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Does Monetary Policy Influence Economic Growth in Nigeria?

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Abstract

This study examines the impact of monetary policy on economic growth in Nigeria. The study uses time-series data covering the range of 1975 to 2010. The effects of stochastic shocks of each of the endogenous variables are explored using Error Correction Model (ECM). The study shows that Long run relationship exists among the variables. Also, the core finding of this study shows that inflation rate, exchange rate and external reserve are significant monetary policy instruments that drive growth in Nigeria. It is therefore recommended that the establishment of primary and secondary government bond markets that can also increase the efficiency of monetary policy and reduce the government's need to rely on the central bank for direct financing.

Introduction

Since its establishment in 1959, the Central Bank of Nigeria (CBN) has continued to play the traditional role expected of a central bank, which is the regulation of the stock of money in such a way as to promote the social welfare. This role is anchored on the use of monetary policy that is usually targeted towards the achievement of full-employment equilibrium, rapid economic growth, price stability, and external balance. Over the years, the major goals of monetary policy have often been the two later objectives. Thus, inflation targeting and exchange rate policy have dominated CBN's monetary policy focus based on assumption that these are essential tools of achieving macroeconomic stability (Ajayi, 1999).

Folawewo and Osinubi (2006) describes monetary policy as a combination of measures designed to regulate the value, supply and cost of money in an economy, in consonance with the expected level of economic activity. For most economies, the objectives of monetary policy include price stability, maintenance of balance of payments equilibrium, promotion of employment and output growth, and sustainable

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development. These objectives are necessary for the attainment of internal and external balance, and the promotion of long-run economic growth.

Evidence in the Nigerian economy has shown that since the 1980's some relationship exist between the stock of money and economic growth or economic activity. Over the years, Nigeria has been controlling her economy through variation in her stock of money. Consequent upon the effect of the collapse of oil price in 1981 and the B.O.P deficit experienced during this period, various methods of stabilization ranging from fiscal to monetary policies were used. Interest rates were fixed and these were said to be beneficial to big borrower farmers (Ojo, 1989). Ikhide and Alawode (1993) while evaluating the effect of Structural Adjustment Programme (SAP) concluded that reducing money stock through increased interest rates would lower gross National product. Thus, the notion that stock of money varies with economic activities applies to the Nigerian economy (Laidler, 1993).

Tradable economic activities are "special" in developing countries. These activities suffer disproportionately from the institutional and market failures that keep countries poor. Sustained real exchange rate depreciations increase the relative profitability of investing in tradable, and act in second-best fashion to alleviate the economic cost of these distortions. That is why episodes of undervaluation are strongly associated with higher economic growth. There exist a unique long-run relationship between interest rates and economic growth. Thus, interest rate is an important determinant of economic growth in Nigeria. However, the deregulation of interest rates in Nigeria may not optimally achieve its goals, if those other factors which negatively effects investment in the country, as suggested by Guseh and Oritsejafor (2007), are not tackled.

The main thrust of this study is to evaluate the effectiveness of the CBN's monetary policy over the years. This would go a long way in assessing the extent to which the monetary policies have impacted on the growth process of Nigeria using the major objectives of monetary policy as yardstick. The remainder of the paper is organized as follows. Section two deals with the literature review. In Section three, the methodological framework of the study is pursued while the empirical results are discussed in section four. Section five concludes the paper.

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Literature Review

For middle-income economies, the empirical literature shows that monetary policy shocks have some modest effects on economic parameters. Ganev et al. (2002) for example, studied the effects of monetary shocks in ten Central and Eastern European (CEE) countries and find no evidence that suggests that changes in interest rates affect output, but find some indication that changes in the exchange rate does. In the same spirit, Starr (2005) using an SVAR model with orthogonalized identification find little evidence of real effects of monetary policy in five Commonwealth of Independent States (CIS) with the notable exception that interest rate have a significant impact on output in Russia.

The evidence that is inconsistent with theoretical expectations returned from different investigations in different countries is what economist usually refers to as "puzzles". The three most common puzzles identified in the literature are; the liquidity puzzle, the price puzzle and the exchange rate puzzle. The liquidity puzzle is a finding that an increase in monetary aggregates is accompanied by an increase (rather than a decrease) in interest rates. While the price puzzle is the finding that contractionary monetary policy through positive innovations in the interest rate seems to lead to an increase (rather than a decrease) in prices. And yet, the most common in open economies is the exchange rate puzzle, which is a finding that an increase in interest rate is associated with depreciation (rather than appreciation) of the local currency. In contemporary studies, researchers have devised convenient ways of eradicating these puzzles. Most of them now follow the framework set by Lucas (1972) who recommended the incorporation of rational expectations in the studies of the effects of monetary policy. Some recent investigations that follow this approach include: Khan et al. (2002); Brument and Dincer (2008); Cochrane (1998); and Zhang (2009).

In developed economies, such as the United States (U.S) and some core European countries, there is substantial evidence of the effectiveness of monetary policy innovations on real economic parameters (see also, Mishkin, (2002); Christiano et al.,(1999); Rafiq and Mallick, 2008 and Bernake et al., (2005). However, for developing countries like Nigeria, the evidence is weak and full of "puzzles". For example, Balogun (2007) used simultaneous equation models to test the hypothesis of monetary policy ineffectiveness in Nigeria and find that, rather than

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promote growth; erstwhile domestic monetary policy was the source of stagnation and persistent inflation. Similar evidence was also found for The Gambia, Guinea, Ghana and Sierra Leone using the same models.

