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Modeling Nigerian Government Revenues and Total Expenditure: Combined Estimators' Analysis and Error Correction Model Approach

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Abstract

The national total expenditure of a country is precipitated on several factors of which revenue generated could be one and very significant. This paper therefore examines the contribution of some selected sources of Nigerian government revenue to total national expenditure. Statistical and econometric techniques used for the data analysis are unit root test, cointegration test, combined estimators' analysis, the error correction model (ECM) and the feasible generalized linear (FGLS) estimators. Results showed that the variables are non stationary but are stationary at first difference. The long-run relationship of total expenditure on oil revenue, non-oil revenue, federation account and federal retained revenue revealed that the variables are co-integrated and required the use of combined estimators. The effect of non-oil revenue and federal retained revenue is very significant. Investigations on the short-run modeling necessitated the use of FGLS estimators. The effect of ECM and federal retained revenue is very significant. Consequently, other sources of revenue apart from federal retained revenue need to be enhanced and tailored towards improving economic growth and development through national expenditure.

Keywords: unit root test, cointegration test, combined estimators, error correction model, feasible generalized linear estimators

JEL Classification: C22

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1 Introduction

Several fiscal policies have been postulated by numerous authors as to the direction of flow of the economic fiscal policy transpirations based on the behavior of macroeconomic variables (like gross domestic product(GDP), inflation rate etc.) without adequate cognizance to the cash flow of the economy in terms of different sources of revenue and total national expenditure (Friedman, 1978; Buchanan and Wagner, 1978; Peacock and Wiseman, 1979; Musgrave, 1966; Meltzer and Richard, 1981; Barro,1990; Romer, 1990; Bloom et al, 2001; Taiwo and Abayomi, 2011.). Fiscal policy, a short-run issue having long lasting economic effects, is viewed as an instrument used to mitigate short-run imbalances of output and employment and bring the economy closer to a potential output (Zagler and Dürnecker, 2003). This can be as a result of changes in expenditures, revenues, or both. On the revenue side, taxes can distort private agents' decisions with respect to factor accumulation and supply. Turnovsky (1996) emphasized that as in the endogenous growth, framework externalities are always present; distorting taxation can internalize the effect of the externality in private decision rules, and thus induce the efficient allocation of resources.

If expenditure is considered growth enhancing, then a government deficit exhibits an indirect effect on long-term economic growth. In a Ricardian world, however, where agents view the deficit simply as taxes delayed, there should be no difference between tax and deficit finance of government expenditures, as long as the tax structure remains unchanged in the future (Ludvigson, 1996). As argued by Araújo and Martins (1999), running a debt-financed deficit can induce the government to absorb additional resources from the private sector, which could have been used instead for the accumulation of private physical capital. If the revenue raised in that fashion is spent in a less productive way than it would be by the private sector, the overall growth effect would be negative.

Current trends in fiscal policy has proposed various ways of reducing expenditure that contributes none/little to the developmental goals of national economy. Alongside this thought is the adoption of medium term expenditure framework (MTEF, 1998) as part of budget reforms to encourage cooperation across various tiers of government in planning and strategizing for reduction of wasteful expenditure. The effect of a change in government spending on aggregate activity is a central question in the economic theory. However, there appears to be no uniform consensus on this issue. In particular there is no clear understanding of the effect on government revenues, which is aggregated as cash in-flow. This has always been a pivotal cause of out-lashes in major sections of public offices.

Understanding various sources of government revenues and expenditure especially in Nigeria becomes important as their linkages with economic growth has been attracting the attention of researchers in the recent time (Taiwo and Abayomi, 2011). More so, this presently appears to be the mainstay of nation's economy. Consequently, in this work, effort is made to study the inter-temporal relationship among these different

sources of Nigerian government revenue and total expenditure and at the same time examine effect or contribution of the formal on the latter using a model majorly based on the assumption that government generated income (revenue) enhances spending (expenditure). Further interrelationships between the revenues and the total expenditure are also harnessed.

