

Fiscal Policy and Economic Growth in Nigeria Using ARDL, DOLS and FMOLS Estimators

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ABSTRACT

This study investigates the long run relationship between fiscal policy and economic growth in Nigeria using the Autoregressive Distributed Lag (ARDL), Dynamic Ordinary Least Squares (DOLS) and Fully Modified Ordinary Least Squares (FMOLS) estimators. A set of annual data from 1981 to 2023 were employed, with RGDP as the dependent variable and seven explanatory variables. The stationarity of the data was analyzed using Phillips–Perron and KPSS tests, and a significant long-run relationship was confirmed by the ARDL bounds test ($F = 6.7537$, $p < 0.01$). The ARDL estimates indicate positive and significant long run relationships for total government expenditure, non-oil revenue and federation account statutory allocation, while there is a negative relationship for total exports at the 10% level. The error correction coefficient (-0.1310) suggests over time, there will be adjustments towards long run equilibrium. DOLS and FMOLS estimates vary in size, magnitude and significance, thus reflecting estimator sensitivity. The results highlight the importance of enhancing the efficiency of non-oil revenues mobilization and public expenditure efficiency for sustainable economic growth.

Keywords: Fiscal Policy, Economic Growth, ARDL, DOLS, FMOLS.

INTRODUCTION

In recent times, global economic uncertainties have become a constant feature of the global economic landscape, including continued inflationary pressures, geopolitical pressures, supply chain disruptions, growing public debt levels, and increasingly stringent financial conditions, which has further emphasized the need for fiscal policy as a key instrument for maintaining macroeconomic stability and sustainable economic growth. The external shocks have put more pressure on governments to take prudent fiscal action to build economic resilience, ensure fiscal sustainability, and reduce the negative impact on domestic economies from external shocks (IMF, 2025; IMF, 2026; OECD, 2026). Over the last fifty years, governments in both advanced and developing countries have turned to fiscal policy as an increasingly popular tool for boosting aggregate demand, increasing public investment in infrastructure, enhancing social welfare, and creating long-term economic development. Thus, efficient public expenditure, enhanced domestic revenue collection, prudent debt management and prudent public financial management have been encouraged in effective fiscal policy with a view to fiscal sustainability and inclusive growth (IMF, 2024; Ojo et al., 2026). The connection between fiscal policy and economic growth has been a relevant theme in macroeconomic research ever since the fiscal policy directly affects investment, employment, productivity, capital accumulation, and aggregate demand. Keynesian theory suggests that during slowdowns in the economy, expansionary fiscal policies increase aggregate demand, while endogenous growth theory suggests that productive public spending on infrastructure, education, health, research, and technological innovation will boost productivity and lead to continuous long-term economic growth (Keynes, 1936; Barro,

1990; Mankiw, 2022). Recent reviews and theoretical investigations still confirm these channels, noting that the strength of the growth impact of fiscal policy critically relies on the composition and quality of public spending (Poylov, 2023). Empirical studies in recent times have also confirmed that fiscal policy effectiveness is more determined by institutional quality, fiscal discipline, revenue collection and expenditure efficiency, and not necessarily by the magnitude of government spending (Olukotun et al., 2026; Ojo et al., 2026). The fiscal policy–economic growth link is relevant to the Nigerian context because Nigeria is a longstanding crude oil dependent country, with frequent fiscal deficits and the creation of high levels of public debt, with high exchange rate volatility, and with the government seeking to diversify its revenue sources. The Federal Government has carried out significant fiscal reforms since 2023, such as the phasing out of fuel subsidies, liberalization and unification of the foreign exchange market, reforms to improve tax administration, and general measures to improve domestic revenue mobilization and fiscal sustainability. The reforms have made the macroeconomic situation more resilient and investor confidence stronger, but also come with high inflationary pressures and cost-of-living issues (IMF, 2024, 2025). Despite these reforms, the Nigerian economy still suffers from inflation, debt servicing problems, infrastructure deficits, and poverty, among other challenges, which indicate that the economy requires more efficient fiscal management and sustainable revenue generation (IMF, 2024; Olukotun et al., 2026).

Existing empirical evidence on the relationship of fiscal policy and economic growth in Nigeria is inconclusive, with some studies finding a positive relationship between fiscal policy and economic growth while others find the opposite. This is because of differences in fiscal indicators, estimation method, sample period and structural change in the data used for the analysis. Ojo et al. (2026) used the autoregressive distributed lag (ARDL) with structural stability approach to investigate the relationship between economic growth and fiscal policy in Nigeria. They found that every exploratory variable was significant and had a positive effect on RGDP with the exception of Oil Revenue (OIRE), Total Federally Collected Revenue (TFCR) and the Federal Government Retained Revenue (FGRR). In the study of the relationship between fiscal policy, debt management and economic development in Nigeria, Olukotun et al. (2026) used Auto-regressive Distributed Lag model. They discovered fiscal policy variables and debt-management variables were significant determinants of economic performance and that the effects of each of these variables depended on institutional quality, fiscal discipline and debt sustainability. In examining the effect of fiscal policies instruments on economic growth in Nigeria, Hussaini (2026) used the technique of Vector Error Correction Model (VECM). They found that government investment in capital and Value Added Tax is a significant contributor to the country's economic growth and hence they believe that if these can be utilized in a proper manner, they will be very useful for the sustainable economic growth of the country. Aako et al (2026) conducted using ARDL method and the Bai – Perron structural break approach on the impact of fiscal policy measures on Nigeria's economy. They found that Total Government Expenditure and Non-Oil Revenue and Federation Account Statutory Allocation have significant and positive impacts on economic growth, irrespective of the treatment of structural breaks.

