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Effects of institutional quality and public expenditure on economic growth nexus in a small open economy

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ABSTRACT

This research aims to analyze the influence of institutional quality on the relationship between economic growth and public expenditure in a small open economy. This research uses the autoregressive distributed lag (ARDL) methodology. The results showed that (1) institutional variables have a significant and positive moderating effect on the relationship between public spending and economic growth; (2) lending rates that are too high hurt economic growth because they keep the private sector from borrowing money; and (3) inflation rates that are too high hurt economic growth rates. In optimizing the moderating impact of institutional quality on the relationship between public expenditure and economic growth, the government should adopt policies that build strong institutions through consistency in upholding the rule of law. Specific and concrete policy recommendations include a need to address the endemic problem of corruption, boost the economy's industrial productivity, stimulate private sector investment participation in the economy, moderate excessive lending rates, and encourage the crowding-in of the private sector so that the private sector can readily access funding for business expansion.

Contribution/ Originality: This study is one of the first to empirically explore the interaction between institutional quality and recurrent and capital public expenditure in a small open economy, with Nigeria as a proxy. Findings reinforce the theoretical background, form a basis for improved recurrent and capital public expenditure patterns, and provide the platform to strengthen the quality of its institutions.

1. INTRODUCTION

Several studies have explored the relationship between public expenditure and variations in national income in Nigeria (Ebipre & Eniekezimene, 2020; Gukat & Ogboru, 2017; Jeff-Anyeneh & Ibenta, 2019). Indeed, literature confirms a priori expectations of a strong positive relationship between public expenditure and economic growth (Aluthge, Jibir, & Abdu, 2021; Gupta, 2018). Many of these studies have, however, been Anglo-centric in focus, with extremely limited studies considering whether institutional variables such as governance, political stability, or control of corruption in any way, moderate the relationship between public expenditure and economic growth in small open economies such as Nigeria. To the best of our knowledge, the literature to identify how institutional quality moderates the relationship between selected macroeconomic variables and economic growth is extremely limited for the sub-Saharan Africa region. On the other hand, there is an abundance of literature in developed economies (Çelik & Irem, 2022; Van Bon, 2022) and Asian economies (Chiang, Chin-Chi, & Liu, 2022; Liu, Tang, Zhou, & Liang, 2018; Singh & Pradhan, 2022) in this area.

There is also no consensus on the ideal methodology to use in analysing causality relationships between economic growth and predictive variables, with previous studies in this area making use of a variety of methodologies that include, among others, vector autoregressive (VAR) models (Navaratnam & Mayandy, 2016), ordinary least squares (OLS) models (Thompson & Rita, 2016), and threshold autoregressive (TAR) models (Aero & Ogundipe, 2016). The linear autoregression distributed lag (ARDL) models have been used in more recent studies, though there aren't that many of them (Aluthge et al., 2021; Onifade, Çevik, Erdoğan, Asongu, & Bekun, 2020). However, none of these studies considered any causality relationships between economic growth and predictive variables that involve the possibility of moderating effects of institutional quality. Our study proposes to contribute to what little knowledge is available by seeking to answer the research question of whether positive changes in institutional quality can stimulate positive changes in public expenditure growth, which would ultimately result in positive changes in economic growth in Nigeria. The relationship between public expenditure and economic growth has been the subject of many scholarly works, but at best, the findings of studies on whether public expenditure promotes or retards aggregate output and employment have been inconclusive. Impediments to economic growth have been attributed to the crowding-out effects of government expenditure (De Soyres, Santacreu, & Young, 2022) as the increase in public expenditure on the basis of government borrowings may result in a decline in private sector investments (Lidiema, 2017). Other sources have argued that in the absence of adequate institutional capacity, any government spending will produce little or no economic growth. For example, International Monetary Fund (IMF) (2016) found a diminished effect of institutional quality on financial development in sub-Saharan African compared with other developing economies. In addition, while macroeconomic fundamentals were the main drivers of financial development in Africa, the level of financial development was below the benchmark in many African countries as a result of the diminished effect of institutional quality on financial development with institutional quality being one of the leading explanations (p. 20). According to recent study findings, the institutional quality of the Nigerian economy in terms of political stability, terrorism, rule of law, and corruption appears to be worsening over the years (BTI Transformation Index, 2023; Maku, 2018; Yagboyaju & Akinola, 2019). Five sections organize this study. Section one introduces the study, including the background, the significance, and the scope of study. Section two covers the literature review, which evaluates the works of other researchers on the subject, their approaches, and criticisms of previous research. Section three focuses on the study's methodology and includes the data and data sources, model specification, and method of analysis. Section four focuses on data analysis, while the fifth section discusses the findings. The final section summarizes the findings, makes policy recommendations, and highlights the study's contributions to knowledge.

2. LITERATURE REVIEW

2.1. Theoretical Review

For a long time, the generally accepted belief was that all economies follow a predetermined sequence of developmental stages to achieve economic growth and development (Rostow, 1991). However, more recent theories and findings point to the importance of institutions in the drive for economic growth and development (Landes, 1998; North, 1990, 1991). According to IMF (2002), the renewed thinking in this area stems from the observed significant cross-country differences in incomes across developed versus developing economies (p. 95). IMF (2002) described the extremes of global income distribution as striking, with "GDP per capita ranging from about $100 a year in Ethiopia, for example, to over $43,000 in Switzerland—but so also is the uneven dispersion of incomes" (p. 95). With most sub-Saharan African economies having incomes of well under $1,000 per capita and continuing to face large and persistent income gaps relative to national income, differences between developed economies and developing economies appear to be closely associated with indicators of institutional quality. Therefore, this section will present a review of some of the available literature on public expenditure, institutional quality, and economic growth to establish the link between this study and other related studies in our specific area of focus.

Consistent with the position of classical economics, there are studies that have argued that there is no need for government intervention in the economy, as government intervention would more likely worsen the functioning of the economy and ultimately cause economic decline (Fayed, 2013; Iheonu & Nwakeze, 2016; Smith, 1776). This position is taken because proponents view the government sector as the non-productive sector of the economy such that increasing expenditure to a non-productive sector invariably implies moving resources away from the private sector, which is the productive sector of the economy, and causes a general economic decline (Irvin, 2012). Neoclassical economists disagree with the position of classical economists as they argue that while increasing public expenditure, particularly if this is done via borrowing from the public or financial institutions, will increase consumption, it will also cause a decrease in investments (Phelps, 2022). Greenspan (2002) argued that increasing public expenditure deficits will raise interest rates and therefore posited that the best approach for the economy is a more passive fiscal policy that promotes low tax rates and limited public expenditure, which will promote economic growth by allowing the private sector and the whole economy to prosper.