2 Literature review

The growth impact of fiscal policy has generated several comments in both theoretical and especially, empirical studies. There is a popular assertion in the empirical literature that public spending is negatively correlated with economic growth due to inefficiency of the public sector especially in the developing countries where large proportion of public spending is attributed to non-development expenditure like defense and interest payments on debt (Husnain et al., 2011).Moreover, most of these studies paid more attention to developed economies and the inclusion of developing countries, in case cross-country studies generate enough degrees of freedom in the course of statistical analysis (Aregbeyen, 2007).

Several hypotheses have been proposed to describe the inter-temporal relationship between government revenues and expenditures. First, the tax-and-spend hypothesis advanced by Friedman (1978) contended that changes in government revenues lead to changes in government expenditures. Friedman inferred that tax increases would only lead to expenditure increases, resulting in an inability to reduce budget deficits. Curiously, Buchanan and Wagner (1977) argued for the opposite relationship that decreased revenues lead to increased spending as consumers demand more programs. Empirically, this hypothesis is characterized by unidirectional causality running from government revenues to government expenditures.

The spend-and-tax hypothesis proposed that changes in government expenditures lead to changes in government revenues. Peacock and Wiseman (1979) advocated that temporary increases in government expenditures due to economic and political crises could lead to permanent increases in government revenues from taxation, often called the "displacement effect". Empirically, the spend-and-tax hypothesis is characterized by unidirectional causality running from government spending to government taxes.

Musgrave (1966) as well as Meltzer and Richard (1981) hypothesized that voters usually compare the marginal benefits and marginal costs of government services when formulating a decision in terms of the appropriate levels of government revenues and government expenditures. Thus, revenue and expenditure decisions are jointly determined under this fiscal synchronization hypothesis. Empirically, this hypothesis is characterized by contemporaneous feedback or bidirectional causality between government revenues and government expenditures.

A fourth hypothesis stated by Baghestani and McNown (1994) related to the institutional separation of the expenditure and taxation decisions of government. This perspective suggested that revenues and expenditures are independent of each other.

Empirically, this hypothesis is characterized by non-causality between government revenues and government expenditures.
Although the tax-and-spend, spend-and-tax, fiscal synchronization, and institutional separation hypotheses are easy to distinguish from one another, different studies on the same country result in different conclusions. The results from these empirical studies are sensitive to the sample period under examination, the degree of temporal aggregation, the inclusion of macroeconomic controls, and the choice of econometric methodology. In the case of the United States, Blackley (1986), Ram (1988), and Hoover and Sheffrin (1992) provided evidence to support the tax-and-spend hypothesis, while Anderson et al. (1986), Furstenberg et al. (1986), Jones and Joulfaian (1991), and Ross and Payne (1998) found support for the spend-and-tax hypothesis. Manage and Marlow (1986), Miller and Russek (1990), and Owoye (1995) suggested the fiscal synchronization hypothesis is valid for the United States, while Baghestani and McNown (1994) supported the institutional separation hypothesis.
In a study of Organization for Economic Co-operation and Development (OECD) countries, Joulfaian and Mookerjee (1991) found support for the tax-and-spend hypothesis in Italy and Canada; support for the spend-and-tax hypothesis in the United States, Japan, Germany, France, the United Kingdom, Austria, Finland, and Greece; and support for the fiscal synchronization hypothesis in Ireland.

3 Methodology

As mentioned earlier, this study focuses on modeling Nigerian total national expenditure (Y) and selected sources of revenue which are oil revenue (X_1), non-oil revenue (X_2), federation account (X_3) and federal government retained revenue (X_4). Yearly secondary data on these variables were sourced and collected from Nigerian Statistical Bulletin of the Central Bank for a period of forty two (42) years between 1970 and 2011. The selection of these periods is based on the perceived stability of government due to the halt of the Biafra war and also on the available information as to studying the relationship between cash flow from the aforementioned sources from which the Nigerian monetary flow is estimated.
The generic linear regression model to examine the effect or contribution of the various sources of revenue on the total expenditure is considered to be of the form:

$$LnY_i = \beta_0 + \beta_1 LnX_{1i} + \beta_2 LnX_{2i} + \beta_3 LnX_{3i} + \beta_4 LnX_{4i} + \varepsilon_i, \quad i = 1, 2, \ldots, 42 \quad (1)$$

where Y_i - total national expenditure, X_{1i} - oil revenue, X_{2i} - non-oil revenue, X_{3i} - revenue through federation account, X_{4i} - federal retained revenue, ε_i - error term.
Econometric techniques and estimators used for the data analysis include unit root test, cointegration test, combined estimators analysis, the error correction mechanism (ECM) and the Feasible Generalized Linear Estimators
The most widely adopted test of integration test over the past several years is the unit root test. This test is paramount on every time series data in order to determine

the order of integration of the variable. There are several methods for testing the presence of unit roots. Among the most widely used method is Augmented Dickey-Fuller (ADF) which is applied in this study (Dickey and Fuller, 1979).

