Budget deficit-money demand nexus in Nigeria: A myth or reality?

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ABSTRACT

Budget deficit has an implication for monetary policy formulation and thus aggregate macroeconomic performance. An important question often asked is whether an increase in budget deficit is able to change the money market equilibrium. In order to answer this question, this paper investigates empirically the sensitivity and validity of the Keynesian and Neoclassical propositions and the Ricardian equivalence hypothesis. The study utilized cointegration analysis and ECM methodology to ascertain the short and long-run effect of budget deficit on money demand. The results of the cointegration test confirmed the existence of a strong and stable long-term relationship among the variables in the money demand model. Also, the estimates of the ECM model indicate the existence of a short- and long-term, positive and significant relationship between money demand and budget deficit suggesting that the Keynesian and Neoclassical views hold for Nigeria. Therefore the study suggests that there should be increased emphasis on productivity and efficiency of government expenditure since it impact positively on aggregate money demand via increase in aggregate demand.

Keywords: Budget Deficit, Money Demand, Error Correction Model (ECM), Nigeria.

JEL Classification: E41, H62.

1. Introduction

The contending views on the link between budget deficit and money demand have remained at the centre stage for decades. There are two variant views on this relationship. The first are the proponent of a positive impact of budget deficits on money demand championed by the Neoclassicals and Keynesians. The proponent of this view argued that an expansionary fiscal policy, either by increasing government expenditure or by tax cut will widen the budget deficit (See, for example, Bovenberg, 1998; Laumas, 1989; and Dua, 1993). This increase in budget deficit will affect aggregate demand positively depending on the size of the multiplier. The rise in aggregate demand will in turn increase the demand for money for transaction purposes. Besides, when government decide to finance its budget deficit by issuing bond

rather than through taxation, the net worth of holders of government bond rises thereby changing the consumption pattern of the holders of this bond since their net worth has improved. The rise in consumption expenditure will stimulate growth in national income which in turn increases demand for money for transaction purposes. The overall effects of budget deficits is to increase money demand which in turn leads to increase in interest rate. The rise in interest rates ultimately crowd out private investment.

The second view is the Ricardian' which advocate that budget deficits have no effect on money demand in the short or long run (See, for example, Barro, 1989; Darrat, 1990; and Cheng, 1998). They assumes that government keeps its expenditure level fixed over time. Therefore, a cuts in taxes by government implies a rise in budget deficit. But, this cut in tax at present indicate a rise in taxes in the future which is the same in terms of value with the initial tax cut because governments often equate its total spending in each period with its total revenues from all sources. Invariably, government expenditure at time t, determines the value of taxes and other revenues at the same time t. Thus, the current value of taxes and other revenues will not change as long as the current value of government expenditures remains unchanged (Barro, 1989). The issuance of government bonds to finance its expenditures is considered as assets to holders of the bond, but at the same time a liability since government will increase taxes in the future in order to redeem the bonds (Barro, 1989). Therefore, the equality between the assets and liabilities imply that the net wealth of the society remain unchanged. Since wealth does not change, consumption and aggregate demand would not be affected indicating that the demand for money for transaction purpose will remain unchanged.

Using annual data, this paper attempts to ascertain which of these theoretical paradigms hold for Nigerian economy considering the fact that the country has persistently ran a budget deficit over the years. The need for empirical investigation of these relationship is essential, given that increase in budget deficit can bring about a change in the money market equilibrium. Also, previous empirical studies have dwell more on the link between budget deficits and inflation (Ezeabasili, Mojekwu and Hebert, 2012; Odionye and Uma, 2013; and Bakare, Adesanya and Bolarinwa, 2014) and also the link between budget deficit and economic growth (see among others, Oladipo and Akinbobola, 2011). Therefore, this study utilized the Error Correction model (ECM) to examine the impact of budget deficit on money demand in Nigeria between 1980 and 2015. The paper also conduct a number of basic diagnostic and specification tests in order to examine the robustness, consistency, and stability of the money demand model.