The Keynesian school of economic thought, on the other end of the economic growth spectrum, argues that expansionary public expenditure either directly or indirectly boosts economic growth (Abubakar & Mamman, 2021; Alauddin, 2007). Pigou (1936) theorized that the expected changes in national income are determined by a country's aggregate demand and aggregate supply, and that equilibrium national income occurs at the point where aggregate demand, represented by consumption and investment expenditure, is equal to aggregate supply, represented by national income at factor cost. The observed increases in government expenditure across the world to stimulate the economy because of the global COVID-19 pandemic and recessionary fears is perhaps a pointer to the general acceptability of this approach to economic growth. Fadare and Oladipo (2023) also stated that "in reality, during recessionary spells, only the government has the capacity to find and spend the quantum of finance needed to galvanize consumption, investments, or net exports" (p.19).

In the view of Ricardo (1821) and his Ricardian Equivalence proposition, neither of the Classical or Keynesian approaches is wrong. Ricardo (1821) argued that governments fund public expenditure by either increasing tax revenues or by borrowing, but irrespective of how government chooses to fund its public expenditure, the outcome for the economy will be exactly the same or equivalent as rational taxpayers will prepare for the expected increase in future taxation to finance current government expenditure by saving an amount similar to current deficit spending, so the net change to total spending will be zero.

Theories of public expenditure are concerned with the role of public expenditure in promoting economic growth and development. There are a myriad of public expenditure theories, with three major theories of public expenditures regularly cited in literature; these include Adolf Wagner's Hypothesis, Peacock and Wiseman Hypothesis, and Colin Clark's Critical Limit Hypothesis (Okonkwo & Godslove, 2015; Udo, Akpan, & Nsor, 2023).

While the role of institutions appears clear in literature, there is no consensus on the definition of institutional quality or how it should be measured. According to Samadi and Alipourian (2021), while institutional quality has received much attention in the institutional economics literature, the same cannot be said for institutional change, both of which mean different things, as North (2001) posited that while a lot of knowledge has been gained about institutions and their economic performance, very little is known about how institutions change over time. Therefore, understanding institutional quality is a necessary condition to understanding institutional change (Samadi & Alipourian, 2021).

There are different dimensions of institutional quality in literature, and each dimension is measured by an index as an indicator or proxy for measuring institutional quality. There is, however, no consensus among researchers on which proxies to use to measure the quality of institutions. Samadi and Alipourian (2021) argued that "existing indicators only reflect the status quo of institutions and reveal little about the institutional change" (p. 143). Kuncic (2012) found more than thirty established institutional indicators. These were then put into three similar groups of formal institutions: legal, political, and economic. These groups cover the whole formal institutional environment of

most countries. Dimensions of institutional quality are therefore diverse and include measures such as corruption, governance, regulatory quality, political stability, and rule of law. There are also ongoing debates about what constitutes measures of institutional quality; there are several databases that provide data associated with how researchers across the spectrum define institutional quality.

Voigt (2013) contended that many of the currently available institutional measures are insufficient to contest the argument of whether institutions matter. For instance, the author presents examples of areas where improved data could enhance our understanding of the significance of institutions, such as the necessity of measuring them.

1. Central Bank independence, particularly as higher levels of central bank independence lead to lower inflation levels.
2. Independence of the judiciary using criteria that should be like those used for the analysis of central bank independence.
3. Some of the central institutions that make up the rule of law.

2.2. Empirical Review

Prior research investigating the causal relationship between public expenditure and economic growth in Nigeria consistently confirms that public expenditure influences economic growth to varying degrees. Ifeakachukwu, Adebiyi, and Adedeji (2013), for example, found that government recurrent expenditure had a crowding-in effect on private investments in Nigeria while capital expenditure had a crowding-out effect on private investments. Rahman, Ullah, and Jebran (2015) found a crowding-out effect of community services and debt servicing government expenditure on private investments; but they also found that there was a crowing in effect of agriculture, health, transportation, and communication government expenditure on private investments. Omojolaibi, Okenesi, and Mesagan (2016) also found that recurrent expenditure and external debt showed insignificant crowding-out effects, while capital expenditure showed significant crowding-in effects.

Dada and Adesina (2013) employed the use of vector error correction model and the standard Granger causality test to empirically test the veracity of Peacock – Wiseman's theory and to determine the direction of causality between government expenditure and revenue in Nigeria. They concluded that unidirectional causality exists between government expenditure and revenue in Nigeria. Nurudeen and Usman (2010) explored the effects of disaggregated government expenditure on economic growth in Nigeria between 1970 to 2008. The authors found that total government expenditure and expenditure on education harmed economic growth in Nigeria. Conversely, the study discovered a positive correlation between government expenditure on transport, communication, and health and Nigeria's economic growth. Using disaggregated public expenditure data from 1975 to 2004, Olorunfemi (2008) also analysed the relationship between public investment and economic growth in Nigeria. Olorunfemi (2008) found that public expenditure had a positive effect on economic growth. Using the Vector Auto Regressive modelling approach, Olubokun, Ayooluwade, and Fawehinmi (2016) investigated the impacts of government expenditure and inflation rate on economic growth in Nigeria from 1981 to 2013. Findings showed that high levels of government expenditure and inflation contributed significantly to shocks in real Gross Domestic Product (GDP).

Studies on economic growth and institutional quality have sought to identify the structural determinants of countries' levels of economic growth (De Santis, Esposito, & Masi, 2019; Palacios, 2013). However, much earlier than recently, studies on the determinants of economic growth had focused on sources of economic growth, which have included capital accumulation (Cobb & Douglas, 1928; Solow, 1956), factor productivity (Easterly & Levine, 2001), and macroeconomic policies (Andersen & Gruen, 1995). There has, however, been near unanimity in literature on the close correlation between institutional quality and economic growth, as well as the relative significance of institutions compared with other predictors of economic growth, such as trade openness (Ijirshar, 2019) and government expenditure (Onuoha & Okoye, 2020).

Valeriani and Peluso (2011) looked at how the quality of institutions affected economic growth over sixty years in countries at different stages of development. They used a pooled regression model and a fixed effects model to test

three institutional indicators. They made several interesting findings: (i) the results support their hypothesis that institutional quality positively impacts economic growth. (ii) This was true for all three institutional indicators that were examined, i.e., civil liberties, quality of government, and number of veto players. (iii) The main difference between how developing and developed countries are affected by institutional quality is in the size of the impact, not in the direction of it. (iv) Out of the three institutional indicators, improved civil liberties seem to have a greater effect on economic growth in developing countries, whereas the number of veto players assumes more importance for developed country economies.

Nguyen, Su, and Nguyen (2018) investigated the impacts of institutional quality on economic growth for 29 emerging economies over the 2002-2015 period using the System Generalized Method of Moments estimators. The authors found significant positive impacts of institutional quality on economic growth. They also found that institutional quality incumbers the positive effects of foreign direct investments and trade openness on economic growth.

Olanrewaju, Tella, and Adesoye (2019) examined the interactions among institutional, financial, and inclusive growth variables by employing a Granger non-causality test within the augmented VAR framework and annual time series data from 1998 to 2017.

The analysis found a bi-directional causal relationship between inclusive finance and the interaction of institutional quality and financial inclusion. They argued that "while the effects of institutional quality could vary widely in an economy, institutional quality appears to be the dominant driving force behind inclusive growth. It is, therefore, recommended that institutional improvement, beyond the present liberal democratic threshold, is much needed to effectively harness the human capital resource-base." (p. 39).