Aiming to study the relationship between government expenditure, inflation and economic growth in Nigeria, Ajagbe and Aremu (2026) adopted ARDL technique coupled with structural break analysis. Their analysis found that there was a big positive long-term effect on economic growth from government spending, showing how important it is to take structural changes into account to make fiscal policy estimates more reliable and stable. Aliyu and Salisu (2022) used Bootstrap Autoregressive Distributed Lag (BARDL) technique with structural break to investigate the causality between government expenditure and economic growth in Nigeria. Their work revealed that there is a major long-run relationship between government spending and growth after including structural breaks. Adiele et al. (2024) employed the ARDL technique and Zivot-Andrews and Bai-Perron structural break techniques to explore the monetary policy and economic growth relationship in Nigeria. They found that incorporating a structural break is essential to improve model performance and to make more credible long-run estimates, demonstrating the importance of dealing with regime-switching in macroeconomic policy analysis. Moreover, Okonkwo et al., (2024) used ARDL with structural breaks to analyze the relationship between monetary policy and economic growth in Nigeria. Their research revealed that structural instability is one of the factors which could affect long term relationship between the monetary policy and the economic growth and stressed the importance of taking the structural instability into account in macroeconomic analysis. David et al. (2024) used BARDL, Dynamic Ordinary Least Squares (DOLS), Fully Modified Ordinary Least Squares (FMOLS) and Canonical Cointegrating Regression (CCR) to examine the relationship between oil rents, corruption and economic growth in Nigeria. They found that both oil rents and corruption played an important

role in economic growth and robustness analyses for the empirical results revealed a stable long-run relationship between the variables and also drew attention to the necessity of robustness analyses for confirming empirical results. Nudegbesi et al. (2026) investigated the robustness estimator namely FMOLS and DOLS to examine the relationship between digitalisation and economic growth in Nigeria. Their study proved that in the long run period, digitisation showed little effect on the economic growth and development, while on the contrary Human capital development showed a significant contribution to the economic performance, this is why they added that human capital development is complementary to digitisation in the context of sustainable economic growth in the state of Azerbaijan. In his work, Keremah (2026), investigated the relationship between fintech adoption and the financing of startups in Nigeria using DOLS method and FMOLS method. Their research revealed that the use of fintech led to a remarkable improvement in access to finance for SMEs, underlining the significance of alternative long-term estimators in measuring economic relationships and in contributing to long-term economic growth.

The method of ARDL has been the primary method adopted in the literature and the use of other long run co-integration estimators like FMOLS and DOLS in a complete framework of fiscal policy–economic growth is relatively scarce. Although the related use of their model, e.g. for studies involving the oil rents, corruption, foreign direct investment, financial development, digitalisation and the adoption of financial technology has been relatively weak, their comparative use with ARDL to a broad range of fiscal policy indicators for Nigeria has been comparatively under-investigated. The degree of stability of the long-run reaction of economic growth to different types of fiscal policy indicators is only very weakly supported by empirical evidence. This is particularly important since the magnitudes, directions and statistical significance of the coefficients may be different for various estimators depending on the method of incorporating the impact of endogeneity, serial correlation and long-run dynamics. Thus, using complementary estimation techniques like ARDL, DOLS and FMOLS offers a chance to examine the sensitivity and stability of the long-run relationship from various methodological perspectives (David et al., 2024; Sehli & Mili, 2026). Thus, the study is based on fiscal policy and economic growth relationship in Nigeria adopting ARDL, DOLS and FMOLS estimation technique. The study compares the estimated long-run coefficients of the different complementary estimation methods to assess the sensitivity of the fiscal policy–economic growth relationship and the impact of the different fiscal policy indicators to the choice of the estimator.

METHODOLOGY

Econometric Model Specification

The study uses data obtained from the Central Bank of Nigeria (CBN) Bulletin, spanning the period of 1981-2023. It builds on the theories of fiscal policy and economic growth, which argue that fiscal policy and other macroeconomic variables have an impact on economic performance.

A functional relationship can be represented in logarithm form such as:

$$\ln RGDP_t = f(\ln TEXP_t, \ln OIRE_t, \ln NORE_t, \ln TFCR_t, \ln FDAS_t, \ln FGRR_t, \ln TOEX_t) \quad (1)$$

The econometric model is:

$$\ln RGDP_t = \beta_0 + \beta_1 \ln TEXP_t + \beta_2 \ln OIRE_t + \beta_3 \ln NORE_t + \beta_4 \ln TFCR_t + \beta_5 \ln FDAS_t + \beta_6 \ln FGRR_t + \beta_7 \ln TOEX_t + \varepsilon_t \quad (2)$$

where, (RGDP) represents Real Gross Domestic Product, (TEXP) denotes Total Government Expenditure, (OIRE) equals Oil Revenue, (NORE) denotes Non-Oil Revenue, (TFCR) represents Total Federally Collected Revenue, (FDAS) deduced Federation Account Statutory, (FGRR)= Federal Government Retained Revenue, (TOEX) equals Total Exports, (ε) is Stochastic error term.

Unit Root Test

The stationarity properties of the variables are tested first for the Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root tests before model estimation.

Phillips-Perron Test

The PP test is specified as:

$$\Delta Y_t = \alpha + \beta t + \delta Y_{t-1} + \sum_{i=1}^k \gamma_i \Delta Y_{t-i} + \varepsilon_t \quad (3)$$

KPSS Test

The KPSS model is:

$$Y_t = \xi_t + r_t + \varepsilon_t \quad (4)$$

where:

$$r_t = r_{t-1} + u_t \quad (5)$$

ARDL Bounds Co-integration Test

To ascertain the long-run relationship among fiscal policy and economic growth in Nigeria, the study adopts the method of bounds testing ARDL model. The one of the reasons for the suitability of ARDL approach to this application is the fact that the order of the regressors used in the study is I(0) and I(1), with no I(2). The method further allows the estimation of the short run dynamics and the long run equilibrium relationships simultaneously in one. The unrestricted ARDL model is represented as:

$$\begin{aligned} \Delta \ln GDP_t = & \alpha_0 + \sum_{i=1}^p \alpha_i \Delta \ln RGDP_{t-i} + \sum_{i=0}^{q_1} \beta_i \Delta \ln TEXP_{t-i} + \sum_{i=0}^{q_2} \gamma_i \Delta \ln OIRE_{t-i} + \sum_{i=0}^{q_3} \delta_i \Delta \ln NORE_{t-i} + \\ & \sum_{i=0}^{q_4} \phi_i \Delta \ln TFCR_{t-i} + \sum_{i=0}^{q_5} \lambda_i \Delta \ln FDAS_{t-i} + \sum_{i=0}^{q_6} \theta_i \Delta \ln FGRR_{t-i} + \sum_{i=0}^{q_7} \psi_i \Delta \ln TOEX_{t-i} + \eta_1 \ln RGDP_{t-1} + \\ & \eta_2 \ln TEXP_{t-1} + \eta_3 \ln OIRE_{t-1} + \eta_4 \ln NORE_{t-1} + \eta_5 \ln TFCR_{t-1} + \eta_6 \ln FDAS_{t-1} + \eta_7 \ln FGRR_{t-1} + \\ & \eta_8 \ln TOEX_{t-1} + \varepsilon_t \end{aligned} \quad (6)$$