In the following section, the review of previous studies is presented. In Section 3 theoretical Framework and Research Methodology are discussed. Section 4 presents the empirical findings while Section 5 presents the concluding remarks.

2. Review of Literature

The theoretical relationship between budget deficit and money demand is discussed in three different theoretical paradigm namely; Keynesian, Neoclassical and Ricardian. Many studies have tested the validity of this postulation however, there is no consensus in the literature. For instance, Vamvoukas (1998) investigates the link between budget deficit and money demand for Greek economy from 1950 to 1993. The paper employs Johnsen cointegration test, Error Correction Model (ECM) and several diagnostic tests. The study found a significant and positive relationship between budget deficit and the money demand, implying that the Keynesian view holds for Greece. Extending the time frame from 1948 to 2001,

Vamvoukas and Gargalas (2008) explore cointegration analysis, granger causality tests and impulse response functions (IRF) to examine the link between budget deficit and money demand in Greece. Their results corroborate the findings of Vamvoukas (1998). Other earlier studies that found a positive relationship between these two variables are Laumas, (1989); Dua, (1993); Yellen, (1989); and Knot and De Haan, (1995) among others.

In the same vein, Reinhart and Sack, (2000) examined the impact of budget deficit on money demand and inflation for OECD countries between 1980 and 2000. The findings of their results support the Keynesian and Neoclassical views in the short run. Wadad and Kalakech (2009) also found a positive and significant impact of budget deficit on money demand in Lebanon. Furthermore, using Johansen co-integration test and Vector Error Correction Model, Khrawish, Khasawneh and Khrisat (2012) analysed the impact of budget deficit on money demand in Jordan during the period 1992 to 2010. Their findings reveal a positive short and long run relationship between budget deficit and money demand indicating that Keynesian paradigm holds for Jordan. To substantiate the findings of others studies on the US economy, Li (2013) investigated the association between budget deficit and money demand using quarterly data from 1966 to 2011. The results of the study revealed a positive long-run correlation between budget deficit and money demand, which is consistent with the Keynesian and Neoclassical views.

Contrarily, studies like Deravi, Hegji and Moberly (1990) revealed that there exist a negative link between budget deficit and money demand during the period 1973:q1 to 980:q4 for the US economy. Another study by Gulley (1994) for the US economy extended the period to cover the Reagan-Bush era deficits (1981:q1 to 1989:q4). The results of the study reveal no evidence in support of a positive relationship between government debt and money demand. This infers that budget deficits do not affect money demand. The study of Chaudhary and

Shabbir (2005) for Pakistani economy also reveal a negative and significant effect of budget deficit on money demand. Similarly, Khan and Khattak (2008) analysed the short-term effects of budget deficits on macroeconomic variables in Pakistan between 1960 and 2005 using the Error correction model (ECM) estimation technique. Their finding also reveal a negative link between budget deficit and money demand.

Using ANOVA regression analysis, Aamir, Yasir, Ullah and Ahmad (2014) examined the association between budget deficit and money demand covering the period 1986-2011 for Pakistani economy. Their results also support the submission of the Ricardian paradigm, which is a negative link between budget deficit and money demand.

Summarily, the studies reviewed indicate that understanding the relationship between budget deficit and money demand is critical in analysing the impact of government intervention to the overall growth and sustainable development of any country. In addition, the theoretical paradigms concerning the link between budget deficit and money demand has no distinct effect in terms of whether the country is developed or developing. Finally, the results obtained are sensitive to the measurement of money demand and estimation technique adopted.