The Granger causality (1969) test was developed by Granger. Its methodology can be briefly described as follows. Given stationary series X and Y, if better predictions of a given series Y can be obtained by adding to lagged values of Y current and lagged values of another given variable X, then X is said to Granger-cause Y. That is, X is said to precede temporally Y in that changes in X take place first than changes in Y. Three other possible results are the cases of unilateral causality from Y to X, bi-directional causality (or feedback), and independence. It is important to notice however that temporal precedence does not imply a cause and effect relationship, but establishing the order of temporal precedence between two variables can be very useful to understand the nature of several economic problems (Gujarati, 2003).

The cointegration analysis is to be performed after the order of integration of each variable has been determined. This is to examine whether the time series of these variables display a stationary process in a linear combination $y = f(x)$. Cointegration means that data from a linear combination of two or more variables can be stationary despite those variables being individually non-stationary (Engle and Granger, 1987). A presence of cointegration implies the existence of a long-term relationship between the endogenous and the exogenous variables. It is a remedial for spurious regression danger.

A number of methods for testing cointegration have been proposed in the literature. This study utilizes two stage Engle and Granger (1987) procedure. This test is the same as DF or ADF unit root test on the residuals estimated from the co-integrating regression. The procedures require (i) estimation of the long-run generic model as in (1), (ii) obtaining the residuals of the model, and (iii) applying the DF or ADF tests on the residual. Cointegration is said to exist if the individual regressor is non-stationary and the unit root hypothesis is rejected for the residual of the error term of the linear combination. It should be noted that all these tests are valid provided the order of integration of the variables is 1, I(1).

Combined estimators adopted in this paper are estimators recently proposed by Ayinde and Lukman(2014) for parameter estimation of linear regression model when both multicollinearity and autocorrelation are evident in a data set. The estimators combine the method of principal component estimation method in the presence of multicollinearity with the feasible generalized linear estimator for estimation in the presence of autocorrelation.

Unlike Morikawa (1994) who introduced a method of considering serial correlation of revealed and stated preference data which have complementary characteristics for model estimation using combined estimator for both data types, the combined estimators of this paper are as a result of the incorporation of each of Cochrane-Orcutt and maximum likelihood estimator for autocorrelation correction with principal component estimator for multicollinearity correction to handle the two problems

jointly.
The presence of cointegration indicates that at least one of the variables tested react to deviations from the long-run relationship. Here, the role of revenues in correction for disequilibrium was investigated. The dynamic causal link (or short-run dynamics) between the revenue variables and total expenditure was modeled as:

$$\Delta LnY_i = \theta_0 + \theta_1 \Delta LnX_{1i} + \theta_2 \Delta LnX_{2i} + \theta_3 \Delta LnX_{3i} + \theta_4 \Delta LnX_{4i} + \theta_5 ECT_{i-1} + \tau_i \quad (2)$$

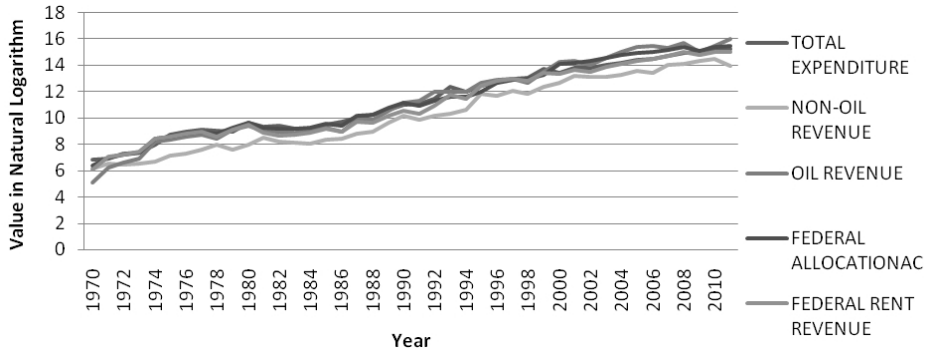
where ECT_{i-1} - error correction term from static regression equation (1), τ_i - error term.
The significance of ECT_{i-1}, implies that there exists adjustment mechanism of total expenditure as the response on the revenues changes.