More recent studies of the impact of institutional quality on economic growth and its derivatives (such as poverty alleviation, employment creation, etc) also appear to show a consistent outcome. Aracil, Gomez-Bengoechea, and Moreno-de-Tejada (2022), for example, studied the moderating effects of institutional quality in the form of extractive or inclusive institutions on the relationship between financial inclusion and poverty alleviation over a sample of seventy-five developing and developed countries. The authors found that institutional quality intensifies the beneficial effects of financial inclusion on poverty rates, with the effect being further pronounced in poorer economies than in wealthier ones.

Using a panel data set of 31 SSA countries from 1991 to 2015 and employing a two-step system-GMM (Generalized Method of Moments) estimation technique. Hussen (2023) examined the impact of different dimensions of institutional quality on the economic growth of Sub-Saharan African (SSA) countries. The study's empirical results indicate that investment-promoting and democratic and regulatory institutions have a significant positive effect on economic growth; however, once these institutions are considered, conflict-preventing institutions do not have a significant impact on growth. The study's findings suggest that countries in the region should continue their institutional reforms to enhance the region's economic growth. Specifically, institutions promoting investment, democracy, and regulatory quality are crucial.

Based on a Barro-type endogenous growth model from the Nigerian perspective, annual time series data obtained from the World Development Indicators, Transparency International, and the Central Bank of Nigeria and ranging from 1970 to 2020, and employing the Autoregressive Distributed Lag methodology to determine the interactive effects of corruption and institutional quality on economic performance, Ozegbe and Kelikume (2022) found that corruption-institutional quality interaction exerts a negative and significant impact on economic performance. They concluded that "institutional quality in Nigeria is feeble and overwhelmed by the magnitude of corruption and the level of individual influences.

The trajectory of Nigeria's economic performance is impeded by a high level of corruption and weak institutional quality" (p. 120). The authors therefore recommended the focus should be on policy interventions to tackle the menace of corruption and improving institutional qualities to achieve positive effects on Nigeria's economy.

3. METHODOLOGY

3.1. Data and Data Sources

Data was collected for this study from the databases of the Central Bank of Nigeria and the World Bank. The study was carried out early in 2024 when the latest available data for Nigeria was December 2022. There are no institutional quality data from the World Bank governance indicators database earlier than 1996; as a result, the sample size for all variables used in this study covers data for the period 1996 to 2022. Table 1 summarises the data and data sources used in this study.

Table 1. Variables, sources, and a priori expectations.

S/N	Variables	Data source	Expected sign.
1	Government recurrent expenditure	Central bank of Nigeria statistical bulletin	Postive
2	Government capital expenditure		
3	Institutional quality - Rule of law - Control of corruption - Regulatory quality	World bank world governance indicators	
6	Inflation rate		
7	Real gross domestic product		
8	Lending rate		Negative

3.2. Model Specification

In a linear model, a set of predictors are used to model dependent variable Y in the form:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_k X_{ki} + e_i \quad (1)$$

Where Y_i is the dependent variable, β_0 is the intercept, β_1 to β_k are the vectors of coefficients, X_{1i} to X_{ki} are the vectors of explanatory variables of i at a point in time and e_i in the model is the stochastic term which captures any variations in the model that cannot be attributed to independent variables used in the model.

For a set of dependent and independent variables, Cohen, Cohen, West, and Aiken (2003) explained that the relationship between the factors may be depicted by any one of a straight line, a curved line, or be indeterminable on a graph, depending on the effects of independent variables on the dependent variable (p. 8). Thus, while multiple regressions are indeed linear, their use is not only restricted to the study of straight-line relationships. In addition, Cohen et al. (2003) noted that although most relationships in the behavioural sciences are not overly complex, the ability to model the relationships with multiple regression or correlation frameworks to any degree or type of shape makes it a general data analysis tool.

With ARDL models, Oxera (2010) explained that the variable of interest is assumed to be a function of the past values of itself (auto regressive) and the current and past values of a function of other exogeneous variables (distributed lag). In an autoregressive-distributed lag model, along with getting explained by the x_t (distributed lag), y_t also gets explained by its own lag (autoregressive). The ARDL model is therefore of the following generalized form:

$$Y_t = \mu_{0i} + \Sigma^p \delta_i Y_{t-1} + \Sigma^q \beta_i X_{t-1} + + e_{it} \quad (2)$$

Where Y is a vector and dependent variable. X are the explanatory variables. μ is the constant while δ and β are coefficients. p, q are optimal lag orders, with p the lag orders for the dependent variables while q the lag order for the explanatory variables representing the regressors. e_{it} is a vector of the error term.

Cohen et al. (2003) reasoned that if a relationship between independent variable Y and a dependent variable C does not remain constant over different levels of a third variable D, such a relationship is described as having a C x D interaction (p. 10). However, if the strength of the relationship between C and Y reduces as the value of D increases, then C is said to be moderated by changes in D (p. 10). According to Cohen et al. (2003), the use of multiple regression/ correlation modelling allows for the computation of different parts of the strength of relationships and permits "statistical hypotheses testing, estimation, construction of confidence levels, and power-analytic procedures" (p. 10).

In terms of testing for a moderating effect, Cohen et al. (2003) explained that moderation analysis requires the use of multiple regression analysis. This procedure is done by adding a third term, M, to the multiple regression model that is meant to regress dependent variable Y on independent variables X. The interaction of X and M specifies the moderation effect in explaining Y. Therefore, given an outcome Y, two variables X, and a moderating variable M:

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 m + \beta_4 (x\, m) + e \quad (3)$$

Thus, while x2 represents the control variable, the role of M as a moderating variable is accomplished by estimating the parameter β4, which is the estimate for the interaction term. Note that because of the interaction between independent variable X and moderating variable M, a new interaction variable will be formed; in other words, the interaction term is the product of the two main effects; this will be used to test the moderation effect.

From the foregoing, and following in the footsteps of economists such as Barro (1990) and Alfonso and Jalles (2011), we specify a Cobb-Douglas production function of the form:

$$Y_{it} = K_{it}^{\alpha}\, G_{it}^{\beta}\, (A_{it}\, L_{it})^{1-\alpha-\beta} \quad (4)$$

Where $0 < \alpha < 1$, $0 < \beta < 1$, and $0 < \alpha + \beta < 1$ are output elasticities, Y is aggregate production (i.e., the real value of all goods produced in a year), K is a measure of physical capital (e.g., all machinery, equipment, and buildings), G is aggregate government expenditure, L is the labor, and A is total factor productivity (a proxy for the level of technology and efficiency) that grows at the exogenous constant rate μ.

$$A_{it} = A_{i0}\, e^{\mu it + Iit\, \rho i} \quad (5)$$

Where I_{it} is a vector of institutional quality (which includes variables such as rule of law, control of corruption, regulatory quality, and other related factors that may affect the level of technology and efficiency in country I at time t, and ρi is a vector of coefficients related to these variables. In this context, the level of technology (A) is a function of both technological improvements determined by μ and institutional quality. As argued by Alfonso and Jalles (2011) in "the presence of efficient and effective institutions ensures that labour can be used for productive purposes, instead of being wasted with red tape or rent seeking activities" (p. 9).