3.0. Theoretical Framework and Research Methodology

3.1 Theoretical Framework

The link between money demand and the budget deficit has been investigated through determining a money demand balance equation using the IS-LM framework within the context of the Keynesian and the Ricardian equivalence models. According to the Keynesian model, an increase in budget deficit either through higher government spending or tax cuts, or both will impact positively on aggregate demand. However, budget deficits financed through the issuance of bonds increases the wealth level of the bondholders which, in turn, stimulate

consumption and consequently aggregate demand. The multiplier effect of the expansion of aggregate demand leads to higher national income. The increase in national income increased the demand for money transactions. Thus, according to the Keynesian proposition, since the budget deficit is financed by issuing government bonds, the resultant expansionary fiscal policy will make the IS curve to shift to the right. The LM curve on the other hand will shift to the left if the increase in budget deficit affects money demand positively. This policy mix bring about a new equilibrium point for IS and LM schedules, where both the output and the interest rate will be higher. This increase in interest rate crowds out investment, thereby reducing the multiplier effect of the increase in aggregate demand.

Thus at equilibrium, the money market suggests that real money supply equals real money demand. This gives the equation:

$$m^s = m^D, \text{ or } \frac{M^s}{P} = \frac{M^D}{P} \quad (1)$$

The real money demand balance is expressed functionally as:

$$m^D = f(ir, y) \quad (2)$$

Where: y is real income, and ir is the nominal interest rate. The nominal money balance is further expressed as:

$$M = f(ir, y, \inf l) \quad (3)$$

Where: M is nominal money balances and $\inf l$ inflation rate which has major impact on total money is demand balance in the economy.

In line with other studies like Vamvoukas (1998); Khrawish, Khasawneh and Khrisat (2012); and Li (2013) equation (3) is augmented to include budget deficit and government purchase of goods and services in order to account for the multiplier effect of changes in government

spending on aggregate demand and the effect of financing budget deficit through issuance of government bond which can impact on money demand via changes in aggregate demand.

This is expressed below as:

$$M = f(ir, y, \inf l, bd, ge) \quad (4)$$

Equation (4) implies that money demand is a function of nominal interest rate, real GDP at constant price, inflation rate, budget deficit and government purchase of goods and services.

3.2 Methodology

As suggested by Engle-Granger representation theorem that if two or more series are cointegrated then they will be efficiently represented by an error correction mechanism.

The Error Correction Model is used in this study to capture the short and long run impact of budget deficit on money demand. The method involves developing a model from it generalized form (over parameterized) to a specific form (parsimonious) using the Hendry modelling approach. In addition, if the variables in equation (4) have stochastic trends and follow a common long term equilibrium association, then the variables are said to be cointegrated. Cointegration is a test for equilibrium between non-stationary variables integrated of the same order. The Johansen's cointegration procedure (1990) is adopted for this study because it involve the use of a well-established, likelihood ratio statistics. The cointegrating equation is specified as:

$$y_t = \alpha + A_t y_{t-1} + ... + A_\rho y_{t-\rho} + \varepsilon_t \quad (5)$$

Where y_t is k-dimensional vector of non-stationary variables, and ε_t is a vector of white noise residuals. By using the first difference operator Δ equation (5) can be rewritten as:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{\rho} T_i \Delta_{t-i} + \varepsilon_t \quad (6)$$

The rank of matrix Π determines the number of linear combinations of y_t that are stationary processes. If the rank of the matrix is *r*, Π can be factored as $\alpha\beta'$, where the elements of α are the adjustment parameters in the error-correction model, and β contains the cointegrating vectors. Johansen derives two test statistics for testing the cointegrating rank. The first is the maximum eigenvalue test while the second is the trace statistic.

If the variables in equation (4) turn out to be cointegrated, the error correction modelling approach is adopted to reveal the short and long run effect of budget deficit on money demand.

The Error Correction Model (ECM) takes the form:

$$\Delta Y_t = a_0 + \sum_{i=1}^{j} \alpha_{1i} \Delta Y_{t-i} + \sum_{i=1}^{j} \alpha_{2i} \Delta X_{it-i} + \alpha_3 ect_{t-1} + u_t \quad (7)$$

Where the long run properties are derived from the proportionality between Y_t and X_{it}. The above specification relates the short run change in the dependent variable ΔY_t to the short run change in the explanatory variables X_{it}. This is called the impact effect (α_{2i}) but ties the change to the long run impact through a feed-back mechanism.