The symbol Δ represents the first-difference operator, p and q_i represent the appropriate lag orders, α_0 is the intercept, η_i are the coefficients of the lagged-level variables, and ε_t is the stochastic error term.

The hypotheses are specified as:

$$H_0 = \eta_1 = \eta_2 = \eta_3 = \eta_4 = \eta_5 = \eta_6 = \eta_7 = \eta_8 = 0 \quad (7)$$

(No long-run relationship exists among the variables)

$$H_1: \text{At least one } \eta_i \neq 0, i = 1, 2, \dots, 8 \quad (8)$$

Long-Run ARDL Model

Once a long-run relationship has been confirmed using the ARDL bounds test, the long run coefficients are estimated by ARDL model:

$$\ln RGDP_t = \beta_0 + \beta_1 \ln TEXP_t + \beta_2 \ln OIRE_t + \beta_3 \ln NORE_t + \beta_4 \ln TFCR_t + \beta_5 \ln FDAS_t + \beta_6 \ln FGRR_t + \beta_7 \ln TOEX_t + \varepsilon_t \quad (9)$$

The coefficients $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$, and β_7 represent the long-run effects of the respective explanatory variables on economic growth.

ARDL Model Estimation and Error Correction Representation

Once co-integration is determined, the short-run dynamics of the relationship are investigated, as well as the rate at which the series adjust to their long-run equilibrium, using the Error Correction Model (ECM):

$$\Delta \ln RGDP_t = \alpha_0 + \sum_{i=1}^{p-1} \alpha_i^* \Delta \ln RGDP_{\{t-i\}} + \sum_{j=0}^{q1-1} \beta_j^* \Delta \ln TEXP_{\{t-j\}} + \sum_{j=0}^{q2-1} \gamma_j^* \Delta \ln OIRE_{\{t-j\}} + \sum_{j=0}^{q3-1} \delta_j^* \Delta \ln NORE_{\{t-j\}} + \sum_{j=0}^{q4-1} \theta_j^* \Delta \ln TFCR_{\{t-j\}} + \sum_{j=0}^{q5-1} \lambda_j^* \Delta \ln FDAS_{\{t-j\}} + \sum_{j=0}^{q6-1} \omega_j^* \Delta \ln FGRR_{\{t-j\}} + \sum_{j=0}^{q7-1} \psi_j^* \Delta \ln TOEX_{\{t-j\}} + \varphi ECM_{\{t-1\}} + \varepsilon_t \quad (10)$$

The lagged error correction term is defined as:

$$ECM_{\{t-1\}} = \ln RGDP_{\{t-1\}} - \beta_1 \ln TEXP_{\{t-1\}} + \beta_2 \ln OIRE_{\{t-1\}} + \beta_3 \ln NORE_{\{t-1\}} + \beta_4 \ln TFCR_{\{t-1\}} + \beta_5 \ln FDAS_{\{t-1\}} + \beta_6 \ln FGRR_{\{t-1\}} + \beta_7 \ln TOEX_{\{t-1\}} \quad (11)$$

The coefficient φ measures the speed of adjustment toward long-run equilibrium following a short-run shock.

Fully Modified Ordinary Least Squares (FMOLS) Estimation

The robustness of the long run ARDL estimates is tested by using the FMOLS estimator suggested by Phillips and Hansen (1990). The FMOLS model is suitable for co-integrated systems as it is used to eliminate the possible endogeneity bias and serial correlation, leading to consistent long-run estimates of the coefficients.

The general FMOLS model is:

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \dots + \beta_k X_{kt} + \varepsilon_t \quad (12)$$

While, the FMOLS model is specified as:

$$\ln RGDP_t = \beta_0 + \beta_1 \ln TEXP_t + \beta_2 \ln OIRE_t + \beta_3 \ln NORE_t + \beta_4 \ln TFCR_t + \beta_5 \ln FDAS_t + \beta_6 \ln FGRR_t + \beta_7 \ln TOEX_t + \varepsilon_t$$

The FMOLS estimates are compared with the long-run ARDL estimates in terms of the direction, magnitude, and statistical significance of the coefficients to assess the robustness of the estimated fiscal policy–economic growth relationship.

Dynamic Ordinary Least Squares (DOLS) Estimation

As a further robustness technique, the study uses the DOLS estimator proposed by Stock and Watson (1993). DOLS estimates of the co-integrating relationship allow for the endogeneity and serial correlation that could be present.

A general specification of multiple regressors is:

$$Y_t = \beta_0 + \sum_{i=1}^k \beta_i X_{it} + \sum_{j=-q}^q \gamma_{ij} \Delta X_{i,t-j} + \varepsilon_t \quad (13)$$

While, the DOLS model is specified as:

$$\ln RGDP_t = \beta_0 + \beta_1 \ln TEXP_t + \beta_2 \ln OIRE_t + \beta_3 \ln NORE_t + \beta_4 \ln TFCR_t + \beta_5 \ln FDAS_t + \beta_6 \ln FGRR_t + \beta_7 \ln TOEX_t + \sum_{j=-q}^q \gamma_{1j} \Delta \ln TEXP_{t-j} + \sum_{j=-q}^q \gamma_{2j} \Delta \ln OIRE_{t-j} + \sum_{j=-q}^q \gamma_{3j} \Delta \ln NORE_{t-j} + \sum_{j=-q}^q \gamma_{4j} \Delta \ln TFCR_{t-j} + \sum_{j=-q}^q \gamma_{5j} \Delta \ln FDAS_{t-j} + \sum_{j=-q}^q \gamma_{6j} \Delta \ln FGRR_{t-j} + \sum_{j=-q}^q \gamma_{7j} \Delta \ln TOEX_{t-j} + \varepsilon_t \quad (14)$$

where q represents the number of leads and lags included in the DOLS specification, while γ_{ij} represents the coefficients of the first differences of the explanatory variables. The estimates from the DOLS model are then compared with those of the ARDL and FMOLS to reveal consistency across alternative co-integration estimators. Large coefficient values in all three approaches, and agreement in coefficient sign and their statistical significance, strengthens the evidence of a long-run relationship, and if there is a significant difference, it strengthens the evidence that the estimator is sensitive.