From Equation 4, Y_t = RGDP$_t$ (aggregate production), $K_{it}^{\alpha} G_{it}^{\beta}$ = GEXP$_t$ (aggregate government expenditure), and $A_{it} L_{it}$ is represented by $A_{i0}\, e^{\mu it + Iit\, \rho i}$ from Equation 5. To demonstrate that economic growth depends not only on variables such as government expenditure but also on the quality of its institutions, the combination of Equations 4 and 5 may be represented in the following functional form:

$$RGDP_t = f(GEXP_t, INST_t) \quad (6)$$

For this study, we represent institutional quality by Rule of Law (ROL), Control of Corruption (COC), and Regulatory Quality (REQ). We also disaggregate government expenditure (GEXP) into Capital Expenditure (CEXP), and Recurrent Expenditure (REXP). Tobin (1965) theorized that an increase in price levels could result in an increase in economic growth. On lending rates, Onwioduokit and Bassey (2013) argued that increases in interest rates reduce the growth of consumer spending as well as economic growth since consumers are motivated to save in banks rather than spend (p.17). Umaru, Aliero, and Abubakar (2021) used the lending rate as a variable in their model, which is the interest rate banks charge for lending activities. In line with previous economists' works, we have incorporated the Inflation Rate (INFR) and Lending Rate (LNDR) into our model. These variables have a significant impact on the aggregate economic production of an economy. Inflation lowers the value of government expenditure, while rising lending rates discourage the private sector and reduce the government's available funds for capital and recurrent expenditures. Therefore, we further break down Equation 6 as follows:

$$GDP_t = f(CEXP_t, REXP_t, ROL_t, COC_t, REQ_t, INFR_t, LNDR_t) \quad (7)$$

We express Equation 7 in econometric form:

$$GDP_t = \alpha + \beta CEXP_t + \gamma REXP_t + \delta ROL_t + \pi COC_t, + \zeta REQ_t + \eta INFR_t + \theta LNDR_t + \varepsilon \quad (8)$$

Except for capital expenditure and recurrent expenditure (which are in raw numbers with significant differences between the smaller and larger numbers), all other variables are in ratios, percentages, or rates. This scenario implies that the raw capital expenditure and recurrent expenditure numbers are unlikely to be normally distributed. To avoid

both sets of variables being non-stationary, we convert capital expenditure and recurrent expenditure raw numbers into log-linear forms:

$$RGDP_t = \alpha + \beta InCEXP_t + \gamma InREXP_t + \delta ROL_t + \pi COC_t, + \zeta REQ_t + \eta INFR_t + \theta LNDR_t + \varepsilon \quad (9)$$

3.3. Method of Analysis

We made use of the linear Autoregression Distributed Lag regression model. Shrestha and Bhatta (2018) advised that the main method of selection of time series analysis should be by using the results of unit root tests, as the test results determine the stationarity of the variable (p. 3). As a result, Shrestha and Bhatta maintained that the ARDL methodology is the best methodology because, unlike the use of OLS or VAR (in which either one of the two methods can be used if all the variables of interest are stationary), if variables of interest in the analysis are of a mixed type, i.e., some are stationary and others are non-stationary, ARDL models are the most appropriate. Aluthge et al. (2021) asserted that the use of an appropriate research methodology is a critical part of time series analysis because if researchers use the wrong method, it will affect the research outcomes, including biased and unreliable estimates.

3.3.1. The Effect of Rule of Law on the Relationship between Government Recurrent and Capital Expenditure and Economic Growth in Nigeria

In our first model, we specify the following ARDL model to examine the effect of Rule of Law in the relationship between government recurrent and capital expenditure and economic growth.

$$\Delta RGDP_t = \alpha_0 + \Sigma^p{}_{i=1}\ \alpha_0\, \Delta RGDP_{t-1} + + \Sigma^q{}_{i=1}\ \alpha_2\, \Delta InCEXP_{t-1} + \Sigma^q{}_{i=1}\ \alpha_3\, \Delta InREXP_{t-1} + \Sigma^q{}_{i=1}\ \alpha_4\, \Delta INFR_{t-1} + \Sigma^q{}_{i=1}\ \alpha_5\, \Delta LNDR_{t-1} + \Sigma^q{}_{i=1}\ \alpha_6\, \Delta ROL_{t-1} + \Sigma^q{}_{i=1}\ \alpha_7\, \Delta(InREXP * ROL)_{t-1} + \Sigma^q{}_{i=1}\ \alpha_8\ \Delta(InCEXP * ROL)_{t-1} + \varepsilon_t \quad (10)$$

Where: α_0 = Constant; Δ = The first difference; $\alpha_1 - \alpha_{10}$ = Coefficients, p, q = The maximum number of lags for each variable in the study.

3.3.2. The Effect of Control of Corruption on the Relationship between Government Recurrent and Capital Expenditure and Economic Growth in Nigeria

In our second model, we specify the following ARDL model to examine the effect of Control of Corruption in the relationship between government recurrent and capital expenditure and economic growth.

$$\Delta RGDP_t = \alpha_0 + \Sigma^p{}_{i=1}\ \alpha_1\, \Delta RGDP_{t-1} + + \Sigma^q{}_{i=1}\ \alpha_2\, \Delta InCEXP_{t-1} + \Sigma^q{}_{i=1}\ \alpha_3\, \Delta InREXP_{t-1} + \Sigma^q{}_{i=1}\ \alpha_4\, \Delta INFR_{t-1} + \Sigma^q{}_{i=1}\ \alpha_5\, \Delta LNDR_{t-1} + \Sigma^q{}_{i=1}\ \alpha_6\, \Delta COC_{t-1} + \Sigma^q{}_{i=1}\ \alpha_7\, \Delta(InREXP * COC)_{t-1} + \Sigma^q{}_{i=1}\ \alpha_8\, \Delta(InCEXP * COC)_{t-1} + \varepsilon_t \quad (11)$$

3.3.3. The Effect of Regulatory Quality on the Relationship between Government Recurrent and Capital Expenditure and Economic Growth in Nigeria

In our third model, we specify the following ARDL model to examine the effect of Regulatory Quality in the relationship between government recurrent and capital expenditure and economic growth in Nigeria.

$$\Delta RGDP_t = \alpha_0 + \Sigma^p{}_{i=1}\ \alpha_1\, \Delta RGDP_{t-1} + + \Sigma^q{}_{i=1}\ \alpha_2\, \Delta InCEXP_{t-1} + \Sigma^q{}_{i=1}\ \alpha_3\, \Delta InREXP_{t-1} + \Sigma^q{}_{i=1}\ \alpha_4\, \Delta INFR_{t-1} + \Sigma^q{}_{i=1}\ \alpha_5\, \Delta LNDR_{t-1} + \Sigma^q{}_{i=1}\ \alpha_6\, \Delta REQ_{t-1} + \Sigma^q{}_{i=1}\ \alpha_7\, \Delta(InREXP * REQ)_{t-1} + \Sigma^q{}_{i=1}\ \alpha_8\, \Delta(InCEXP * REQ)_{t-1} + \varepsilon_t \quad (12)$$

As shown in Table 2, the main features of our dataset were summed up using statistical methods. These include the dataset's central tendency (mean and median), variability (standard deviation), and distribution (skewness and kurtosis). These methods provide an outline of the data set and identify any existing patterns or relationships.