Ajisafe and Folorunso (2002) examined the relative effectiveness of monetary and fiscal policy on economic activity in Nigeria using co-integration and error correction modelling techniques and annual series for the period 1970 to 1998. The study revealed that monetary rather than fiscal policy exerts a greater impact on economic activity in Nigeria and concluded that emphasis on fiscal action by the government has led to greater distortion in the Nigerian economy. Adebiyi (2006) investigated financial sector reforms, interest rate policy and the manufacturing sub-sector in Nigeria, using vector auto-regression and error correction mechanism (ECM) technique with quarterly time series spanning 1986:1 to 2002:4. Unit root and co-integration test were also performed. The study revealed that the real deposit rate and inflation rate are significant for the growth of the manufacturing sub-sector in Nigeria. In addition, the study revealed that the predominant sources of fluctuation in the index of manufacturing production are due largely to own shock and to a lesser extent, to real deposit rate. The study also showed that in the long run the index of manufacturing production is insensitive to inflation rate, commercial banks' credit to the manufacturing sector, interest rate spread and exchange rate. Folawewo and Osinubi (2006) examined the efficacy of monetary policy in controlling inflation rate and exchange instability. The analysis performed was based on a rational expectation framework that incorporates the fiscal role of exchange rate. Using quarterly data spanning over 1980:1 to 2000:4 and applying times series test on the data used, the study showed that the effects of monetary policy at influencing the finance of government fiscal deficit through the determination of the inflation-tax rate affects both the rate of inflation and exchange rate, thereby causing volatility in their rates. The study revealed that inflation affects volatility in its own rate, as well as the rate of real exchange. Bogunjoko (1997) analyzed the efficacy of monetary policy as a stabilization tool, using modified St. Louis model to take account of the peculiarity of the Nigeria economy. Using an error correction model and data covering the period 1970 to 1993; the study found that money matters in Nigeria economy and the appropriate monetary target is the domestic credit of the banking sector.

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A recent study by Chimobi and Uche (2010) examined the relationship between Money, Inflation and Output in Nigeria. The study adopted co-integration and granger-causality test analysis. The co-integrating result of the study showed that the variables used in the model exhibited no long run relationship among each other. Nevertheless money supply was seen to granger cause both output and inflation. The result of the study suggested that monetary stability can contribute towards price stability in the Nigerian economy since the variation in price level is mainly caused by money supply and concluded that inflation in Nigeria is to an extent a monetary phenomenon. Furthermore, the findings of the study support the money-prices-output hypothesis for Nigerian economy. Obviously, the empirical studies on monetary policy and real output growth in Nigeria is still scanty.

Methodology and Data

The Keynesian IS-LM function serves as a platform on which the empirical model is formulated as follows. Following McCallum (1991), the following equation is then derived;

$$RGDP_t = \alpha_o + \alpha_1 M2_t + \alpha_2 IR_t + \alpha_3 Inf_t + \alpha_4 REER_t + \alpha_5 ER_t + e_t \quad (1)$$

Where RGDP refers to real gross domestic product; M2 is money supply; IR is interest rate; INF is inflation rate; REER is real exchange rate; ER is external reserve; e is the error term.

In order to develop strong, robust and reliable models that capture the relationship between monetary policy variables and economic growth, the research work adopts the econometric techniques of the Error Correction Term (ECT) as the estimation technique. The method of ECT is extensively used in regression analysis primarily because it is initiatively appealing and mathematically much simpler than any other econometric technique (Gujarati, 2003). The error correction term indicates the speed of the adjustment which restores equilibrium in the dynamic model.

$$\Delta RGDP_t = \alpha_0 + \sum_{i=1}^{j} \alpha_{1i} \Delta RGDP_{t-i} + \sum_{i=1}^{j} \alpha_{2i} \Delta M2_{t-i} + \sum_{i=1}^{j} \alpha_{3i} \Delta IR_{t-i} + \sum_{i=1}^{j} \alpha_{4i} \Delta INF_{t-i} + \sum_{i=1}^{j} \alpha_{5i} \Delta REER_{t-i} + \sum_{i=1}^{j} \alpha_{6i} \Delta ER_{t-i} + \alpha_{7i} ECM_{t-1} + U_t \quad (2)$$

As this study involves time series data, the ordinary least square (OLS) method cannot be applied unless it is established that the variables concerned are stationary. For this paper, we have applied unit root test to check the stationarity of the variables under study. Specifically, the Augmented Dickey-Fuller (ADF) and

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Phillip-Perron test (PP) are used; the ADF and PP are used to avoid spurious regression thereby subjecting each of the variables used to unit root test so as to determine their orders of integration since unit root problem is a common feature of most time series data.

In order to test the implications of our model, we collected an aggregate data on variables of interest on Nigeria. The entire data set of Nigeria for which all relevant variables are reported over the 1975–2010 period. The data used are obtained from the Central Bank of Nigeria (CBN) statistical bulletin 2010.

Empirical Result

Descriptive Statistics

The summary of the statistics used in this empirical study is presented in Table 1. As may be observed from the Table, IR has the lowest mean value of -1.423335 and the mean value of external reserve (ER) has the highest mean value of 1160568 whereas the mean values of INF, M2, exchange rate (REER), and RGDP are 20.66944, 1414050, 46.86461, and 304661.1 respectively. The analysis was also fortified by the values of the skewness and kurtosis of all the variables involved in the models. The skewness is a measure of the symmetry of the histogram while the kurtosis is a measure of the tail shape of the histogram. The benchmark for symmetrical distribution is how close the variable is to zero while in the case of kurtosis, when it is three it is called mesokurtic but values lower than that are called platykurtic and values above that are referred to as leptokurtic. The result of the Jarque-Bera also confirms the normality distribution assumption of the model.

Table 1: Summary Statistics of the variables used in the regression analysis

	ER	INF	IR	M2	REER	RGDP
Mean	1160568.0	20.67	-1.42	1414050.0	46.8646	304661.1
Median	37643.2	13.85	-3.43	138225.5	19.59	273099.4
Maximum	7025728.0	72.80	25.13	11034941.0	150.29	778671.8
Minimum	781.7	5.40	-32.06	3031.3	0.55	27172.0
Std. Dev.	2119945.0	16.79	12.86	2754794.0	57.03	203316.5
Skewness	1.8	1.49	-0.05	2.371737.0	0.74	0.7
Kurtosis	4.5	4.46	2.93	7.64	1.73	2.8
Jarque-Bera	21.8	16.57	0.02	66.03	5.73	2.7
Probability	0.0	0.00	0.99	0.00	0.06	0.3
Observations	36	36	36	36	36	36

SOURCE: Authors' Computation, 2012

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Table 2: Augmented-Dickey Fuller (ADF) Test

Variables	ADF Values	Mackinnon Critical Values	Order of Integration
RGDP	-5.0684*	-3.6394	I(1)
M2	-8.5592*	-3.6463	I(2)
IR	-4.7782*	-3.6329	1(0)
INF	-3.0159**	-2.9484	I(0)
REER	-5.4396*	-3.6394	I(1)
ER	-3.0267**	-2.9810	I(0)

Source: Computed by the Authors', 2012
Note: One, two and three asterisk denotes rejection of the null hypothesis at 1%, 5% and10% respectively based on Mackinnon critical values.

