.029 (0.000)*	*-13.082*

	J-statistic = 0.000 *Instruments: rgd(t-1), gex(t-1), lnr(t-1), C* *Adjusted R^2 = 0.71,* *F-stat = 246.935,* *p-value in parenthesis below estimate*

Source: Authors' results

Table 10 shows significance of all the explanatory variables, output growth as measured by GDP growth rate, government expenditure and domestic lending rate. Nevertheless, while output growth and government expenditure contributed positively and significantly in the determination of domestic investment, the lending rate just as expected had negative effect on investment in Nigeria.

Consequently, ten percent increase in output positively stimulates domestic investment in Nigeria by 1.3%, confirming accelerator principle of investment. Similarly, ten percent increase in government spending positively stimulates domestic investment in Nigeria by 3.54% while lending rate impacted negatively on investment by 0.29%.

Table 11 reports the GMM results of export function with adjusted R^2 of 94.1 percent, indicating a robust fit of the data to the empirical export function. In effect, over 94% of the systematic variations in export in Nigeria are as determined by depreciation in exchange rate, world income and openness.

Table 11: Econometric Estimates of Export Function

Regressand	*Regressors*	*Coefficient*	*t-ratio*
lnexp	*D(C)*	*19.115* *(0.000)*	*20.447*
	Dln(ext)	*0.007* *(0.000)*	*19.365*
	Dln(wyn)	*0.139* *(0.000)*	*12.876*
	Dln(ope)	*0.014* *(0.000)*	*3.155*
	J-statistic = 0.000 *Instruments: ext(t-1), wyn(t-1), ope(t-1), C* *Adjusted R^2 = 0.941,* *F-stat = 56.287,* *p-value in parenthesis below estimate*		

Source: Authors' results

Table 11 shows the significance of the depreciation in exchange rate with t-ratio of 19.365, world income with t-ratio of 12.876 and openness with t-ratio of 3.155. All variables had positive impact on Nigeria's export in Nigeria. For example, ten percent depreciation in exchange rate causes 0.07% export growth, ten percent rise in world income positively induces export by 1.39% while similar percentage rise in country's openness led to export growth by 0.14%. In all the results reported in Tables 8, 9, 10 and 11, the low J-statistic (s) of 0.000, 0.001, 0.000 and 0.000 indicates that our model is correctly identified and hence there is simultaneous satisfaction of all moment restrictions. In effect, the

instruments are valid and consistent implying an accurate description of the Nigerian by our GMM model.

Table 12: Threshold Effects Test Results

Thresholds	LR	1% Critical value	Significance level
1, 2,3,4,…,20	9.78	7.47	0.001

Source: Authors' results

Table 12 reports test results for existence of threshold effects where LR gives the calculated value of likelihood ratio test. We adopted the 1% critical value from Khan and Senhadji (2000). A critical analysis Table 12 shows that the LR statistic is significant and so null hypothesis no threshold effects is rejected at 1% level. Existence of a threshold effect is a pointer to the fact that link between fiscal deficit financing and long-run output growth is non-linear in Nigeria.

Table 13: Threshold Results for Fiscal Deficit Financing in Nigeria

Threshold (M)*	*Parameters*	*Coefficients*	*Effects*
1%	h_0	*17.563*[b]	
	h_1	*-0.119*[a]	*Negative*
	h_2	*0.271*[a]	*Positive*
	h_3	*0.623*[c]	
	h_4	*0.328*[b]	
	h_5	*-0.001*[a]	
	ESS = 2290.1, Adjusted R^2 *= 0.435, s.e.e = 0.034*		
3%	h_0	*1.089*[a]	
	h_1	*-0.145*[a]	*Negative*
	h_2	*0.015*[a]	*Positive*
	h_3	*1.023*[b]	
	h_4	*0.075*[b]	
	h_5	*0.012*[b]	
	ESS = 2195.3, Adjusted R^2 *= 0.675, s.e.e = 0.015*		
5%	h_0	*19.511*[b]	
	h_1	*-0.014*[b]	*Negative*
	h_2	*-0.335c*	*Negative*
	h_3	*0.971*[a]	
	h_4	*0.145*[a]	
	h_5	*0.112*[c]	
	ESS = 2065.9, Adjusted R^2 *= 0.512, s.e.e = 0.008*		
7%	h_0	*1.023*[a]	
	h_1	*-0.591*[b]	*Negative*
	h_2	*-0.141*[b]	*Negative*
	h_3	*1.157*[b]	
	h_4	*0.663*[b]	
	h_5	*0.012*[a]	
	ESS = 2195.9, Adjusted R^2 *= 0.693, s.e.e = 0.010*		
	h_0	*11.053*[c]	