From equation (4), the estimable money demand error correction model is given as:

$$\Delta M_t = a_0 + \sum_{i=1}^{j} \alpha_{1i} \Delta M_{t-1} + \sum_{i=1}^{j} \alpha_{2i} \Delta ir_{t-1} + \sum_{i=1}^{j} \alpha_{3i} \Delta y_{t-1} + \sum_{i=1}^{j} \alpha_{4i} \Delta \inf l_{t-1}$$
$$+ \sum_{i=1}^{j} \alpha_{5i} \Delta bd_{t-1} + \sum_{i=1}^{j} \alpha_{6i} \Delta ge_{t-1} + \alpha_7 ect_{t-1} + u_t \quad (8)$$

Where ect_{t-1} = the error correction term lagged for one period, α_7 = the coefficients for measuring speed of adjustment to equilibrium in equation (8).

Prior to cointegration and estimation of ECM, Ng and Perron (2001) unit root test was used to determine the stationarity of the variables in the model. This test uses the GLS detrending procedure of Elliott, Rothenberg and Stock (1996) to create an efficient version of the modified PP tests of Perron and Ng (1996). This modified test is adopted for two reasons: firstly, it does not exhibit the severe size distortions for errors with large negative MA or AR roots common with the Phillips and Perron (PP) (1998) tests; and secondly, when the autoregressive term is close to unity, it possesses substantially higher power than the PP tests (Ng and Perron, 2001).

3.3 Data Sources

This study utilized macroeconomic time series for the period 1980-2015. The data are obtained from the Central Bank Nigeria Statistical Bulletin and Annual report and statement of Account (various issues). The variables of interest are; money demand, interest rate, real GDP, inflation rate, budget deficit and government purchase of goods and service.

4.0 Empirical Results

4.1 Unit Root Test

Based on Ng and Perron (2001) unit root test adopted, three M-tests (MZa, MZt and MSB) and modified Elliot et al. (1996) Point Optimal Test (MPT) were used in establishing the stationarity properties of the time series data adopted in this study. The Ng and Perron (2001) test modified Phillip Perron (PP) tests of Perron and Ng (1996) used the GLS de-trending procedure of Elliott, Rothenberg and Stock (1996). This is adopted because it does not reveal the spartan size distortions common with the Phillip Perron (PP) tests for errors with large negative moving average (MA) or autoregressive (AR) roots; and it also possesses

substantially higher power than the PP tests when the autoregressive term is close to unity (Ng and Perron, 2001). The null hypothesis is that there is the presence of unit root.

Table 1 presents the results of the Ng and Perron unit root tests. From the table, it can be seen that all the series in our sample are integrated of order one, or are I (1) series.

Table 1: Results for Ng and Perron Unit Roots Test

Variables	MZa	MZt	MSB	MPT
M				
Level	-4.216	-0.253	0.179	1.651
First Difference	-15.375*	-2.757*	0.599*	4.539*
IR				
Level	-1.146	-0.653	0.162	1.280
First Difference	-19.130*	-3.093*	0.570*	7.671*
Y				
Level	-3.558	-0.316	0.151	1.125
First Difference	-21.931*	-3.309*	0.889*	9.462*
INFL				
Level	-0.592	-0.976	0.154	1.285
First Difference	-19.059*	-3.249*	0.576*	5.177*
BD				
Level	-1.613	-0.457	0.174	0.775
First Difference	-21.141*	-2.864*	0.792*	6.642*
GE				
Level	1.343	-1.139	0.106	2.081
First Difference	15.785	-2.701	0.933	5.559

Notes: (1) The asymptotic critical values for the MZa test are -13.80 and -8.10 for 1% and 5% significance levels respectively.

(2) The asymptotic critical values for the MZt test are -2.58 and -1.98 for 1% and 5% significance levels respectively.

(3) The asymptotic critical values for the MSB test are 0.17 and 0.23 for 1% and 5% significance levels respectively.

(4) The asymptotic critical values for the MPT test are 1.78 and 3.17 for 1% and 5% significance levels respectively.