Table 2 shows that real GDP and exchange rate variables are stationary at first difference and inflation, interest rate and external reserve are stationary at levels except for money supply that was stationary at second difference. This means all the variables are integrated of order 0 and 1.

Table 3: Phillip-Perron Test (PP)

Variables/Coefficients	PP Values	Mackinnon Critical Values	Order of Integration
RGDP	-5.0647*	-3.6394	I(1)
M2	-8.9644*	-3.6463	I(2)
IR	-4.7566*	-3.6329	I(0)
INF	-3.0822**	-2.9484	I(0)
REER	-5.4387*	-3.6394	I(1)
ER	-4.1411*	-3.6394	I(1)

Source: Computed by the Authors', 2012
Note: One, two and three asterisk denotes rejection of the null hypothesis at 1%, 5% and10% respectively based on Mackinnon critical values

Co integration Analysis Result and Interpretation

In determining the number of cointegrating vectors, trace test and maximum eigenvalue test using the more recent critical values of Mackinon-Haug-Michelis (1999) was applied. The assumption of no deterministic trend and restricted constant was for all the variables. The choice was tested using (AIC) and Schwartz Information Criterion (SIC). The result for both trace test and maximum eigenvalue for unrestricted cointegration rank test are presented in Table 4.

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Table 4: Johansen-Juselius Cointegration Test Results

Hypothesized No. of CE(s)	Eigen value	Max-Eigen value	Critical value	Trace statistic	Critical Value
			5 percent		5 percent
None	0.906137	80.44125*	40.07	196.2915*	95.75
At most 1	0.767217	49.56007*	33.87	115.8502*	69.81
At most 2	0.659370	36.61662*	27.58	66.29013*	47.85
At most 3	0.457218	20.77562	21.13	29.67352	29.79
At most 4	0.192329	7.262419	14.26	8.897894	15.49
At most 5	0.046964	1.635474	3.84	1.635474	3.84

Source: Computed by the Authors', 2012
(*) denotes rejection of the hypothesis at the 5 % (0.05) level

It can be observed from Table 4 that both Trace test statistic and the Max-Eigenvalue test indicate three cointegrating equation at 5% level of significance. Based on the evidence above, we can safely reject the null hypothesis (H_0) which says that there are no cointegrating vectors and conveniently accept the alternative hypothesis of the presence of cointegrating vectors. Thus, we can conclude that a long run relationship exists among the variables. This result means that in Nigeria's case, the hypothesis of no cointegration among the variables should be rejected.

Model Estimation Issues and Discussion of Result

The result of the cointegration test reveals that more than one cointegrating vectors exist among the variables of interest. This means that we can estimate the Error Correction Model. An Error Correction Model is designed for use with non-stationary series that are known to be cointegrated. The ECM has cointegration relations built into the specification so that it restricts the long-run behavior of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics. The use of the methodology of cointegration and ECM add more quality, flexibility and versatility to the econometric modeling of dynamic systems and the integration of short-run dynamics with the long-run equilibrium. The Error Correction Models were evaluated using the conventional diagnostic tests and the Akaike Information Criterion (AIC) was adopted in choosing the appropriate lag length. The model with the lowest (AIC) was adopted. The results are of the cointegrating relationship amongst the variables within the ECM framework are presented in Table 5 below:

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Table 5: Parsimonious Error Correction Estimates

Dependent Variable: D(LOG(RGDP))				
Method: Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG(RGDP(-1)))	0.290213	0.221697	1.309050	0.2047
D(LOG(RGDP(-2)))	0.536475	0.224863	2.385791*	0.0145
D(LOG(M2(-2)))	-0.259121	0.336113	-0.770934	0.4493
D(IR(-1))	-0.004496	0.004885	-0.920426	0.3678
D(IR(-2))	-0.001595	0.005116	-0.311660	0.7584
D(INF(-1))	0.011361	0.005179	2.193713**	0.0396
D(INF(-2))	0.003184	0.004364	0.729591	0.4737
D(LOG(REER(-1)))	-0.255454	0.187875	-1.359705	0.1883
D(LOG(REER(-2)))	-0.371610	0.230463	-1.612451***	0.1018
D(LOG(ER(-1)))	0.420007	0.125403	3.349270*	0.0030
D(LOG(ER(-2)))	0.379324	0.118384	3.204173*	0.0043
ECM(-1)	-0.594604	0.210949	-2.818715*	0.0103
R-squared	0.435358			
Adjusted R-squared	0.139592			
Durbin-Watson stat	2.046864			

Source: Computed by the Authors', 2012

Note: One, two and three asterisk denotes rejection of the null hypothesis at 1%, 5% and 10% respectively.

Given the results of the cointegration test which revealed the existence of cointegration among variables in the economic growth models, dynamic error correction model (ECM) is considered appropriate for the analysis. This analysis on the effect of monetary policy on economic growth is presented in the table above. The result obtained from the dynamic model indicates that the overall coefficient of determination (R^2) shows that 43.53 percent of growth rate of RGDP is explained by the variables in the equation. As the adjusted (R^2) tends to purge the influence of the number of included explanatory variables, the adjusted R^2 of 0.1395 shows that having removed the influence of the explanatory variables, the dependent variable is still explained by the equation with 13.95 percent. The Durbin Watson (D.W) statistics of 2.04 was not substantially farther away from the traditional benchmark of 2.0 in the mode, the study can conclude that there is no of sign auto- correlation or serial correlation in the model specification; hence the assumption of linearity is not violated.

In terms of the signs and magnitude of the coefficients which signify the effect of monetary policy on economic growth, it was observed from the model that interest rate (IR), external reserve (ER) and exchange rate (REER) had their expected

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signs while money supply (M2) and inflation rate (INF) had signs contrary to a'priori theoretical expectation. In addition to the above, the coefficient of individual variables is examined to determine the nature of the relationship between monetary policy and other macroeconomic variables. The co-efficient of external reserve was observed to be positive and significant while the coefficient of interest rate and exchange rate was observed to be negative and significant.