Diagnostic and Stability Tests

Breusch-Godfrey Serial Correlation Test

Breusch–Godfrey test is a statistical test that seeks to identify whether a regression model has serial correlation in its residuals.

$$LM = nR^2 \quad (15)$$

Breusch-Pagan Heteroskedasticity Test

A Breusch–Pagan test is a heteroskedasticity test for a regression model.

$$BP = nR^2 \quad (16)$$

Jarque-Bera Normality Test

This test is frequently used in diagnostics to check the normality assumption of the regression residuals.

$$JB = \frac{n}{6} \left[S^2 + \frac{(k-3)^2}{4} \right] \quad (17)$$

Newey–West Heteroskedasticity and Autocorrelation Consistent (HAC) Standard Errors

HAC standard errors are estimated using the Newey–West method, as these may be present in the regression disturbances. This method gives a consistent estimation of the covariance matrix even when heteroskedasticity and serial correlation exist, and makes statistical inference more reliable. The Newey–West covariance matrix estimator is:

$$\hat{V}_{NM} = (X'X)^{-1} \hat{\Omega} (X'X)^{-1} \quad (18)$$

CUSUM Test

CUSUM (Cumulative Sum) Test is a diagnostic method for the analysis of the stability of the regression coefficients in time.

$$CUSUM_t = \frac{\sum_{i=k+1}^t w_i}{\sqrt{\sum_{i=k+1}^T w_i^2}} \quad (19)$$

where, n represents the total number of observations, and R^2 denotes the coefficient of determination obtained from the auxiliary regression, S represents the sample skewness, K denotes the sample kurtosis, $K - 3$ represents the excess kurtosis, The Newey–West covariance matrix estimator is denoted by $\hat{V}_{NM}$, X represents the matrix of explanatory variables, X' denotes the transpose of X , $(X'X)^{-1}$ represents the inverse of the information matrix. Furthermore, $\hat{\Omega}$ denotes the estimated covariance matrix of the error terms adjusted for both heteroskedasticity and autocorrelation. The recursive residual is denoted by (w_i) , where k represents the number of parameters estimated in the model, t denotes the time period under consideration, and T represents the total number of observations.

RESULTS AND DISCUSSION

Table 1: Phillips-Perron (PP) and KPSS Unit Root Test Results

Variable	PP (Level)	PP (1st Diff.)	KPSS (Level)	KPSS (1st Diff.)	Integration Order
	PP_I0	PP_I1	KPSS_I0	KPSS_I1	
RGDP	0.5407	0.0472	0.01	0.1	I(1)
TEXP	0.8644	0.01	0.01	0.1	I(1)
OIRE	0.9801	0.01	0.01	0.0827	I(1)
NORE	0.6787	0.01	0.01	0.1	I(1)
TFCR	0.99	0.01	0.01	0.0542	I(1)
FDAS	0.9765	0.01	0.01	0.1	I(1)
FGRR	0.9671	0.01	0.01	0.1	I(1)
TOEX	0.9331	0.01	0.01	0.1	I(1)

Source: Rstudio Computation, 2026

Table 1 shows the results of the unit root tests for each study variable at level by using the PP and KPSS tests. At first difference, the PP test rejected the null hypothesis of a unit root and the KPSS test failed to reject the null hypothesis of stationarity for all variables. As a result, all variables are stationary after taking the first differences, which means that they are I(1) stationary. Based on the results, it is suggested that the series under consideration have long-run stochastic trends and the analysis of long-run relationships between the variables is suggested to be performed by co-integration techniques.

Table2: ARDL Model Estimation (Dependent Variable: RGDP)

Variable	Coefficient	Std. Error	t-Statistic	P-value
Constant	1.37221	0.41878	3.277	0.00331
RGDP(-1)	0.86896	0.0428	20.304	0
TEXP	-0.0145	0.10037	-0.144	0.88638
TEXP(-1)	0.19269	0.1073	1.796	0.08567
TEXP(-2)	-0.04622	0.03789	-1.22	0.2349
OIRE	0.13835	0.13666	1.012	0.32188
OIRE(-1)	-0.04172	0.02297	-1.817	0.08235
NORE	0.11978	0.05121	2.339	0.02839
TFCR	-0.14758	0.18351	-0.804	0.42951
FDAS	0.0585	0.02692	2.173	0.04031
FDAS(-1)	-0.05713	0.04681	-1.221	0.23463
FDAS(-2)	0.09201	0.03255	2.826	0.00957
FGRR	-0.11073	0.04848	-2.284	0.03193
FGRR(-1)	0.15399	0.04992	3.085	0.00523
FGRR(-2)	-0.06313	0.03511	-1.798	0.08531
TOEX	0.05292	0.11482	0.461	0.64918
TOEX(-1)	-0.30171	0.1171	-2.577	0.01687

Source: Rstudio Computation, 2026

The short-run results of ARDL in Table 2 reveal that the coefficient of the variable of RGDP is positive and highly significant ($\beta = 0.86896$, $p < 0.01$) which suggests high persistence in economic growth. The NORE is positively related and statistically significant with RGDP, which indicates the significance of non-oil revenue in aiding economic activity. The contemporaneous impact of TEXP is not significant, and the lagged impact has a positive and significant relationship at 10% level, suggesting that the growth response to government expenditure is lagged. A weak negative lagged association is evident in OIRE while positive and significant contemporaneous and second-period lagged effects can be seen in FDAS. The coefficient for FGRR is negative in the current period, but positive in the lagged period. The lagged relationship between Total Exports (TOEX) and future RGDP is slightly negative, or -0.03 as shown by the lagged coefficient. The results suggest that non-oil revenue, government expenditure, revenue allocation, and exports play important roles in the short-run dynamics of economic growth.