Table 2. Descriptive statistics.

Statistic	RGDP	REXP	CEXP	INFR	LNDR	ROL	COC	REQ
Mean	4.77	3876.04	1311.87	12.8	17.6	-1.13	-1.18	-0.92
Median	5.02	2128.0	783.17	12.2	16.9	-1.14	-1.16	-0.92
Maximum	15.3	15553.6	6335.59	29.3	24.8	-0.84	-0.90	-0.68
Minimum	-1.79	124.3	212.93	5.39	11.5	-1.51	-1.50	-1.29
Std. dev.	3.55	4436.7	1549.9	5.02	2.94	0.19	0.14	0.16
Skewness	0.56	1.47	1.94	1.23	0.3	-0.41	-0.63	-0.66
Kurtosis	4.39	3.91	5.86	5.38	3.53	2.45	3.10	3.08
Jarque-Bera	3.59	10.6	26.2	13.1	0.71	1.08	1.79	1.99
Probability	0.17	0.005	0.000002	0.001	0.70	0.58	0.41	0.37
Sum	128.7	104653.0	35420.47	344.8	476.1	-30.6	-31.8	-24.9
Sum sq.	327.4	512000000	62455576	655.4	225.2	0.90	0.48	0.63
Observation	27	27	27	27	27	27	27	27

4. RESULTS

The minimum and maximum recurrent expenditures are ₦124.29 billion and ₦15,553.55 billion, respectively, while the minimum and maximum capital expenditures are ₦212.93 billion and ₦6,335.59 billion. The data implies that over the period within the scope of this study, the minimum amounts expended on recurrent expenditure and capital expenditure were ₦124.29 billion and ₦212.93 billion, respectively, while the maximum amounts expended on recurrent expenditure and capital expenditure were ₦15,553.55 billion and ₦6,335.59 billion, respectively. The above trend can also be seen in the mean and median data for both ongoing and capital expenditures. For example, over the 27 years that this study looked at, the average amount spent on ongoing costs was ₦3,876.04 billion, while only about a third of that amount, ₦1,311.87 billion, was spent on capital costs. Over the years, there has been an increase in recurrent public expenditure and a decrease in capital public expenditure. For the median measure (the middle number in an ordered set of data—from lowest to highest), recurrent expenditure and capital expenditure are ₦2,127.97 billion and ₦783.12, respectively.

4.1. Pre-Estimation Tests

4.1.1. Correlation Analyses

Table 3, displays the correlation coefficients between all possible pairs of values. It shows, for example, that all specified components of institutional quality are positively correlated with both recurrent expenditure and capital expenditure, with the Rule of Law having the strongest positive correlation with both components of government expenditure.

It also shows a negative relationship between real GDP and inflation rate. While this is inconsistent with economic theory, it is not unusual, as inflation rates that are below threshold levels have been shown to have statistically significant positive effects on GDP growth while the positive relationship quickly changes to a negative one once inflation rates exceed threshold levels. The analysis also reveals a negative correlation between real GDP and the lending rate.

This again is expected because when lending rates are very high, borrowers, producers, and investors are effectively penalized for borrowing funds, thus discouraging borrowing activities and crowding out the private sector to the detriment of the real economy (Asogwa & Okeke, 2013). Notwithstanding the results of the correlation analysis, it is important to note that in general, descriptive statistics only show the direction and strength of relationships and not causality.

Table 3. Correlation matrix.

Correlation								
Prob.	**RGDP**	**REXP**	**CEXP**	**INFR**	**LNDR**	**ROL**	**COC**	**REQ**
RGDP	1.00							

REXP	-0.26	1.00						
	0.183	-----						
CEXP	-0.37	0.90	1.00					
	0.06	0.00	-----					
INFR	-0.03	-0.02	0.04	1.00				
	0.88	0.90	0.85	-----				
LNDR	0.49	-0.71	-0.78	0.03	1.003			
	0.01	0.00	0.00	0.90	-----			
ROL	-0.66	0.70	0.80	-0.15	-0.78	1.003		
	0.00	0.00	0.00	0.477	0.00	-----		
COC	-0.47	0.42	0.53	-0.04	-0.71	0.72	1.00	
	0.01	0.03	0.01	0.83	0.00	0.00	-----	
REQ	-0.15	0.13	0.14	-0.30	-0.25	0.33	0.51	1.00
	0.4580	0.5222	0.4874	0.1274	0.2187	0.0948	0.0067	-----

4.1.2. Test for Stationarity (Unit Root Test)

The Augmented Dickey-Fuller (ADF) test and the Phillips-Peron (PP) test were used in this study to check the unit root properties of the variables we used in our models. This means that we checked to see if all the variables in the series are stationary at level or at first difference. The ADF test is like the PP test, as both check to confirm whether a time series is stationary or non-stationary; however, the ADF test checks if the mean of the time series is constant over time, while the PP test checks if the variance of the time series is constant over time. According to Arltová and Fedorová (2016), the ADF test achieves better and more reliable results than others and is more suitable when the sample period is more than 25 but less than 50.

We used the following hypothesis to interpret the results displayed in Table 4:

H_0: Variable has a unit root (Variable is non-Stationary).

H_1: Variable has no unit root (Variable is Stationary).

The result in Table 4 shows the stationarity level of the variables. For RGDP, REXP, CEXP, LNDR, ROL, and COC, the p-values are 0.0000, 0.0001, 0.0001, 0.0011, 0.0083, 0.0083, and 0.0001, which are all less than 0.05 at a 95% confidence level for accepting the null hypothesis that they are not stationary (i.e., has a unit root). This means that they are stationary. On the other hand, only INFR is seen to be stationary at level (i.e., they reach stationarity without differencing) with a p-value of 0.0348, which is also less than 0.05 at a 95% confidence level for accepting the null hypothesis that they are not stationary (i.e., has a unit root). This means that they are also stationary.

Table 4. Augmented Dickey-Fuller and Phillips-Peron test results.

Variables	**Augmented Dickey-Fuller**			**Phillips-Peron**		
	t-statistic	**p-value**	**Status**	**t-statistic**	**p-value**	**Status**
RGDP	-7.04	0	I(1)	-7.14	0	I(1)
REXP	-5.88	0.0001	I(1)	-5.86	0.0001	I(1)
CEXP	-5.6	0.0001	I(1)	-5.63	0.0001	I(1)
INFR	-3.16	0.0348	I(0)	-5.79	0.0001	I(0)
LNDR	-4.67	0.0011	I(1)	-4.67	0.0011	I(1)
ROL	-3.88	0.0083	I(1)	-3.85	0.0075	I(1)
COC	-3.88	0.0083	I(1)	-4.34	0.0024	I(1)
REQ	-5.79	0.0001	I(1)	-5.79	0.0001	I(1)

Note: Where I(0) means stationarity at level and I(1) means stationarity at first difference.