From the table, a unit change in previous RGDP brings about 53.6 percent growth increases in present RGDP at 1% significance level. Also, a unit change in inflation brings about 1 percent increase in output level at 5% significance level which showed a positive impact on economic growth but does not conform to the theoretical expectation. A unit change in exchange rate brings about 37.1 percent decrease in economic growth and it is significant at 10% while a unit change in external reserve brings about an increase in real GDP at a significant level of 1%.

Contrary to the above, the coefficients of both money supply and inflation rate were observed to be insignificant. The significant relationship between interest rate, exchange rate and external reserve reflect the potency of the variables as an important conduct in transmitting monetary policy impulses to the aggregate economy. In contrast, the insignificant relationship between money supply and inflation in Nigeria, suggest that monetary policy as a policy option had been inactive in influencing these macroeconomic variables. This could step from the dominance of fiscal measures especially government expenditures in stimulating such macroeconomic variables. More so, the insignificant relationship between these variables could be explained by the underdeveloped nature of the financial institutions in transmitting monetary policy to the ultimate variables in the economy which is usually economic growth and price stability. The insignificant effect of inflation is a consequence of the autonomy that is granted monetary authority in the management of price instability in Nigeria and also the various policy initiatives that have been adopted (such as financial regulation, interest rate and exchange rate deregulation and inflation targeting) to mitigate price instability in Nigeria.

The results confirm that growth of RGDP in Nigeria has an automatic mechanism and that RGDP growth in Nigeria responds to deviations from equilibrium in a balancing manner. A value of (-0.5946) for the ECM coefficients suggests that a fast speed of adjustment strategy of roughly 59.46%. Empirical

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analysis result also supports growing evidence that monetary policy exerts significant effect on interest rate, exchange rate, external reserve according to the confirmed result earlier by Asogu (1998) and Ubogu (1985), making the assumption that the Central Bank cannot observe unexpected changes in output level within the same period.

Conclusion

It has been established in this study that monetary policies implemented in Nigeria depended on major policy instrument such as interest rates, exchange rate, external reserve, and monetary base. This study also evaluates the impact of monetary policy variables within the institutional framework and basic theoretical model on economic growth.

Overall, the study found evidence that monetary policy innovations have both real and nominal effects on economic parameter depending on the policy variable selected. The study notes that monetary policy implementation in a developing country like Nigeria faces additional challenges that are not present in developed economies; such has fiscal dominance and the treat of currency substitution.

This study conclude therefore that the inability of monetary policies to effectively maximize its policy objective most times is as a result of the shortcomings of the policy instruments used in Nigeria as such limits its contribution to growth even though monetary policies had brought impressive contribution over the years.

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Government Spending and Economic Growth: A Revisit of the Nigerian Experience

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Abstract

Given the continued debate surrounding the effectiveness and efficiency of government spending in Nigeria, this study adopts a modified Autoregressive Distributed Lag Model in order to investigate the impact of federal government spending on economic growth between 1961 and 2010. The main findings are that government total expenditure and recurrent expenditure have insignificant effect on real GDP growth irrespective of the lag period. However, capital expenditure has significant positive effect in the second lagged period. Nevertheless the long run multiplier of government spending whether total expenditure, capital expenditure or recurrent expenditure, is negative. This means that in the long run real GDP growth is slowed by the negative government expenditure multiplier. The policy implication of the findings is that the quality and efficiency of government spending remains an issue in Nigeria as theory posits that the multiplier effect of government spending should be positive even if it is, as usual, lower than private sector investment multiplier.

Introduction

The effectiveness and efficiency of government spending in Nigeria remains a topical issue since the public sector remains a key driver of the economy. The formulation and implementation of the federal government budget, apart from helping to provide the platform on which government provides the necessary public goods, also helps the private sector to plan its activities in line with government's fiscal policies. Although there is the debate as to the optimum level of government's spending needed to boost growth, the consensus is that at some level of development, the government is needed to facilitate developmental process

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especially by way of infrastructure provision. Given the developmental challenges facing Nigeria as a nation, the government's drive at encouraging private sector participation through its various reforms should be complemented with effective and efficient public sector spending. Figure 1 shows that change in total government expenditure between 1961 and 2010 averaged 27.2%, higher than average inflation rate of 17.3% in same period. Similarly, the change in total government capital expenditure averaged 29.5% which is also higher than the average inflation rate in the period. This implies that in real terms government spending has increased between 1961 and 2010.

Despite this real increase in government spending Nigeria still faces huge infrastructure challenges. Therefore, because some aspects of government spending may affect the economy with a lag, this study aims to empirically investigate the impact of government expenditure on economic growth using a modified Autoregressive Distributed Lag Model. This approach differs from most empirical studies on Nigeria that were reviewed in this study as they mostly applied the cointegration and causality methodologies. A key brickbat of these approaches remains the implicit assumption of an instantaneous response mechanism of economic growth to variations in public expenditure. Hence, a more nuanced view, which we empirically pursue in this paper, is that economic activity reacts to fiscal policy stimulus in a rather delayed manner. Thus, contemporaneous output realizations are more likely linked to immediate historical rather than current spending patterns. To dig further into this line of thought, therefore, the crux of our paper is to re-investigate the government spending-economic growth nexus in Nigeria, while inventively making allowance for possible delay effects.

Sequel to this opening section, the rest of the paper is mapped out as follows. Section two discusses the empirical literature review on the most recent and entirely Nigerian studies. The methodology is what section three summarizes while section four presents the results. Section five discusses the policy implications of the findings.

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Empirical literature review

This section reviews some of the studies that have been conducted on the relationship between government spending and economic growth in Nigeria. As obtains in the wider literature, the conclusions from the studies on Nigeria remain inconclusive as the rest of this section demonstrates.

Chimobi (2009) conducted causality and cointegration tests and found no long-run relationship between government expenditure and national income, while causality runs from government expenditure to national Income. Babalola and Aminu (2011) also applied the cointegration approach and investigated the impact of fiscal policy on economic growth in Nigeria in the period 1977 to 2009. Their key finding was that productive expenditure positively impacted economic growth with a long-run relationship existing between them as confirmed by the cointegration test. Usman (2011) employed a reduced form model in addition to Beta coefficient, Theil's inequality and Root Means Square Error (RMSE) techniques to investigate the stability and effectiveness of fiscal policy in Nigeria. The results reveal that government spending is a major factor which influences macroeconomic activity in Nigeria.