Table 3: ARDL Bounds Test

Test	Statistic	p-value
Bounds F-Test	6.7537	0.000075

Source: Rstudio Computation, 2026

Table 3 shows the results of the ARDL bounds test for the long-run relationship between RGDP and the explanatory variables. The calculated F-statistic is 6.7537, which is higher than the upper bound of the critical value at the 1% level of significance, so the null hypothesis of no long run relationship is rejected. Therefore, the results suggest that there is a long run equilibrium relationship between economic growth, fiscal policy variables and total exports during the study period. Since co-integration is found, the long-run coefficients are estimated, and the error-correction model is estimated in order to study both the long-run relationship and the short-run adjustment process.

Table 4: Long-Run ARDL Coefficients

Variable	Coefficient	Std. Error	t-Statistic	P-value
Constant	10.4714	0.8093	12.9387	0.000
TEXP	1.007	0.5436	1.8524	0.0768
OIRE	0.7374	1.0185	0.724	0.4764
NORE	0.9141	0.4362	2.0954	0.0473
TFCR	-1.1262	1.3939	-0.808	0.4274
FDAS	0.7125	0.2293	3.1074	0.005
FGRR	-0.1516	0.297	-0.5105	0.6146
TOEX	-1.8985	0.9355	-2.0294	0.0541

Source: Rstudio Computation, 2026

The long run ARDL estimates are shown in Table 4. More statistically significant positive long-run association is found between RGDP and NORE and FDAS, with coefficients of 1.0070 ($p = 0.0768$) and 0.9141 ($p = 0.0473$), respectively, while the association between RGDP and TEXP and TOEX is comparatively weak statistically and can be concluded only at 10% level, with their coefficients of 1.0070 ($p = 0.0768$) and -1.8985 ($p = 0.0541$), respectively. No statistical significant long-run association is established between RGDP and OIRE, TFCR, or FGRR.

Table 5: ECM Results

Dependent Variable: Δ RGDP

Variable	Coefficient	Std. Error	t-Statistic	P-value
Constant	1.37221	0.41878	3.277	0.00331
ECM(-1) [L(RGDP,1)]	-0.13104	0.0428	-3.062	0.00552
L(TEXP,1)	0.13197	0.06758	1.953	0.06313
L(OIRE,1)	0.09663	0.1328	0.728	0.47421
NORE	0.11978	0.05121	2.339	0.02839
TFCR	-0.14758	0.18351	-0.804	0.42951
L(FDAS,1)	0.09337	0.02724	3.427	0.0023
L(FGRR,1)	-0.01987	0.04069	-0.488	0.62994
L(TOEX,1)	-0.24879	0.094	-2.647	0.01442
Δ TEXP	-0.0145	0.10037	-0.144	0.88638
Δ TEXP(-1)	0.04622	0.03789	1.22	0.2349
Δ OIRE	0.13835	0.13666	1.012	0.32188
Δ FDAS	0.0585	0.02692	2.173	0.04031
Δ FDAS(-1)	-0.09201	0.03255	-2.826	0.00957
Δ FGRR	-0.11073	0.04848	-2.284	0.03193
Δ FGRR(-1)	0.06313	0.03511	1.798	0.08531
Δ TOEX	0.05292	0.11482	0.461	0.64918

Source: Rstudio Computation, 2026

The Evidence of ECM is presented in Table 5 which shows that the error correction term (ECT) between the variables was negative and statistically significant ($ECM = -0.13104$, $p < 0.01$), supporting a stable long run relationship. The coefficient indicates that there is a reduction in the disequilibrium during each period, and hence the economy is trending towards long-run equilibrium in the long-run. Among the explanatory variables, lagged total expenditure (TEXP), non-oil revenue (NORE) and lagged FDAS have positive and significant signs of economic growth and lagged TOEX has a negative and significant effect on RGDP. The changes in FDAS in the short run have positive impact on growth, while the lagged changes in FDAS and current changes in FGRR have negative impact. The explanatory power of the model is high and equals to 74.4% for RGDP and the overall F-statistic validates that the regressors collectively, and at a significant level explain economic growth. The findings showed that the mobilization of non-oil revenue and good fiscal management is one of the factors influencing the economic growth, and added commitments with external sources can be limiting factors in economic growth.

Table 6: Breusch–Godfrey LM Test

Test	Test Statistic (LM)	Degrees of Freedom	P-value
Breusch–Godfrey Serial Correlation Test	10.707	1	0.0011

Source: Rstudio Computation, 2026

Diagnostic Test

The LM test in Table 6 was used to test for serial correlation of residuals of the estimated ARDL-ECM model. An LM statistic of 10.707 ($p = 0.0011$) was obtained from the test. The null hypothesis is rejected, indicating that there is a serial correlation. This means that there is serial correlation in the model residuals. This was done to account for this issue and to obtain reliable statistical inferences, standard errors that were robust to heteroskedasticity and autocorrelation (Newey–West HAC) were then used. Therefore, the reported “robust” estimates are valid and consistent when using the model with autocorrelated residuals.

Table 7: Breusch-Pagan Heteroskedasticity Test

Diagnostic Test	Test Statistic	Degrees of Freedom	P-value
Breusch-Pagan Heteroskedasticity Test	21.711	16	0.1528

Source: Rstudio Computation, 2026

Table 7: Breusch-Pagan heteroskedasticity test, test statistic is 21.711 ($p = 0.1528$). The p-value is larger than 5% implies that there is no significant heteroskedasticity among the residuals of the model, the error variance is constant and therefore the standard errors and estimated coefficients can be used for statistical inferences.