(5) *, ** depicts the rejection of the null hypothesis at 1% and 5% significant level.

4.2 Cointegration Test

The Johansen and Juselius (1990) cointegration technique was adopted to establish the existence of a long run relationship among the variables in equation (8). To out carry cointegration analysis, it pertinent to determine the optimal lag length of the Vector Autoregressive (VAR) model in equation (6) using various information criteria. The results

of the lag selection criteria presented in Table 2 reveal that all the five different information criteria namely: Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), Hannan-Quinn Information Criterion (HQ), Final Prediction Error (FPE) and Sequential modified LR test statistic (LR) considered suggest 1 as the optimal lag length.

Table 2: VAR Lag Order Selection Criteria

Lag Length	LogL	LR	FPE	AIC	SC	HQ
0	-771.642	NA	90434215	35.347	35.591	35.438
1	-489.145	475.109*	1251.414*	24.143*	25.846*	24.775*
2	-455.373	47.587	1519.147	24.244	27.407	25.417

Note: * indicates lag order selected by the criterion
LR: sequential modified LR test statistic
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

The Johansen cointegration test is presented in Table 3 using one (1) as the maximum lag length of the VAR model in equation (6). The results of the cointegration tests reveal that there exist a long-run equilibrium relationship between money demand, budget deficit and the control variables in Nigeria. The table also revealed that the trace and Maximum eigenvalue tests indicate between 5 and 4 cointegrating equation, indicating a long run relationship between money demand, budget deficit, real GDP, interest rate, inflation rate and government purchase of goods and services.

Table 3: Test Results for Cointegration between Pairs of Variables

	Trace Test			**K=1**	**Maximum Eigenvalues**			**K=1**	
Equation	H_o	H_A	Trace Statistics	5% Critical Values	H_o	H_A	Max-Eigen Statistic	5% Critical Values	No of Cointegrating Equation
Equation (6)	R=0* R≤1* R≤2* R≤3* R≤4* R≤5	R=0 R=1 R=2 R=3 R=4 R=5	104.483 65.327 42.592 25.471 12.323 1.944	83.937 60.061 40.175 24.276 11.321 4.129	R=0* R≤1* R≤2* R≤3* R≤4 R≤5	R=0 R=1 R=2 R=3 R=4 R=5	109.156 72.735 40.121 24.159 10.379 2.231	86.630 64.159 38.964 17.121 11.225 5.203	5

Source: **Author's computation**

4.3 Results of the ECM Estimation

The results of the parsimonious ECM model is presented in Table 4. The results reveal that change in one-period lagged value of budget deficit has positive and significant impact on changes in money demand this implies that increase in budget deficit impact positively on money demand. This confirms that the Keynesian and Neoclassical views on the relationship between money demand and budget deficit holds for Nigeria. This results is in line with findings of Vamvoukas (1998) for Greek economy, Reinhart and Sack, (2000) for the US economy, Vamvoukas and Gargalas (2008) for Greek, Wadad Saad and Kamel Kalakech (2009) for Lebanon and Li (2013) for the US economy. However, changes in one-period lagged value of inflation rate has negative and significant effect on money demand. This indicate that fluctuation in consumer price index impact negatively on money demand in Nigeria. In addition, changes in one-period lagged value of money demand and interest rate have positive and significant impact on money demand. The coefficient of changes in real GDP and one period lagged value of government purchase of goods and services have the right signs but they are not statistically significant. This implies that in the short run, changes in real GDP and government purchase of goods and services do not impact meaningfully on money demand to bring about a positive/negative change.

The results further reveal that the estimated lagged error correction term (ECT_{t-1}) is negative and significant at 5 percent level. This supports the co-integration test results presented in Table 3. The feedback coefficient is -0.114 suggesting a fairly low speed of adjustment to equilibrium after a shock. Approximately, 11 percent of the disequilibria from the previous year's shock in money demand converge or adjust back to the long run equilibrium in the current year.