Taiwo and Abayomi (2011) examined the trends as well as effects of government spending on the growth rate of real GDP in Nigeria using the Ordinary Least Square (OLS) technique. The study found that there is a positive relationship between real GDP growth and government spending. Olaiya *et al.* (2012) examined the causal relationships among economic growth, government expenditure and inflation rate in Nigeria in the period 1970 to 2010. The study found evidence of co-integration among the variables, while there is bi-directional causality between government expenditures and economic growth both in the short run and in the long run. Also, it was revealed that in the short run a unidirectional causality existed from economic growth and government expenditure to inflation rate while no feedback from inflation rate was observed.

While looking at specific government spending, Nurudeen and Usman (2010) investigated the effect of government expenditure on economic growth by employing a disaggregated analysis. The results reveal that government total capital

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expenditures, total recurrent expenditures and government expenditure on education have negative effect on economic growth. The effect of rising government expenditure on transport and communication and health results in an increase in economic growth. Similarly, Usman *et al.* (2011) investigated the effect of expenditure on a disaggregated level by focusing on education, health, transport, and administration using a multivariate time series framework. The results showed that in the short run public spending has no impact on growth but the cointegration show that there is long run relationship between public expenditure and growth.

Amassoma *et al.* (2011) also examined the relationship between the components of government expenditure (agriculture; education; health and transport and communication) and economic growth. They found that expenditure on agriculture had a significant influence on economic growth while expenditure on education, health and transport and communication had insignificant influence on economic growth. Nasiru (2012) employed the Bounds test approach to co-integration based on unrestricted error correction model and pair wise granger causality tests. The results indicate that there exists no long-run relationship between government expenditure and economic growth in Nigeria. In addition, the causality results reveal that government capital expenditure granger causes economic growth, while no causal relationship was observed between government recurrent expenditure and economic growth.

In summary, the review of some of the studies on Nigeria with respect to government spending and economic growth shows mixed results. Therefore, this study aims to contribute to the literature and the methodological approach to doing this is explained in the next section.

Methodology and data sources

This sections business center on briefly explicating the adopted methodology for the purpose of capturing the influence of lagged effects in economic relationships in the first instance. Thereafter, brisk comments on model variables, estimation procedure and data sources make an appearance.

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To kick-off, an explanatory variable may affect a dependent variable with a time lag while the dependent variable may also be correlated with lags of itself, suggesting that lags of the dependent variable should also be included in the regression. These considerations motivate the application of the Autoregressive Distributed Lag (ARDL) model which includes lags of both the dependent and the explanatory variables as follows:

$$Yt = \alpha + \partial t + \Phi 1Yt\text{-}1 + \ldots + \Phi pYt\text{-}p + \beta 0Xt + \beta 1Xt\text{-}1 + \ldots + \beta qXt\text{-}q + et \quad (1)$$

In this model the dependent variable Y depends on *p* lags of itself, the current value of an explanatory variable X, as well as *q* lags of X. The model also allows for a deterministic trend ∂t. Therefore, since the model contains *p* lags of Y and *q* lags of X we denote it by ARDL (p, q). Koop (2009) explained that a variant of the ARDL model can be estimated as stated in equation (2) below;

$$\Delta Yt = \alpha + \partial t + \beta Yt\text{-}1 + \lambda 1\Delta Yt\text{-}1 + \ldots + \lambda p\text{-}1\Delta Yt\text{-}p+1 + \emptyset Xt + \theta 1\Delta Xt + \ldots + \theta q\Delta Xt\text{-}q+1 + et \quad (2)$$

Where:

- ΔYt = first difference of the dependent variable
- Yt-1 = the lagged value of the dependent variable
- ΔYt-1 = the lagged value of the first difference of the dependent variable
- Xt = the explanatory variable at time t
- ΔXt = first difference of the explanatory variable at time t
- ΔXt-1 = the lagged value of the first difference of the explanatory variable
- ∂t = the deterministic time trend

A key advantage of this variant of the ARDL (p, q) model is that the problem of multicollinearity is minimized. Both the marginal and long-run effects of the coefficients can be interpreted using the concept of the multiplier. The long-run multiplier which measures the effect of a change in the explanatory variable on the dependent variable can be established by the ratio of the coefficients of Xt and Yt-1 which is - Ø/β.

Estimation of this model depends on whether the series are stationary or not. We therefore apply the Augmented Dickey–Fuller (ADF) test to ensure that the variables do not have unit root. The variables of interest in estimating the model are

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real GDP growth (RGDPG) which is the dependent variable and total government expenditure (TEXP), total capital expenditure (CAPEX) as well as total recurrent expenditure (RECU) which are the explanatory variables. However, each of the variables enters the model separately in order to provide a more focused impact analysis on their effect on real GDP growth. While there is no general convention about lag selection (Koop 2009:165), we think the estimation of the ARDL model up to three lags for each of the explanatory variables will provide an insight into the effectiveness of government spending. The estimation of up to two and three lags will not reduce significantly the degree of freedom since the study uses annual data from 1961 to 2010 and are sourced mainly from the Central Bank of Nigerian (CBN) statistical bulletin.

Results

The result section covers mainly the treatment of stationarity and the growth impact regressions of aggregate, capital and recurrent expenditures in that order. Precisely, the results of the Augmented Dickey Fuller (ADF) mean-reversion test and the various ARDL models of the growth-spending association are presented and then discussed, while also pointing out the reliability of estimated models via a series of standard regression diagnostics.

Unit root test

Table 1: Augmented Dickey Fuller test

	Level		1st Difference	
Variables	Intercept	Intercept and trend	Intercept	Intercept and trend
RGDPG	0.0001	0.0019	0.0013	0.0001
TEXP	0.1080	0.1034	0.0088	0.0023
CAPEX	0.2923	0.1826	0.0072	0.0033
RECU	0.1303	0.1669	0.0303	0.0074

Note: Only the probability values are reported here.