Table 8: Jarque-Bera Normality Test

Diagnostic Test	Test Statistic (χ^2)	Degrees of Freedom	P-value
Jarque-Bera Normality Test	0.8036	2	0.6691

Source: Rstudio Computation, 2026

The Jarque-Bera normality test statistic in Table 8 was 0.8036 ($p = 0.6691$). The result of the p value is greater than 5% significance level, therefore the normality null hypothesis cannot be rejected. Hence, the normality assumption of the model is satisfied, which is important for valid statistical inferences to be made.

Table 9: Newey-West HAC Robust Standard Errors Results

Variable	Coefficient	Robust Std. Error	t-Statistic	P-value
Constant	1.372207	0.16091	8.5278	0
RGDP(-1)	0.868957	0.017486	49.6958	0
TEXP	-0.014501	0.059761	-0.2427	0.8104
TEXP(-1)	0.192687	0.053829	3.5797	0.0016
TEXP(-2)	-0.046219	0.025108	-1.8408	0.0786
OIRE	0.13835	0.109139	1.2677	0.2176
OIRE(-1)	-0.041724	0.013046	-3.1984	0.004
NORE	0.119781	0.033606	3.5642	0.0016
TFCR	-0.147577	0.14817	-0.996	0.3296
FDAS	0.058497	0.015983	3.6598	0.0013
FDAS(-1)	-0.057135	0.027283	-2.0941	0.0475
FDAS(-2)	0.092008	0.014677	6.2691	0
FGRR	-0.110732	0.021695	-5.104	0
FGRR(-1)	0.153986	0.023867	6.4518	0
FGRR(-2)	-0.063126	0.027994	-2.255	0.034
TOEX	0.052924	0.074051	0.7147	0.482
TOEX(-1)	-0.301711	0.073039	-4.1308	0.0004

Source: Rstudio Computation, 2026

Table 9 shows the Newey–West HAC robust standard errors which further validate the stability of the ARDL results in the presence of heteroskedasticity and autocorrelation. The lagged dependent variable (RGDP(-1)) is still very significant, suggesting that the economy is very persistent in economic growth. The result of the non-oil revenue (NORE) is positively and statistically significant on the RGDP, thus giving a strong contribution in the economic performance in the long run. Lagged growth effects are suggested by the very small size of government expenditures in the current period (TEXP) and the large size in the lagged form. Lagged effect is also a very high negative lagged oil revenue (OIRE) which indicates inefficiency in the utilization of oil revenues. FDAS has very high dynamic effects on all lags and FGRR has alternate effects, but not statistically significant. TOEX has a negative effect on growth in a lagged manner, emphasizing the negative impact of external obligations in the long run. In general, the results with the HAC corrections underscore the strength of

the model and support the conclusion that fiscal structure and fiscal composition have a significant impact on the dynamics of economic growth.

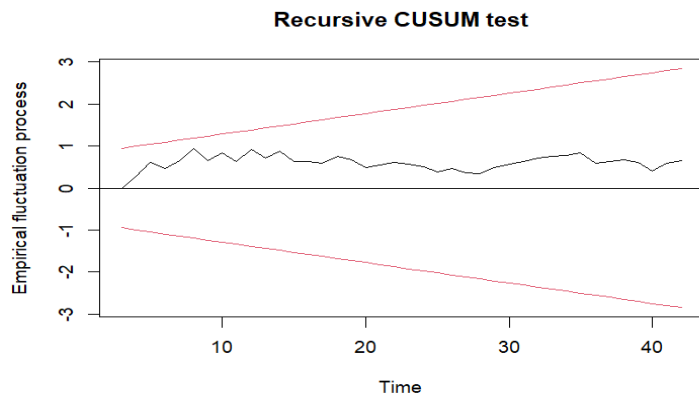


Figure 1: Recursive CUSUM stability

Table 10: CUSUM Stability Test Result

Test	Test Statistic (S)	P-value
Recursive CUSUM Test	0.74446	0.1936

Source: Rstudio Computation, 2026

An ARDL-ECM model stability test was performed using the recursive CUSUM test for the stability of the estimated ARDL-ECM model as shown in figure 1 and table 10 below. The result is the CUSUM plot does not cross the 5% critical lines during the sample period and the estimated parameters are not structurally unstable. In addition, the value of the CUSUM-statistic is 0.7445 and the corresponding p-value equals 0.1936, do not exceed the 5% level and, therefore, the null hypothesis of parameter stability is not rejected. Thus, the estimated model is deemed stable and appropriate for policy inference, forecasting and long run economic analysis. The findings suggest that the relationship of fiscal policy dynamics with economic growth in Nigeria is rather stable throughout the study period even though it has experienced the various phases of economic reform, oil price shocks and fiscal adjustments.

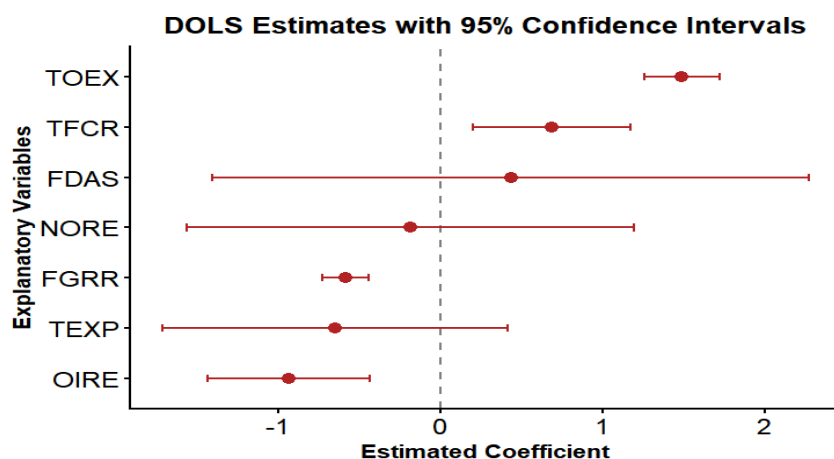


Figure 2: Long-Run DOLS Coefficient Estimates and Their 95% Confidence Intervals

In Figure 2, the long-run coefficient estimates obtained from the DOLS are shown along with their 95% confidence intervals. Results show that the long-run effects on the explanatory variables vary. Specifically, TOEX and TFCR have positive and statistically significant effects on the dependent variable, as the 95 % confidence intervals of the TOEX and TFCR models are completely above the zero value, while the FGRR and OIRE models have statistically significant negative effects, with the confidence intervals of the two models being completely below the zero value. The estimated coefficients for FDAS, NORE, and TEXP are not

statistically significant, however, because their confidence intervals contain zero, the null hypothesis that the long-run effects are zero is accepted. When it comes to effect size, TOEX proves to be the strongest positive determinant, and OIRE the strongest negative determinant. Thus, the DOLS estimates suggest that the long run variations in the dependent variable are mainly attributable to TOEX, TFCR, FGRR, and OIRE, while the effect of FDAS, NORE, and TEXP are not statistically distinguishable at the conventional 5% level of significance.