4.1.3. Optimal Lag Selection Criteria

4.1.3.1. VAR Lag Order Selection Criteria (Model 1)

The VAR Lag Order Selection result on Table 5 shows that all the criterion selected lag (0) as the optimum leg for estimating the long run relationship.

Table 5. Effect of ROL on relationship between REXP, CEXP and RGDP (Model 1).

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-45.4	NA*	6.29*	4.65*	5.04*	4.75*
1	-45.3	0.14	6.88	4.72	5.17	4.83
2	-44.8	0.58	7.31	4.77	5.26	4.89
3	-44.8	0.05	8.13	4.85	5.39	4.99
4	-43.0	1.64	7.86	4.79	5.38	4.94

Note: * Indicates lag order selected by the criterion
NA* "Not available" - The test could not produce a reliable result, potentially because the selected lag length cannot be determined with the current data.

4.1.3.2. VAR Lag Order Selection Criteria (Model 2)

The VAR Lag Order Selection result on Table 6 shows that except for the LR test statistic whose lag criterion was not applicable, all the criterion selected Lag (2) as the optimum leg for estimating the long run relationship.

Table 6. Effect of COC on relationship between REXP, CEXP and RGDP (Model 2).

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-50.5	NA*	9.77	5.09	5.48	5.19
1	-49.6	1.09	9.99	5.1	5.54	5.21
2	-46.5	3.58	8.4*	4.91*	5.40*	5.03*
3	-46.0	0.51	9.02	4.95	5.5	5.09
4	-44.8	1.09	9.17	4.94	5.53	5.09

Note: * Indicates lag order selected by the criterion
NA* "Not available" - The test could not produce a reliable result, potentially because the selected lag length cannot be determined with the current data.

4.1.3.3. VAR Lag Order Selection Criteria (Model 3)

Table 7 shows that with the exception of the LR test statistic, whose lag criterion was not applicable, all the criterion selected Lag (2) as the optimum leg for estimating the long run relationship.

Table 7. REQ on relationship between REXP, CEXP and RGDP (Model 3).

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-48.6	NA*	10.4	5.14	5.54	5.24
1	-45.6	3.55	8.81	4.96	5.41	5.07
2	-43.0	1.75	8.52*	4.91*	5.40*	5.03*
3	-43.6	0.41	9.23	4.96	5.51	5.09
4	-43.6	0.03	10.4	5.05	5.65	5.19
5	-42.3	1.04	10.6	5.03	5.67	5.18

Note: * Indicates lag order selected by the criterion.
NA* "Not available" - Test could not produce a reliable result, because the selected lag length cannot be determined with the current data.

4.1.4. Co-Integration Bounds Test

In the ARDL bounds testing method, an F-test is used to see if there is a long-term relationship between the variables. This is done by looking at the joint significance of the coefficients of the lagged levels of the variables. The null hypothesis that there is no long-term relationship can be thrown out if the F-statistic (also called the "F-calculated") is above the upper critical value. This is true no matter what order the time series are integrated in. This implies that if the F-statistic value is greater than the I(1) value, co-integration is established, and the error correction model (ECM) for the dependent variable should be estimated, as it is indicative of the presence of a long-run relationship among the variables. If the F statistic falls below the lower critical value, the null hypothesis of no level relationship cannot be rejected, but we estimate the short-run ARDL model. If the F statistic falls between the lower and upper critical values, the result is inconclusive.

Table 8 shows values of the F-statistics for Models 1, 2, and 3 as 2.749893, 7.8787497, and 3.7937217, respectively, at a 5% level of significance.

Table 8. Bounds test for co-integration (Short- or long-run test).

Model 1	F-statistic	Significance	I(0)	I(1)	Decision
ARDL	2.75	5%	2.32	3.5	Estimate ARDL short run model
Model 2	F-statistic	Significance	I(0)	I(1)	Decision
ARDL	7.88	5%	2.32	3.5	Estimate ECM long run model
Model 3	F-statistic	Significance	I(0)	I(1)	Decision
ARDL	3.79	5%	2.32	3.5	Estimate ECM long run model

4.2. Regression Analyses and Interpretation of Results

4.2.1. Model 1

We evaluated the effect of Rule of Law on the relationship between government recurrent and capital expenditure and economic growth, and ARDL (1, 0, 0, 0, 0, 0, 0, 0) was identified as the best model to test the relationship between real GDP and the regressors. The ARDL short run model was estimated for Model 1; see Table 9.

The results in Table 9 show that the equation is statistically significant at a 99% confidence interval. Also, while the adjusted R-squared is not high at 42.93 %, the R-squared is relatively high at 61.19 %, with the F-statistic of 0.01 showing that the model is a good fit. For the model, the optimum selected Model is that in which the variables are lagged as follows: GDP (1 year), while REXP, CEXP, REXP*ROL, CEXP*ROL, ROL, INFR, and LNDR were not lagged at all. Additionally, the result of Model 1 also shows that rule of law has a significant moderating effect on the relationship between disaggregated public expenditure and economic growth in Nigeria.

Table 9. Short run model (Model 1).

Variables	Coefficient	Std. error	t-statistic	Prob.*
RGDP(-1)	-0.03	0.29	-0.09	0.93
REXP	-6.03	14.3	-0.42	0.68
CEXP	4.78	13.9	0.35	0.75
REXP_ROL	-5.82	12.1	-0.48	0.64
CEXP_ROL	2.00	12.3	0.16	0.87
ROL	8.42	33.3	0.25	0.80
INFR	-0.21	0.20	-1.05	0.31
LNDR	0.23	0.38	0.60	0.56
C	-7.41	37.1	-0.2	0.84
R-squared	0.61	Mean dependent var		4.79
Adjusted R-squared	0.43	S.D. dependent var		3.62
S.E. of regression	2.73	Akaike info criterion		5.12
Sum squared resid	126.0	Schwarz criterion		5.55
Log likelihood	-57.5	Hannan-Quinn criteria		5.24
F-statistic	3.35	Durbin-Watson stat		2.12
Prob (F-statistic)	0.02			

***Note:** P-values and any subsequent tests do not account for model selection.

The result of the estimated ARDL short run estimation shows that for Model 1, in the short run, the selected explanatory variables displayed varying signs as they relate to the growth rate of the economy.

4.2.2. Model 2

We evaluated the effect of Control of Corruption on the relationship between government recurrent and capital expenditure and economic growth in Nigeria, and ARDL (1, 2, 1, 2, 2, 2, 2, 2) was selected to be the best model to test the relationship between real GDP and the regressors. Given the outcome of the Bounds test, the ARDL ECM long run model was estimated for Model 2; see Table 10.