4 Empirical results and discussion

Figure 1 reveals a steady increase in national total expenditure and the different sources of revenue in Nigeria. The non-oil revenue is generally and slightly below others over the years while others compete. The trend pattern is the same. Figure 2 reveals the graph of stationary levels of total expenditure and revenues' variables.

The results of the unit root test of the variables are provided in Table 1. From

Figure 1: Graphical Representation of Total Expenditure and various sources of revenue between 1970 and 2011

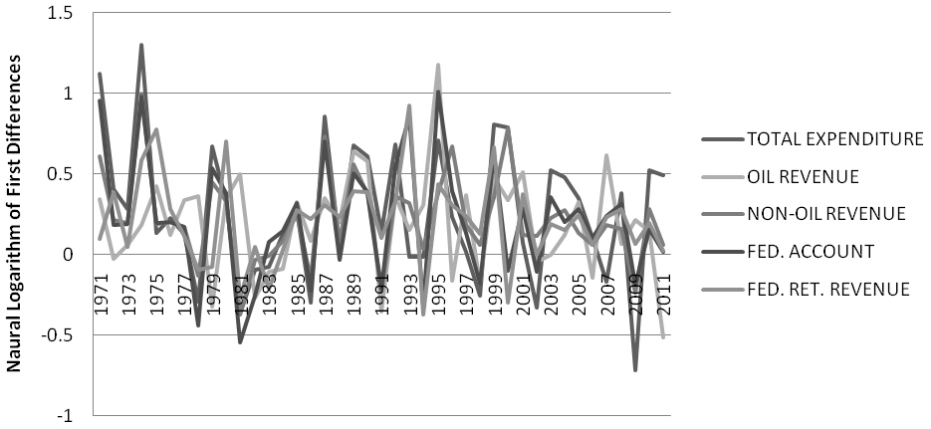


Source: Data collected from Nigerian Central Bank Statistical Bulletin.

the table, it can be seen that the Augmented Dickey-Fuller unit root tests of all the variables in their natural logarithm are non-stationary but their first differences are stationary. Thus, they are integrated of order one i.e. I(1).

The result of the Granger causality test in Table 2 reveals directional nature of the relationships between each of the revenues to the total expenditure. The causal

Figure 2: Graphical Representation of Total Expenditure and various sources of revenue at stationary level



Source: Data collected from Nigerian Central Bank Statistical Bulletin.

relationships of pairs of variables were examined at maximum lag 3 on the basis of the Aikaike Information Criterion.

It is deductible that there is a unilateral causality from oil revenue to total expenditure and non-oil revenue to total expenditure, suggestive of a tax-and-spend fiscal policy for these two categories of revenue. The non causality between federal account and total expenditure, and federal retained revenue and total expenditure is an indication of non-fiscal synchronization policy as regarding these two sources of revenues. Consequently, the regression model of total expenditure on revenue is adopted.

In an attempt to study the long-run relationship among the variables, the linear regression model (1) of original variables in their natural logarithm gives the result in Table 3.

From Table 3, it can be seen that estimation based on the OLS estimator produces residuals that are stationary even though the original variables in their natural logarithm are not stationary. Thus, the variables are cointegrated. This means that, by maintaining the trend, it seems that the effect of revenues on total expenditure in the long-run is unaffected despite the non-stationarity of the series in the short-run investigation. The validity of the normality assumption of residual (Jarque-Bera test) improves the quality of forecasts and is the key assumption in the standard testing procedure as in this study. Furthermore, the results reveals the existence and multicollinearity (Variance Inflation Factor, $VIF > 10$) and autocorrelation ($DW = 1.469121$) simultaneously. To determine the actual nature of contribution of each revenue on the total expenditure, correcting the autocorrelation problem necessitated the use of FGLS Cochrane-Orcutt (CORC) and maximum likelihood (ML) estimators

Table 1: Summary of the Unit Root Stationary Tests Using Augmented Dickey-Fuller (ADF) Statistic at lag zero.