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Effects of total expenditures on real GDP growth

One of the conditions for estimating the variant of the ADRL (p, q) model described in the previous section is that the variables must be stationary. Therefore, using the Augmented Dickey Fuller (ADF) test, table 1 shows that TEXP, CAPEX and RECU all have unit roots at level. However, all the variables become stationary after first differencing.

Table 2 shows the results of the first estimated ARDL model in which the dependent variable is the real GDP growth while the explanatory variables are the lagged value of real GDP growth, lagged value of the first difference of real GDP growth, total government expenditure, first difference of total government expenditure and lagged value of the first difference of total government expenditure. The R-square shows that the model is able to explain approximately 38% of the variation in real GDP while the DW statistic of 1.9478 indicates that the model does not suffer from the problem of autocorrelation. With respect to the specific impacts of TEXP on real GDP, the coefficients have mixed signs and are all insignificant.

Table 2: Real GDP growth and total expenditure (1-lag model)

	Coefficient	Std. Error	t-ratio	p-value
const	5.5601	3.9715	1.4000	0.1694
RGDPGt-1	-0.8223	0.1768	-4.6502	0.0004
ΔRGDPGt-1	0.2559	0.1546	1.6563	0.1057
TEXPt	-0.1498	0.1967	-0.7617	0.4508
ΔTEXPt	0.0480	0.2482	0.1935	0.8476
ΔTEXPt-1	0.0269	0.2262	0.1191	0.9058
time	0.0155	0.0825	0.1876	0.8522
R-squared	0.3773			
Adj. R-sq	0.2815			
DW	1.9478			

*Dependent variable is real GDP growth

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The long-run multiplier effect of total spending on real GDP growth is given by the ratio of TEXPt and RGDPGt-1 which is -0.18. This means that TEXP has a negative multiplier effect on real GDP growth. Because real GDP growth averaged 4.17% in the period (see summary statistics in Appendix A), in the long-run real GDP growth should increase by 4.17% plus the long-run multiplier of -0.18 which is 3.99%. In other words the negative multiplier will reduce average real GDP growth from 4.17% to 3.99%.

The validity of these results is tested by conducting three post estimation tests which include normality test, specification test using the Ramsey's RESET test and heteroskedasticity test using White's (1980) test. The rationale for using White's test is that it eliminates the problems associated with other tests such as the Breusch-Pagan test. This is because it does not depend on the normality assumption

Table 3: Real GDP growth and total expenditure (2-lag model)

	Coefficient	Std. Error	t-ratio	p-value
const	5.8174	4.3268	1.3445	0.1867
RGDPGt-1	-0.8395	0.1772	-4.7373	0.0000
ΔRGDPGt-1	0.2705	0.1553	1.7422	0.0897
TEXPt	-0.2224	0.2129	-1.0444	0.3031
ΔTEXPt	0.1467	0.2587	0.5671	0.5741
ΔTEXPt-1	0.2128	0.2597	0.8195	0.4178
ΔTEXPt-2	0.3332	0.2283	1.4593	0.1529
time	0.0541	0.0872	0.6206	0.5387
R-squared	0.4093			
Adj. R-squared	0.2975			
Durbin-Watson	1.9155			

*Dependent variable is real GDP growth

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and also does not assume prior knowledge of heteroskedasticity. The results of the tests in Appendix 1B shows that we fail to reject the null hypotheses that the errors are normally distributed. Moreover, the specification is adequate and that there is no heteroskedasticity.

Given that a one year lag may not be sufficient for government spending to start impacting economic growth in some cases, we take the second lag of total government expenditure. The results as shown in table 3 are not significantly different from the earlier estimation. This is because the coefficients of total government expenditure remain insignificant. However, the explanatory power of the model improved with R-square of approximately 41%. The negative long-run multiplier of -0.26 suggests that, in the long-run, real GDP will only increase by the sample average of 4.17% plus the long-run multiplier. This amounts to some 3.91%. Therefore, as in the earlier estimation the negative multiplier slows down long run real GDP growth. Appendix 2B confirms the validity of these results as we again fail to reject the null hypotheses with respect to normality, specification and heteroskedasticity tests.

We probe further into the lagged effect of total government expenditure on real GDP by taking a third lag. Again, the results as shown in table 4 depict insignificant effect of total government expenditure on the real GDP growth. The negative long-run multiplier of 0.27 means that average real GDP growth will slow to 3.9% from 4.17% between 1961 and 2010. Table 3, in appendix B, also shows that we fail to reject the null hypotheses that the errors are normally distributed, specification is adequate and there is no presence of heteroskedasticity.

Given that total government expenditure includes both capital and recurrent expenditure, the earlier results may not tell us the specific effect of each of these on economic growth. Therefore, the need to have a disaggregated estimation becomes necessary. Table 5 shows that the coefficients of CAPEX are mixed and insignificant. The long-run multiplier given by the ratio -(-0.4788/-0.8647) is -0.55 and implies that average real GDP growth of 4.17% in the period will slow to 3.62%. Table 1 in appendix B shows that while this model fails the normality test, we accept the null hypotheses of adequate specification and absence of heteroskedasticity.

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Table 4: Real GDP growth and total expenditure (3-lag model)

	Coefficient	Std. Error	t-ratio	p-value
Const	6.2879	4.8209	1.3043	0.2007
RGDPGt-1	-0.8300	0.1842	-4.5067	0.0000
ΔRGDPGt-1	0.2751	0.1597	1.7227	0.0938
TEXPt	-0.2264	0.2351	-0.9633	0.3419
ΔTEXPt	0.1289	0.2868	0.4498	0.6556
ΔTEXPt-1	0.1917	0.2837	0.6760	0.5035
ΔTEXPt-2	0.2975	0.2735	1.0875	0.2843
ΔTEXPt-3	-0.0634	0.2435	-0.2604	0.7961
Time	0.0401	0.0965	0.4156	0.6803
R-squared	0.4095			
Adj. R-squared	0.2746			
Durbin-Watson	1.9243			

Effects of capital expenditures on real GDP growth

We take the second lag of CAPEX in order to ascertain the effect on real GDP since capital projects take some time to be completed. Table 6 shows that the explanatory power of the model improved with R-square and adjusted R-square of

Table 5: Real GDP growth and capital expenditure (1-lag model)