Table 4. Estimates of the Parsimonious Error Correction Model

Variable	Dependent Variable: ΔM (Money Demand)	
	Coefficient	t-statistic
Constant	0.108	2.878***
ΔM_{t-1}	0.436	2.731***
ΔIR_{t-1}	0.222	2.254**
ΔY	0.045	1;454
$\Delta INFL_{t-1}$	-0.262	-2.148**
ΔBD_{t-1}	0.313	1.967*
ΔGE_{t-1}	0.135	1.675
ECT_{t-1}	-0.114	-2.833***
R^2	0.776	
Adj R^2	0.733	
Durbin Watson	1.885	
F-statistic	4.590	
Prob (F-statistic)	0.00247	
RESET	0.9153	
BG test	0.4752	

Note: *, ** and *** depict significance at the 10%, 5% and 1% levels respectively
Source: **Author's computation**

In order to ascertain the robustness of the parsimonious ECM estimates, diagnostic test such as the Regression Specification Test (RESET) statistics, White F-statistics, Breusch-Godfrey (BG) tests for serial correlation and cumulative sum (CUSUM) of squares. Form Table 4, the value of the RESET suggest that no serious variable was omitted from the model, indicating that the ECM was correctly specified. The probability of the F-statistics also reveal that the absence of simultaneity bias in the estimates. The BG test for serial correlation indicate that there is no serial correlation in the disturbance of the error term. In addition, the CUSUM and CUSUM square figure below indicate that the parameter estimated are stable during the sample period (1980-2015) and can best explain the variation in the dependent variable.

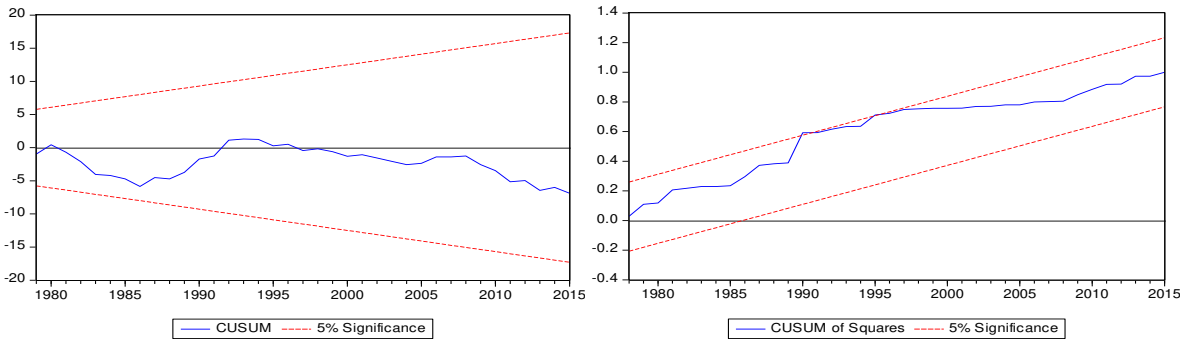

Figure 1: CUSUM and CUSUM Square Parameter Stability Tests

5. Conclusion

Relying on the economic modelling of previous studies and using annual data from the Nigerian economy, this paper investigates empirically the sensitivity and validity of the Keynesian and Neoclassical propositions and the Ricardian equivalence hypothesis. The study used cointegration analysis and ECM methodology to ascertain the short and long run effect of budget deficit on money demand.

The results of the cointegration test confirmed the existence of a strong and stable long-term relationship among the variables in the money demand model. Also, the estimates of the ECM model indicate the existence of a short- and long-term, positive and significant relationship between money demand and budget deficit. Although inflation rate has negative and significant effect on money demand in the short run, interest rate however has positive and significant impact on money demand. The statistical insignificance of real GDP and government purchase of goods and services implies that in the short run, the two variables do not impact meaningfully on money demand to bring about any change. Overall, the empirical findings suggest that the Keynesian and Neoclassical propositions hold for Nigeria. Therefore the study suggest that there should be increased emphasis on productivity and efficiency of government expenditure since it impact positively on aggregate money demand via increase in aggregate demand.

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