The result in Table 10 shows that the cointegration equation effect is statistically significant at a 99% confidence interval. Furthermore, both the R-squared (the proportion of the variation in the dependent variable that is

predictable by the independent variables) and the adjusted R-squared (which shows whether increasing the number of independent variables improves the regression model or not) are very high at 98.78 % and 97.07%, respectively, with the F-statistic of 0.00 showing that the model is a good fit. For long-run real GDP, the optimum selected model is one in which the variables are lagged as follows: GDP (1 year), REXP (2 years), and CEXP (1 year). The model also includes two years for REXP*COC, two years for CEXP*COC, two years for COC, two years for INFR, and two years for LNDR. The result of Model 2 shows that control of corruption has a significant moderating effect on the relationship between disaggregated public expenditure and economic growth in Nigeria.

Table 10. ARDL error correction long run model (Model 2).

ECM regression				
Variables	**Coefficient**	**Std. error**	**t-statistic**	**Prob.**
C	-334.0	23.1	-14.5	0.00
D(LNREXP)	-6.21	3.349287	-1.86	0.16
D(LNREXP(-1))	37.3	5.966840	6.25	0.01
D(LNCEXP)	41.6	3.515379	11.8	0.00
D(REXP_COC)	12.8	3.025636	4.22	0.02
D(REXP_COC(-1))	50.1	6.495309	7.72	0.01
D(CEXP_COC)	33.5	3.009747	11.1	0.00
D(CEXP_COC(-1))	-8.79	0.613113	-14.3	0.00
D(COC)	-338.0	22.81011	-14.8	0.00
D(COC(-1))	-352.0	48.47361	-7.27	0.00
D(INFR)	-0.79	0.082371	-9.54	0.00
D(INFR(-1))	0.48	0.033197	14.4	0.00
D(LNDR)	-2.74	0.234807	-11. 7	0.00
D(LNDR(-1))	-0.58	0.185534	-3.13	0.05
CointEq(-1)*	-1.12	0.077001	-14.5	0.00
R-squared	0.99	Mean dependent var		0.01
Adjusted R-squared	0.97	S.D. dependent var		3.47
S.E. of regression	0.59	Akaike info criterion		2.08
Sum squared resid	3.53	Schwarz criterion		2.81
Log likelihood	-11.0	Hannan-Quinn criteria		2.28
F-statistic	57.84	Durbin-Watson stat		3.42
Prob (F-statistic)	0.00			

***Note:** P-values and any subsequent tests do not account for model selection.

4.2.3. Model 3

We evaluated the effect of Regulatory Quality on the relationship between government recurrent and capital expenditure and economic growth, and ARDL (1, 2, 2, 2, 2, 2, 2, and 2) was selected to be the best model to test the relationship between real GDP and the regressors.

Given the outcome of the Bounds test, the ARDL ECM long run model was estimated for Model 3; see Table 11. The result in Table 11 shows that the cointegration equation effect is statistically significant at a 99% confidence interval. Furthermore, both the R-squared (the proportion of the variation in the dependent variable that is predictable by the independent variables) and the adjusted R-squared (which shows whether increasing the number of independent variables improves the regression model or not) are very high at 98.59 % and 96.24%, respectively, with the F-statistic 0.000000 showing that the model is a good fit. For the long-run real GDP, the optimum selected model is that in which the variables are lagged as follows: GDP (1 year), REXP (2 years), and CEXP (2 years). The model also includes the variables REXP*REQ (2 years), CEXP*REQ (2 years), REQ (2 years), INFR (2 years), and LNDR (2 years). The result of Model 3 shows that regulatory quality has a significant moderating effect on the relationship between disaggregated public expenditure and economic growth.

Table 11. Error correction long-run model (Model 3).

ECM regression				
Variable	**Coefficient**	**Std. error**	**t-statistic**	**Prob.**
C	227.0	19.4	11.7	0.01
D(LNREXP)	31.3	3.74	8.38	0.01
D(LNREXP(-1))	-64.3	6.0	-10.7	0.01
D(LNCEXP)	-46.0	3.98	-11.6	0.01
D(LNCEXP(-1))	86.2	7.06	12.2	0.01
D(REXP_REQ)	48.7	3.72	13.1	0.01
D(REXP_REQ(-1))	-66.5	5.99	-11.1	0.01
D(CEXP_REQ)	-54.5	4.22	-12.9	0.01
D(CEXP_REQ(-1))	88.2	7.59	11.6	0.01
D(REQ)	7.23	16.0	0.45	0.7
D(REQ(-1))	-74.6	15.6	-4.78	0.04
D(INFR)	-0.39	0.05	-8.38	0.01
D(INFR(-1))	0.43	0.04	11.0	0.01
D(LNDR)	-0.37	0.11	-3.25	0.08
D(LNDR(-1))	-0.89	0.17	-5.22	0.03
CointEq(-1)*	0.13	0.01	11.69	0.01
R-squared	0.99	Mean dependent var		0.01
Adjusted R-squared	0.96	S.D. dependent var		3.47
S.E. of regression	0.67	Akaike info criterion		2.31
Sum squared resid	4.08	Schwarz criterion		3.09
Log likelihood	-12.81	Hannan-Quinn criteria		2.52
F-statistic	41.98	Durbin-Watson stat		2.98
Prob(F-statistic)	0.00			

***Note:** p-values and any subsequent tests do not account for model selection.

4.3. Test for Heteroskedasticity

In regression analysis, it is assumed that the error term is the same across all values of independent variables; this is known as homoscedasticity. If this assumption does not hold, then the estimates are not efficient, and their standard errors become biased. Thus, heteroscedasticity is the opposite of homoscedasticity, and the effect of heteroscedasticity is that the size of the error term differs across values of an independent variable and the standard deviations of predicted variable are non-constant.

We used the following hypothesis to interpret the results displayed.

H_0: Heteroskedasticity.

H_1: Homoskedasticity.

4.3.1. Heteroskedasticity Test (Model 1)

Table 12 presents the outcome of the Heteroskedasticity test for Model 1. The result indicates that the null hypothesis cannot be rejected with a p-value of 0.9075, which is greater than the 0.05 level of significance at a 95% confidence interval for rejecting the null hypothesis, which implies that the model is free from heteroskedasticity (i.e., it is homoscedastic).

Table 12. Heteroskedasticity test: Breusch-Pagan-Godfrey (Model 1).

F-statistic	**0.4**	**Prob. F (8,17)**	**0.91**
Obs.*R-squared	4.09	Prob. Chi-square (8)	0.85
Scaled explained SS	1.69	Prob. Chi-square (8)	0.99

4.3.2. Heteroskedasticity Test (Model 2)

Table 13 presents the outcome of the Heteroskedasticity test for Model 2. The result indicates that the null hypothesis cannot be rejected with a p-value of 0.8103, which is greater than the 0.05 level of significance at a 95%

confidence interval for rejecting the null hypothesis, which implies that the model is free from heteroskedasticity (i.e., it is homoscedastic).

Table 13. Heteroskedasticity test: Breusch-Pagan-Godfrey (Model 2).