9%	h_1	*-0.234* [c]	*Negative*
	h_2	*-0.165* [a]	*Negative*
	h_3	*1.157* [a]	
	h_4	*0.143* [b]	
	h_5	*-0.572* [a]	
	ESS = 2100.9, Adjusted R^2 = 0.385, s.e.e = 0.001		
11%	h_0	*1.197* [b]	
	h_1	*-0.910* [b]	*Negative*
	h_2	*-0.135* [a]	*Negative*
	h_3	*0.065* [c]	
	h_4	*0.173* [c]	
	h_5	*0.412* [b]	
	ESS = 2150.3, Adjusted R^2 = 0.900, s.e.e = 0.004		
13%	h_0	*1.275* [b]	
	h_1	*-0.187* [b]	*Negative*
	h_2	*-0.009* [b]	*Negative*
	h_3	*0.131* [a]	
	h_4	*0.126* [a]	
	h_5	*0.013* [c]	
	ESS = 2284.6, Adjusted R^2 = 0.722, s.e.e = 0.001		
15%	h_0	*1.089* [a]	
	h_1	*-0.007* [a]	*Negative*
	h_2	*-0.109* [a]	*Negative*
	h_3	*1.013* [b]	
	h_4	*1.110* [b]	
	h_5	*0.293* [b]	
	ESS = 2794.3, Adjusted R^2 = 0.645, s.e.e = 0.009		
17%	h_0	*0.133* [a]	
	h_1	*-0.118* [a]	*Negative*
	h_2	*-0.145* [a]	*Negative*
	h_3	*0.078* [a]	
	h_4	*0.159* [c]	
	h_5	*0.263* [c]	
	ESS = 2571.3, Adjusted R^2 b= 0.820, s.e.e = 0.001		
	"a", "b", "c" implies significance @1%, 5% & 10%		

Source: Authors' results

As shown in Table 13, estimated effect of fiscal deficit financing above threshold value, h_2 is positive from 1% through to 3%. Away from 3% through to 17%, effect of fiscal deficit financing became negative. Evidently, our study upholds the policy implication that fiscal deficit of 3% of GDP or below stimulate output growth in Nigeria. The CBN should unite fiscal measures to uphold fiscal deficit at below 3% of GDP.

6. Conclusion

The study econometrically re-estimates the effects of fiscal deficit financing on output growth and threshold of deficit financing that stimulates growth of national output in contemporary time in Nigeria. The results of the likelihood ratio test validated the existence of a threshold effect and by this inference, the link between fiscal deficit financing and long-run output growth is non-linear in Nigeria. Our empirics based on TAR results uphold evidently that fiscal deficit changes negatively impact output growth especially if such deficit financing exceeds 3% of GDP. Fiscal deficit financing that exceeds 3% of GDP injures output growth in Nigeria. At some low values of fiscal deficit financing, the link between fiscal deficit ad output growth could be positive while at higher values, such link turns negative. Moreover, the negative link for fiscal deficit values above the threshold value is highly significant. In effect, 3% is the threshold at which the sign of existing link switches. At threshold of 4% and above, link between fiscal deficit financing and output growth becomes negative. The study thus establishes 3% fiscal deficit funding with which fiscal deficit stimulate growth. Therefore, the Nigerian monetary authority (CBN) can be so advised to target not more than 3% fiscal deficit funding for output determination while simultaneously reduce lending rate to encourage domestic investment that links local production required to boost exportation and so generate the requisite foreign exchange desirable to steer economic growth to an appreciable rate**.** Our study refuted findings of Ogunmuyiwa, (2011) but validated those of Huynh (2007) and Onuorah and Ogbonna (2014).

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