Variable Status	Variable Name	Variable	Statistics	RWOC	RWC	RWCT
Original	Total National Expenditure	LnY	Value	4.31954	-0.810267	-2.3322
			P-value	1.0000	0.8056	0.408
	Oil Revenue	LnX_1	Value	3.33415	-1.49248	-3.22666
			P-value	0.9996	0.5274	0.09348*
	Non-Oil Revenue	LnX_2	Value	3.43775	-0.610824	-2.3923
			P-value	0.9997	0.8571	0.3779
	Federal Allocation	LnX_3	Value	4.44931	-1.14271	-2.07777
			P-value	1.0000	0.6896	0.5424
	Federal Rent Revenue	LnX_4	Value	3.21371	-1.2055	-2.44545
			P-value	0.9995	0.663	0.3521
1st Difference	Total National Expenditure	ΔLnY	Value	-5.0409	-7.87435	-7.84668
			P-value	5.005e-006***	5.336e-008***	1.187e-007***
	Oil Revenue	ΔLnX_1	Value	-5.4603	-7.13188	-7.05066
			P-value	8.965e-007***	3.644e-007***	2.401e-006***
	Non-Oil Revenue	ΔLnX_2	Value	-5.42321	-7.38954	-7.2766
			P-value	1.052e-006***	1.824e-007***	1.08e-006***
	Federal Allocation	ΔLnX_3	Value	-4.67877	-6.86827	-6.81964
			P-value	1.924e-005***	7.576e-007***	5.246e-006***
	Federal Rent Revenue	ΔLnX_4	Value	-5.0409	-7.87435	-7.84668
			P-value	5.005e-006***	5.336e-008***	1.187e-007***

Note: RWOC - random walk model without constant, RWC - random walk model with constant, RWCT - random walk model with constant and linear trend.

Table 2: Granger Causality Test

Direction of Causality (H_0)	F	p-value	Direction of Causality (H_0)	F	p-value	Conclusion
$\Delta LnY \rightarrow \Delta LnX_1$	3.3663	0.0746	$\Delta LnX_1 \rightarrow \Delta LnY$	8.0844	0.007228*	$\Delta LnX_1 \rightarrow \Delta LnY$
$\Delta LnY \rightarrow \Delta LnX_2$	0.3931	0.5345	$\Delta LnX_2 \rightarrow \Delta LnY$	13.016	0.000908*	$\Delta LnY \rightarrow \Delta LnX_2$
$\Delta LnY \rightarrow \Delta LnX_3$	1.5838	0.2161	$\Delta LnX_3 \rightarrow \Delta LnY$	0.0322	0.8585	None causes the other
$\Delta LnY \rightarrow \Delta LnX_4$	1.0547	0.3111	$\Delta LnX_4 \rightarrow \Delta LnY$	3.0691	0.08808	None causes the other

* indicates significance at 1%

of which the CORC estimator is better, having considered some statistics like the value of standard error of the regression, adjusted co-efficient of determination and Schwarz B.I.C. statistics. However, the problem of multicollinearity is still unresolved; and this was addressed using the combined estimators' analysis. The results of the combined estimators are provided in Tables 4 and 5. However, the best ones, CORCPC123 and MLPC123, are extracted and given in Table 3. The diagnostic statistics of the best combined estimators suggest a preference of MLPC123 over CORCPC123. Hence, any estimated linear regression equation from Table 3 is a cointegrating regression and

Table 3: Results of the cointegrating regression of various estimators of the model