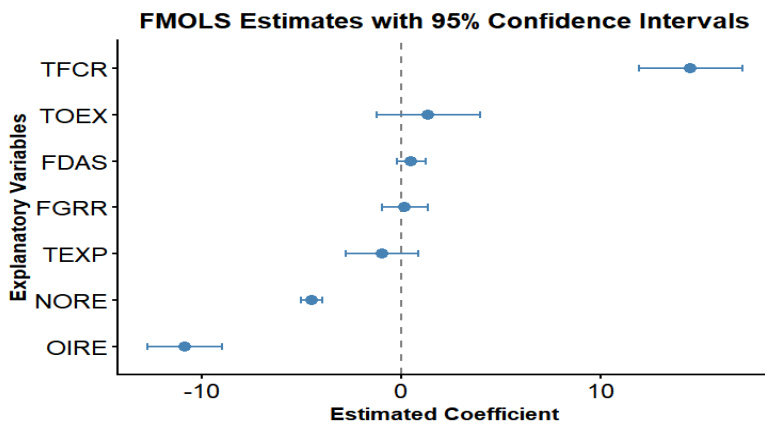
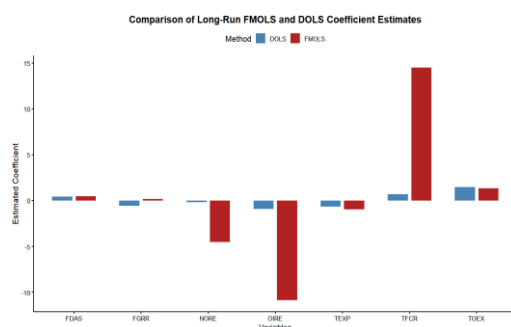


Figure 3: Long-Run FMOLS Coefficient Estimates and Their 95% Confidence Intervals

Figure 3 shows the FMOLS long-run coefficient estimates and their associated 95% confidence intervals. The findings show that the coefficient of TFCR has a positive and significant effect on the dependent variable, and the 95% confidence interval is completely above zero, while the estimated coefficient of the TFCR is significantly higher than that of other independent variables. On the other hand, OIRE has a statistically significant negative impact with a confidence interval that is entirely below zero, suggesting a strong negative long-run relationship with the dependent variable. The estimated coefficients for TOEX, FDAS, FGRR, TEXP, and NORE, however, are not statistically significant as the 95% confidence intervals for each of these variables contain the null value of zero, indicating that the long-run effects of these variables cannot be separated from zero at the conventional 5% significance level. While TOEX has a positive coefficient, NORE and TEXP have negative coefficients, uncertainty about such estimates makes it difficult to make any clear statements about their long-term impact. Thus, the FMOLS estimates suggest that only the variables TFCR and OIRE have significant long-run effects (TFCR being the most important positive predictor and OIRE the most important negative predictor), while the other explanatory variables are not statistically significant in the long run.



Source: Rstudio Computation, 2026

Figure 4 : Comparison of Long-Run FMOLS and DOLS Coefficient Estimates

Table 11: Comparative Long-Run Effects of Fiscal Policy Variables from FMOLS and DOLS

Variable	FMOLS	DOLS	Long-Run Effect
TEXP	-0.9716	-0.6496	Negative
OIRE	-10.8400	-0.9348	Negative
NORE	-4.5014	-0.1854	Negative
TFCR	14.4875	0.6854	Positive
FDAS	0.4932	0.4333	Positive
FGRR	0.1734	-0.5872	Mixed
TOEX	1.3435	1.4862	Positive

Figure 4 shows the consistent and inconsistent results for the impact of fiscal policy variables on economic growth. Both FMOLS and DOLS show a positive long-run relation with economic growth with positive coefficients of 0.4932 and 0.4333, respectively for FDAS and TOEX shows 1.3435 and 1.4862, respectively. For TEXP, the long run relationship is negative for both FMOLS and DOLS with the values of the regression coefficients being -0.9716 and -0.6496 respectively. Likewise, the signs are negative for both methods: OIRE and NORE, with substantially larger negative estimates in the case of FMOLS (-10.8400 and -4.5014) than in the case of DOLS (-0.9348 and -0.1854). The long run effects of TFCR are positive in both the estimators,

albeit the coefficient in FMOLS is significantly higher than that in DOLS, namely 14.4875 and 0.6854 respectively. Only one variable, FGRR, has a change in the direction of the estimated relationship, from positive under FMOLS (0.1734) to negative under DOLS (−0.5872). The results show, therefore, that the economic growth direction of association with FDAS, TOEX, TEXP, OIRE, NORE, and TFCR are the same two estimation approaches, but that FGRR shows a different long-run direction of association between the two estimation approaches.