	Coefficient	Std. Error	t-ratio	p-value
const	6.8354	3.0586	2.2348	0.0312
RGDPGt-1	-0.8647	0.1797	-4.8119	0.0000
ΔRGDPGt-1	0.2681	0.1503	1.7823	0.0825
CAPEXt	-0.4788	0.2769	-1.7290	0.0917
ΔCAPEXt	0.0756	0.3858	0.1960	0.8456
ΔCAPEXt-1	-0.1729	0.3477	-0.4971	0.6219
time	0.0087	0.0777	0.1124	0.9111
R-squared	0.4321			
Adj. R-squared	0.3447			
Durbin-Watson	1.8855			

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Table 6: Real GDP growth and capital expenditure (2-lag model)

	Coefficient	Std. Error	t-ratio	p-value
const	7.3673	3.1462	2.3417	0.0247
RGDPGt-1	-0.9032	0.1746	-5.1721	0.0000
ΔRGDPGt-1	0.3503	0.1505	2.3288	0.0254
CAPEXt	-0.6651	0.2849	-2.3340	0.1251
ΔCAPEXt	0.2279	0.3782	0.6026	0.5505
ΔCAPEXt-1	0.2666	0.3882	0.6868	0.4965
ΔCAPEXt-2	0.7531	0.3357	2.2434	0.0309
time	0.0467	0.0787	0.5946	0.5557
R-squared	0.4973			
Adj. R-squared	0.4022			
Durbin-Watson	1.9131			

approximately 50% and 40% respectively, while the DW test also improved. The coefficient of CAPEX after second lag is positive and significant. The long-run multiplier of -0.74% implies that real GDP growth in the long run will slow by 0.74% from average 4.17% to 3.43%. Table 2 in appendix C equally shows that while this model also fails the normality test, we accept the null hypotheses of adequate specification and absence of heteroskedasticity.

When we consider the third lag of capital expenditure, Table 7 shows that the model is again able to explain approximately 50% of the variation in real GDP. Also, the effect of the second lag of capital expenditure remains positive and significant while the third lag has insignificant negative effect. The long-run multiplier given by the ratio of the coefficients -(-0.6370/-0.8916) is -0.72% and implies that real GDP growth in the long run will slow to 3.45% from the average 4.17% recorded in the period 1961 to 2010. Appendix 3C shows that while this model also fails the normality test, we accept the null hypotheses of adequate specification and absence of heteroskedasticity.

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Table 7: Real GDP growth and capital expenditure (3-lag model)

	Coefficient	Std. Error	t-ratio	p-value
Const	7.7084	3.4019	2.2659	0.0297
RGDPGt-1	-0.8916	0.1794	-4.9713	0.0000
ΔRGDPGt-1	0.3656	0.1552	2.3558	0.0242
CAPEXt	-0.6370	0.3115	-2.0452	0.1484
ΔCAPEXt	0.1819	0.3996	0.4552	0.6518
ΔCAPEXt-1	0.2276	0.4037	0.5636	0.5766
ΔCAPEXt-2	0.6602	0.3867	1.7072	0.0966
ΔCAPEXt-3	-0.1816	0.3445	-0.5271	0.6015
time	0.0269	0.0847	0.3171	0.7530
R-square	0.5026			
Adj. R-squared	0.3889			
Durbin-Watson	1.9253			

Effects of recurrent expenditures on real GDP growth

The recurrent expenditure is that component of government spending that is mostly used for payments of wages and salaries and other settlements. The result of the estimation as presented in the table 8 shows that the model is able to explain approximately 41% of the variation in real GDP. However, while the signs of the coefficients of RECU are mixed, they generally have insignificant effects on the real GDP as expected. The long run multiplier which is given by the ratio -(-0.4858/-0.8563) is -0.75. This implies that in the long run, the average real GDP of 4.17% recorded in the period under review will slow to 3.42%. Appendix 1D shows that model passed the normality, specification and heteroskedasticity tests.

Taking the second lag did not significantly affect the pattern of the result as the effects of recurrent expenditure still has mixed signs and insignificant effects on real GDP as shown in table 9. The model however is able to explain approximately

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Table 8: Real GDP growth and recurrent expenditure (1-lag model)

	Coefficient	Std. Error	t-ratio	p-value
Const	-1.4742	4.2535	-0.3466	0.7308
RGDPGt-1	-0.8563	0.1799	-4.7598	0.0003
ΔRGDPGt-1	0.2562	0.1523	1.6824	0.1005
RECUt	0.4858	0.4209	1.1542	0.2555
ΔRECUt	-0.1875	0.5108	-0.3661	0.7162
ΔRECUt-1	0.3829	0.4913	0.7794	0.4405
Time	0.0047	0.0798	0.0587	0.9535
R-squared	0.4130			
Adj. R-squared	0.3226			
Durbin-Watson	1.8855			

Table 9: Real GDP growth and recurrent expenditure (2-lag model)

	Coefficient	Std. Error	t-ratio	p-value
Const	-3.1839	4.8258	-0.6598	0.5135
RGDPGt-1	-0.8628	0.1823	-4.7327	0.0003
ΔRGDPGt-1	0.2448	0.1563	1.5653	0.1263
RECUt	0.5915	0.4758	1.2433	0.2216
ΔRECUt	-0.2256	0.5343	-0.4223	0.6752
ΔRECUt-1	0.3756	0.5191	0.7236	0.4739
ΔRECUt-2	0.0765	0.5057	0.1513	0.8805
Time	0.0254	0.0848	0.2989	0.7667
R-squared	0.4254			
Adj. R-squared	0.3166			
Durbin-Watson	1.9507			

Table 10: Real GDP growth and recurrent expenditure (3-lag model)

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	Coefficient	Std. Error	t-ratio	p-value
Const	-4.4443	5.5396	-0.8023	0.4278
RGDPGt-1	-0.8706	0.1908	-4.5618	0.0006
ΔRGDPGt-1	0.2427	0.1607	1.5108	0.1398
RECUt	0.7064	0.5371	1.3153	0.1969
ΔRECUt	-0.31816	0.5861	-0.5428	0.5906
ΔRECUt-1	0.31778	0.5463	0.5817	0.5645
ΔRECUt-2	0.0293	0.5363	0.0546	0.9567
ΔRECUt-3	-0.1322	0.5147	-0.2569	0.7987
Time	0.0289	0.0910	0.3185	0.7520
R-squared	0.4273			
Adj. R-squared	0.2964			
Durbin-Watson	1.9160			

43% of the variation in real GDP. The long run multiplier effect on real GDP, given by the ratio – (-0.5915/-0.8628) is -0.68. This implies that in the long run real GDP growth will slow to 3.49% from 4.17%. Appendix 2D shows that model passed the normality and heteroskedasticity tests but failed the specification test.