Variable/ Statistic	OLS Estimator	COCR Estimator	ML Estimator	VIF	Best Combined Estimator	
					CORCPC123	MLPC123
Constant	1.07067 (0.0003)***	1229.55 (0.996)	0.715051 (0.053)*		0.75414	0.79343
LnX_1	0.263592 (0.0618)*	−0.25026 (0.067)*	−0.020517 (0.922)	135.97	0.051560	0.036757
LnX_2	0.359067 (0.0028)***	0.057874 (0.573)	0.311351 (0.004)***	71.784	0.31057	0.32976
LnX_3	−0.0300243 (0.8772)	−0.052971 (0.801)	0.201503 (0,391)	220.98	0.13760	0.13307
LnX_4	0.354916 (0.0183)**	0.700777 (0.000)***	0.484762 (0.005)***	112.32	0.47339	0.47187
RHO		0.9999 (0.000)***	0.446881 (0.023)**		0.402420	0.409623
Standard Error of Regression	0.227923	0.210442	0.218012		**0.082225**	**0.081306**
DW	1.469121 (0.0117)**	2.1829	2.01778		1.79914	2.00759
Jarque-Bera Test	0.307879 (0.857324)	0.591051 (0.74414)	0.919385 (0.631478)		0.717695 (0.6985)	1.05417 (0.5903)
Schwarz B.I.C.	4.17047	2.1707	3.70429		-38.9311	-40.35
R2 Adjusted	0.992400	0.99321	0.993057		**0.99289**	**0.99340**
Stationary of Residual	−4.92004 (0.03667)				−6.46854 (0.0000)	−6.3675 (0.0000)

Table 4: Summary of results based on COCRPC combined estimator

Variable / Statistic	COMBINED ESTIMATOR			
	CORCPC1	CORCPC12	CORCPC123	CORCPC1234
Constant	0.89216	0.93029	0.75414	0.70113
LnX_1	0.21619	0.16399	0.051560	0.0015764
LnX_2	0.24338	0.32641	0.31057	0.30369
LnX_3	0.23958	0.22884	0.13760	0.18753
LnX_4	0.24995	0.23412	0.47339	0.48446
Rho	0.283045	0.324029	0.402420	0.438409
Standard Error of Regression	0.082807	0.083287	**0.082225**	0.083322
DW	1.79894	1.81908	1.79914	1.82418
Schwarz B.I.C.	-41.2762	-39.7151	-38.9311	-37.0923
R2 Adjusted	0.99279	0.992701	**0.99289**	0.99270

this regression is not spurious. There is a long run relationship among the variables with the effect of non-oil revenue and federal retained revenue statistically significant ($p - value < 0.01$).

For comparative examination of the estimators; OLS, CORCPC123 and MLPC123; their residuals were used to link the long-run with the short-run effects using the

model in (2) which is in turn estimated using OLS, CORC and ML procedures. The summary of the results is given in Table 6 and 7.

Table 5: Summary of results based on MLPC combined estimator

Variable / Statistic	COMBINED ESTIMATOR			
	MLPC1	MLPC12	MLPC123	MLCPC1234
Constant	0.97103	0.97736	0.79343	0.71086
LnX_1	0.21455	0.14564	0.036757	-0.020576
LnX_2	0.24153	0.35367	0.32976	0.31148
LnX_3	0.23777	0.22443	0.13307	0.20157
LnX_4	0.24805	0.22795	0.47187	0.48463
Rho	0.291459	.334331	0.409623	0.446679
Standard Error of Regression	0.083052	0.082490	**0.081306**	0.082259
DW	1.98943	1.98640	2.00759	2.01817
Schwarz B.I.C.	-42.2030	-41.0987	-40.3495	-38.5266
R2 Adjusted	0.99311	0.99320	**0.99340**	0.99324

Table 6: Summary of results of the short run relationship with OLS and CORCPC123 residuals

Variable / Statistic	OLS RESIDUAL	CORCPC123 RESIDUAL			VIF
	OLS Estimate	OLS Estimate	CORC Estimate	ML Estimate	
Constant	0.097579 (0.015)**	0.10883 (0.008)***	0.118277 (0.004)***	0.106451 (0.018)**	
ΔLnX_1	−0.0951 (0.47)	−0.147622 (0.262)	−0.112557 (0.294)	−0.143867 (0.189)	3.711
ΔLnX_2	0.177064 (0.08)*	0.140193 (0.161)	0.134625 (0.076)*	0.140135 (0.070)*	1.220
ΔLnX_3	−0.10174 (0.597)	−0.093198 (0.635)	−0.146468 (0.332)	−0.1129 (0.461)	3.657
ΔLnX_4	0.561535 (0.000)***	0.600680 (0.000)***	0.637184 (0.000)***	0.607775 (0.000)***	3.030
$ECM(-1)$	−0.540728 (0.001)***	−0.518035 (0.001)***	−0.666771 (0.000)***	−0.70673 (0.000)***	1.112
Residual of Regression	0.189831	0.180392	0.167777	0.176158	
RHO			0.311848 (0.073)*	0.374303	
DW	1.67956 (0.15626)	1.49200 (0.05696)*	1.92631	1.84275	
Jarque-Bera Test	0.864573 (0.649)	0.588873 (0.745)	0.451878 (0.797767)	0.455721 (0.796235)	
Schwarz B.I.C.	-4.99505	-4.14399	-5.58359	-4.07612	
R^2 Adjusted	0.594906	0.577734	0.644577	0.658809	