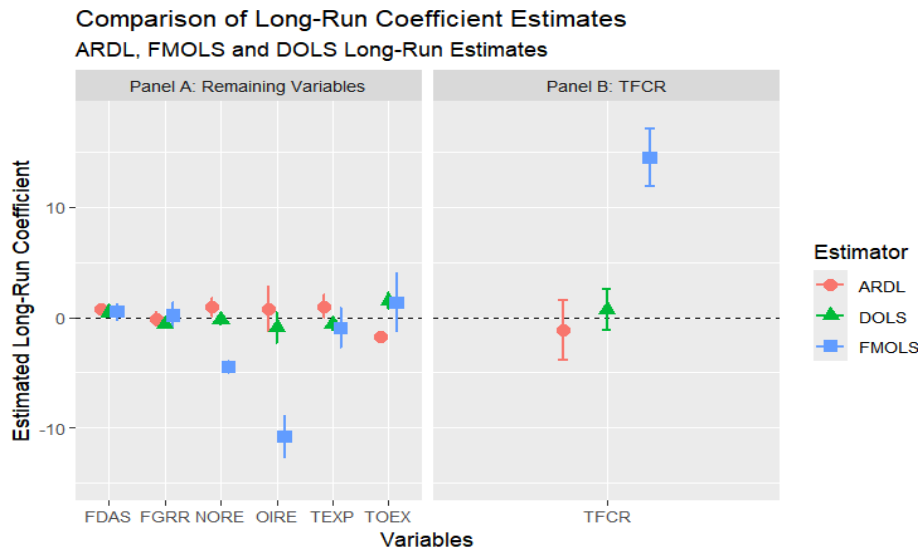


Figure 5: Comparative Long-Run Effects of Fiscal Policy Variables under ARDL, DOLS, and FMOLS Estimation

Table 12: Long-Run Coefficient Estimates from ARDL, DOLS and FMOLS

Variable	ARDL	DOLS	FMOLS
TEXP	1.007* (0.544)	−0.650 (0.542)	−0.972 (0.930)
OIRE	0.737 (1.018)	−0.935*** (0.255)	−10.840*** (0.954)
NORE	0.914** (0.436)	−0.185 (0.702)	−4.501*** (0.264)
TFCR	−1.126 (1.394)	0.685*** (0.248)	14.488*** (1.330)
FDAS	0.713*** (0.229)	0.433 (0.938)	0.493 (0.364)
FGRR	−0.152 (0.297)	−0.587*** (0.072)	0.173 (0.591)
TOEX	−1.899* (0.935)	1.486*** (0.118)	1.343 (1.326)

Source: Rstudio Computation, 2026

Table 12 shows the long-run coefficient estimates obtained from the different ARDL, DOLS and FMOLS estimators, which shows differences in the magnitude, direction and statistical significance of each of them. FDAS shows a positive long-run relationship with RGDP for all three estimators (significant only under ARDL). The OIRE is negative and significant under DOLS and FMOLS, but positive and insignificant under ARDL, and the TFCR is positive and highly significant under DOLS and FMOLS, but negative and insignificant under ARDL. These differences in direction and significance extend to the differences between the estimators in terms of their estimated long-run relationships with RGDP, as shown by the differences in the signs of the relationships and their significance, respectively, for each of the three estimators. In ARDL, TOEX is negative and significant while in DOLS and FMOLS, it is positive and significant, and positive but insignificant, respectively. The overall results suggest that the long run relationships between the fiscal policy variables and total exports and economic growth differ among the different methods of estimation, with some variables being more consistent on their directionality than others.

DISCUSSION

The results of this study suggest that there is evidence of a long run relationship between fiscal policy and economic growth in Nigeria, confirmed by ARDL bounds test. Further, the long-run estimates also reveal that the nature of the relationship and its strength differ depending on the fiscal instrument and estimation method.

The ARDL estimator shows positive and statistically significant long run association between the government expenditures (TEXP), non-oil revenue (NORE) and federation account statutory allocation (FDAS) and economic growth (RGDP) for the long run. The ARDL estimator indicates that the government expenditures (TEXP), non-oil revenue (NORE) and federation account statutory allocation (FDAS) have positive and statistically significant long run relationships with economic growth (RGDP). But the results of OIRE, TFCR and FGRR are not significant statistically and TOEX is negative and significant at 10% level. The DOLS and FMOLS estimates show that some of the coefficients are statistically and directionally different. Both estimators yield negative and negligible values for TEXP, and negative and significant values for OIRE under both DOLS and FMOLS. While the estimators of NORE are negative, the same is reverse for TFCR; under ARDL it is negative and insignificant while under DOLS and FMOLS it is positive and highly significant. FGRR is negative and statistically significant under DOLS but is positive, and non-significant, under FMOLS; and TOEX is negative and statistically significant under ARDL but is positive under both DOLS and FMOLS, with statistical significance under DOLS. Conversely, under the ARDL model, only FDAS shows a positive coefficient which is statistically significant. The various differences suggest that the estimated long-run relationships between the fiscal variables (total exports and economic growth) differ among the estimation methods. Hence, the results suggest that the long-run relationship should be interpreted as the joint direction, size and significance of the ARDL, DOLS and FMOLS results, not based on any single estimation technique.

CONCLUSION

In this study, the long-run relationship between fiscal policy and economic growth was investigated in Nigeria using the ARDL, DOLS and FMOLS estimation techniques. The ARDL bounds test showed that there was a strong long-run relationship between the variables, and the error correction model showed that there was a strong mechanism of adjustment towards long-run equilibrium after the short-run deviation of the variables. The ARDL estimates revealed positive and statistically significant long-run relationships for the variables TEXP, NORE and FDAS while the others variables (OIRE, TFCR and FGRR) were statistically insignificant and TOEX (Total Exports) had a negative association with economic growth at the 10% level of significance. But the DOLS and FMOLS estimates did show differences in the size, direction, and statistical significance of several long-run coefficients, especially for TEXP, OIRE, NORE, TFCR, FGRR and TOEX, whereas for FDAS, there was no difference in the size of the coefficient, direction or in the statistical significance of the coefficient estimates obtained using all three estimation methods and ARDL yielded positive coefficients with statistical significance. The results of the current study point to the fact that the estimated long run relationships between the individual fiscal policy instruments and total exports and economic growth are not the same when using the different estimation methods, and thus the current results should be interpreted together for the ARDL, DOLS and FMOLS. The overall conclusion is that there is a need for the strengthening of domestic revenue mobilization, increase in the efficiency of government expenditure, prudent management of oil related revenues, and improvement of the fiscal institutions to enable effective allocation of public resources for productive activities and sustained economic growth in Nigeria

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