Again, as shown in Table 10, taking the third lag of recurrent expenditure also shows that the effects on real GDP growth are insignificant with the coefficients having mixed signs. This model explains approximately 43% of the variation in the real GDP growth. The long run multiplier of -0.81 implies that the average real GDP growth of 4.17% in the period slows to 3.36% in the long run. Appendix 3D shows that model passed the normality, specification and heteroskedasticity tests.

Conclusion and policy implications of findings

The study investigated the impact of government spending on real GDP growth in Nigeria over the period 1961 to 2010 using a special variant of the ARDL model. The main findings are that total government spending has insignificant effect

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on real GDP even when lags are taken for up to three periods. However, when disaggregated into capital and recurrent expenditure, the former had significant positive effect after second lag while the latter expectedly had insignificant effects on real GDP. In the long run, real GDP growth is slowed down by the negative multiplier effect of total government spending on one hand and the disaggregated capital and recurrent expenditures components on the other. However, on average, recurrent spending has the most negative multiplier effect of -0.75% on real GDP growth.

The broad policy implication of the findings is that government spending has not improved economic growth in Nigeria despite the enormous amounts that have been expended. Factors responsible for this may include the high proportion of recurrent component of the budget, poor capital budget implementation and associated leakages and the market distortion cost as government financing of its spending hinder resource allocation oftentimes. It therefore means that there is need for government to be more prudent and efficient in its spending as this will ensure provision of basic infrastructure that will boost rather than slow real GDP growth.

To strengthen the budget implementation process, the Nigerian fiscal authorities have gravitated towards performance-based budgeting as against the erstwhile line budgeting, while attempts have also been made in recent times to link the budget estimates of ministries, departments and parastatals with clearly outlined sectorial priorities through a medium term expenditure framework (MTEF). These, along with other ongoing fiscal reforms, should work to ensure that the potential positive effects of government spending on economic growth materialise in line with Nigeria's aspiration to break into the league of the biggest global economic players (top 20) by the year 2020.

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Appendices

Appendix A: Summary Statistics

	Mean	Median	Minimum	Maximum
RGDPG	4.1736	4.7556	-15.7436	25.0072
TEXP	17.3041	17.2694	6.4475	30.5161
CAPEX	7.2875	6.6500	2.3000	20.0000
RECU	9.6083	9.9177	3.9887	14.8696

Appendix B1: Post estimation tests for ARDL for total expenditure

	Null hypothesis	P-value	Decision
Normality test	Error is normally distributed	0.1306	Accept null hypothesis
Specification test	Specification is adequate	0.2563	Accept null hypothesis
Heteroskedasticity test	No presence of heteroskedasticity	0.5317	Accept null hypothesis

Appendix B2: Post estimation tests for ARDL for total expenditure

	Null hypothesis	P-value	Decision
Normality test	Error is normally distributed	0.2561	Accept null hypothesis
Specification test	Specification is adequate	0.3198	Accept null hypothesis
Heteroskedasticity test	No presence of heteroskedasticity	0.7485	Accept null hypothesis

Appendix B3: Post estimation tests for ARDL for total expenditure

	Null hypothesis	P-value	Decision
Normality test	Error is normally distributed	0.2545	Accept null hypothesis
Specification test	Specification is adequate	0.3367	Accept null hypothesis
Heteroskedasticity test	No presence of heteroskedasticity	0.1538	Accept null hypothesis

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Appendix C1: Post estimation tests for ARDL for capital expenditure

	Null hypothesis	P-value	Decision
Normality test	Error is normally distributed	0.0285*	Reject null hypothesis
Specification test	Specification is adequate	0.6579	Accept null hypothesis
Heteroskedasticity test	No presence of heteroskedasticity	0.4966	Accept null hypothesis

*Reject null hypothesis at 5% level of significance

Appendix C2: Post estimation tests for ARDL for capital expenditure

	Null hypothesis	P-value	Decision
Normality test	Error is normally distributed	0.0759*	Reject null hypothesis
Specification test	Specification is adequate	0.6251	Accept null hypothesis
Heteroskedasticity test	No presence of heteroskedasticity	0.7708	Accept null hypothesis

*Reject null hypothesis at 10% level of significance

Appendix C3: Post estimation tests for ARDL for capital expenditure

	Null hypothesis	P-value	Decision
Normality test	Error is normally distributed	0.0723*	Reject null hypothesis
Specification test	Specification is adequate	0.4921	Accept null hypothesis
Heteroskedasticity test	No presence of heteroskedasticity	0.1629	Accept null hypothesis

*Reject null hypothesis at 10% level of significance

Appendix D1: Post estimation tests for ARDL for recurrent expenditure

	Null hypothesis	P-value	Decision
Normality test	Error is normally distributed	0.2486	Accept null hypothesis
Specification test	Specification is adequate	0.1585	Accept null hypothesis
Heteroskedasticity test	No presence of heteroskedasticity	0.3069	Accept null hypothesis

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Appendix D2: Post estimation tests for ARDL for recurrent expenditure

	Null hypothesis	P-value	Decision
Normality test	Error is normally distributed	0.2555	Accept null hypothesis
Specification test	Specification is adequate	0.0980*	Reject null hypothesis
Heteroskedasticity test	No presence of heteroskedasticity	0.3467	Accept null hypothesis

*Reject null hypothesis at 10% level of significance

Appendix D3: Post estimation tests for ARDL for recurrent expenditure

	Null hypothesis	P-value	Decision
Normality test	Error is normally distributed	0.22366	Accept null hypothesis
Specification test	Specification is adequate	0.665242	Accept null hypothesis
Heteroskedasticity test	No presence of heteroskedasticity	0.233056	Accept null hypothesis