Table 7: Summary of results of the short run relationship with OLS and MLPC123 residuals

Variable / Statistic	OLS RESIDUAL	CORCPC123 RESIDUAL			VIF
	OLS Estimate	OLS Estimate	CORC Estimate	ML Estimate	
Constant	0.097579 (0.015)**	0.109759 (0.008)***	0.119505 (0.004)***	0.107304 (0.019)**	
ΔLnX_1	−0.0951 (0.47)	−0.155423 (0.242)	−0.116783 (0.279)	−0.152472 (0.169)	3.711
ΔLnX_2	0.177064 (0.08)*	0.142527 (0.160)	0.140231 (0.067)*	0.145492 (0.064)*	1.220
ΔLnX_3	−0.10174 (0.597)	−0.091655 (0.644)	−0.148777 (0.327)	−0.11273 (0.467)	3.657
ΔLnX_4	0.561535 (0.000)***	0.601885 (0.000)***	0.6378 (0.000)***	0.607845 (0.000)***	3.030
$ECM(-1)$	−0.540728 (0.001)***	−0.505334 (0.002)***	−0.664423 (0.000)***	−0.700087 (0.000)***	1.112
Residual of Regression	0.189831	0.182253	0.168580		
RHO			0.308484 (0.076)*	0.373873 (0.034)*	
DW	1.67956 (0.1563)	1.49988 (0.059985)*	1.92631	1.84275	
Jarque-Bera Test	0.864573 (0.649)	0.435145 (0.804)	0.428634 (0.807092)	0.290162 (0.864952)	
Schwarz B.I.C.	-4.99505	-3.72306	-5.39268	-3.57618	
R^2 Adjusted	0.594906	0.568974	0.641223	0.587839	

From Table 6 and 7, it can be seen that estimation based on all the estimators reveal that the effect of $ECT(-1)$ and federal retained revenue to be very significant in explaining the national total expenditure. The estimation based on OLS estimator using the combined residuals reveals the presence of autocorrelation which necessitated the use of FGLS (CORC and ML) estimators. Moreover, that of CORC and ML estimators with CORCPC123 residual is better considering the standard error of the regression and the adjusted co-efficient of determination.
The significant contribution of the estimated coefficient of $ECT(-1)$suggests that the last period (year) disequilibrium in revenues is corrected in the following year by 66.68% and 70.67% as revealed by the CORC and ML respectively. The negativity of co-efficient of $ECT(-1)$ is an indication of movement back to equilibrium. Thus, there exists adjustment mechanism of current total expenditures as the response on the past revenue changes. The total expenditure adjusts to the past revenue change by 66.68%.

5 Conclusions and recommendations

In this study, using annual data for government expenditures and revenues over the period 1970 to 2011 and modern time series econometric techniques, it has been established that expenditures and revenues share a long-run relationship, indicating that deviations in the short-run total expenditure will be adjusted towards the long-run value. Furthermore, from the value of the coefficient of the error correction term (66.67%), it has been observed that this adjustment is well paced and that the total expenditure will take a considerably short period to be in equilibrium with the revenues. The government total expenditure and revenues exhibit a stable relationship in the long run with the effect of non-oil revenue and federal retained revenue significant whereas it is only latter that is significant in the short run. and that it can be concluded that the revenue variables- oil revenue, federal statutory allocation and federal government retained revenue have significant contribution to Nigeria total expenditure. Consequently, towards achieving good economic growth and development through total expenditure in Nigeria, attention need to be focused on using revenue from oil and federation account, among other things.

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