F-statistic	**0.58**	**Prob. F (21,3)**	**0.81**
Obs.*R-squared	20.0	Prob. Chi-square (21)	0.52
Scaled explained SS	0.28	Prob. Chi-square (21)	1.00

4.3.3. Heteroskedasticity Test (Model 3)

Table 14 presents the outcome of the Heteroskedasticity test for Model 3. The result indicates that the null hypothesis cannot be rejected with a p-value of 0.3703, which is greater than the 0.05 level of significance at a 95% confidence interval for rejecting the null hypothesis, which implies that the model is free from heteroskedasticity (i.e., it is homoscedastic).

Table 14. Heteroskedasticity test: Breusch-Pagan-Godfrey (Model 3).

F-statistic	**2.12**	**Prob. F (22.2)**	**0.37**
Obs.*R-squared	24.0	Prob. Chi-square (22)	0.35
Scaled explained SS	0.262860	Prob. Chi-square (22)	1.0000

4.4. Normality Test

A normality test is used to determine whether the data used in our analysis has been drawn from a normally distributed population. We used the following hypothesis to interpret the results displayed:

H_0: The residual is normally distributed.

H_1: The residual is not normally distributed.

4.4.1. Normality Test (Model 1)

The graph below is bell-shaped and bears a resemblance to a data set that is well-modeled to a normal distribution curve. Figure 1 illustrates a histogram of the sample data used for Model 1. From the normality test result (Figure 1), we cannot reject the null hypothesis that the residuals are normally distributed with their p-value of 0.9579, which is greater than 0.05 at a 95% confidence interval. We therefore conclude that the residual is normally distributed.

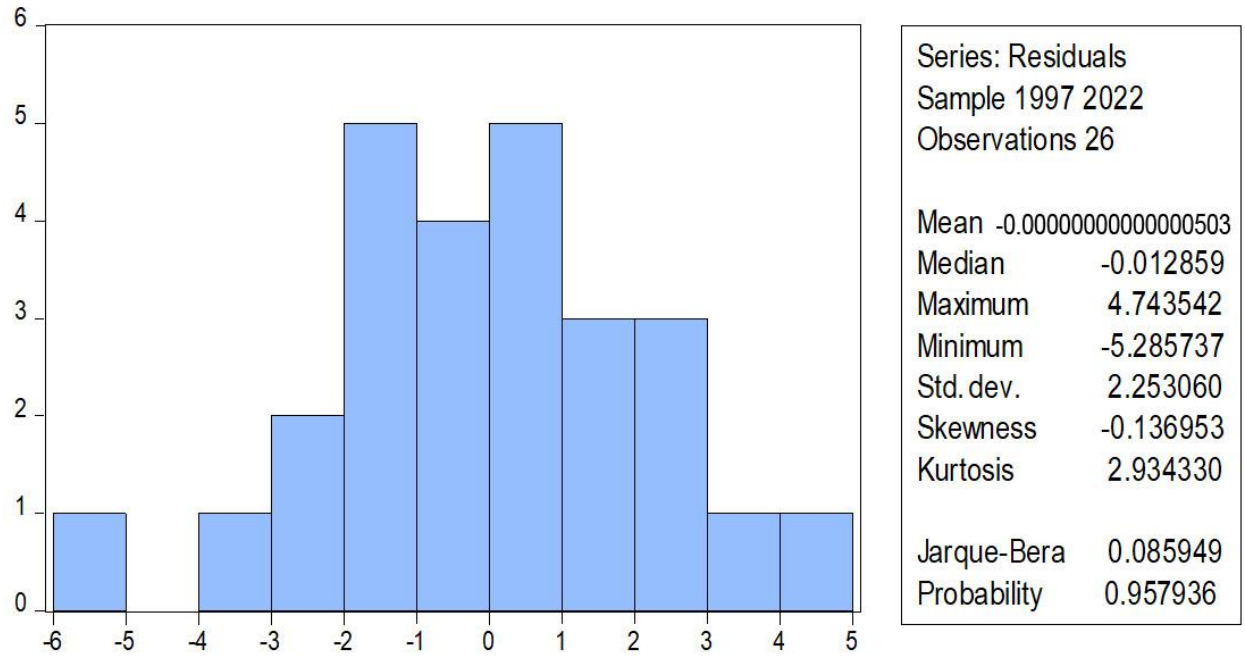

Figure 1. Normality test (Model 1).

4.4.2. Normality Test (Model 2)

From the normality test result (Figure 2), we cannot reject the null hypothesis that the residuals are normally distributed with its p-value of 0.8448, which is greater than 0.05 at a 95% confidence interval. We conclude that the residual is normally distributed.

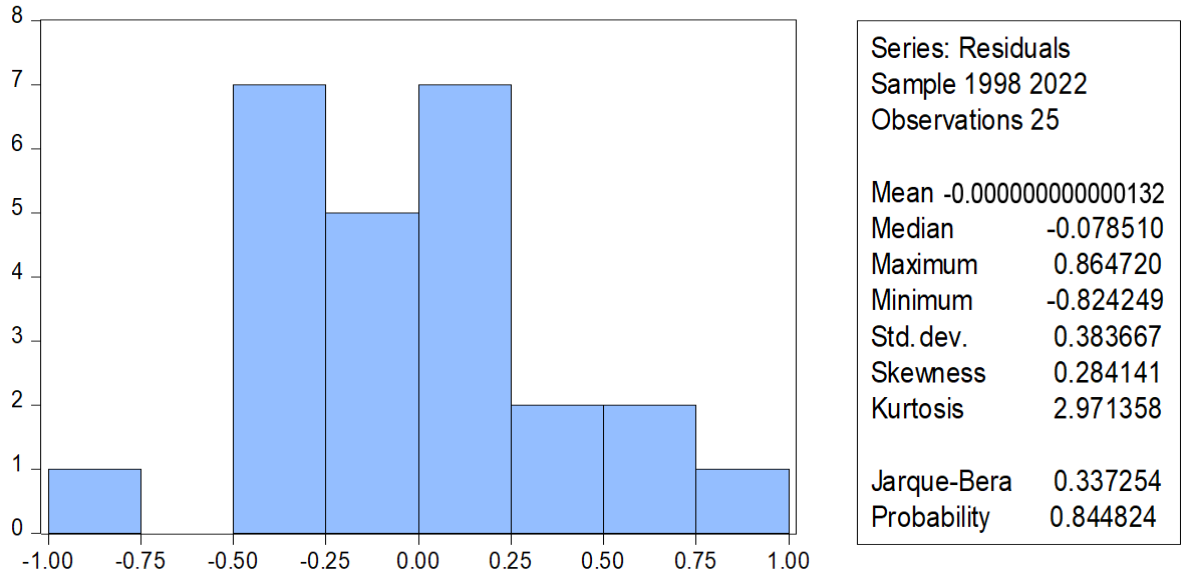

Figure 2. Normality test (Model 2).

4.4.3. Normality Test (Model 3)

From the normality test result (Figure 3), we cannot reject the null hypothesis that the residuals are normally distributed with its p-value of 0.3456, which is greater than 0.05 at a 95% confidence interval. We conclude that the residual is normally distributed.

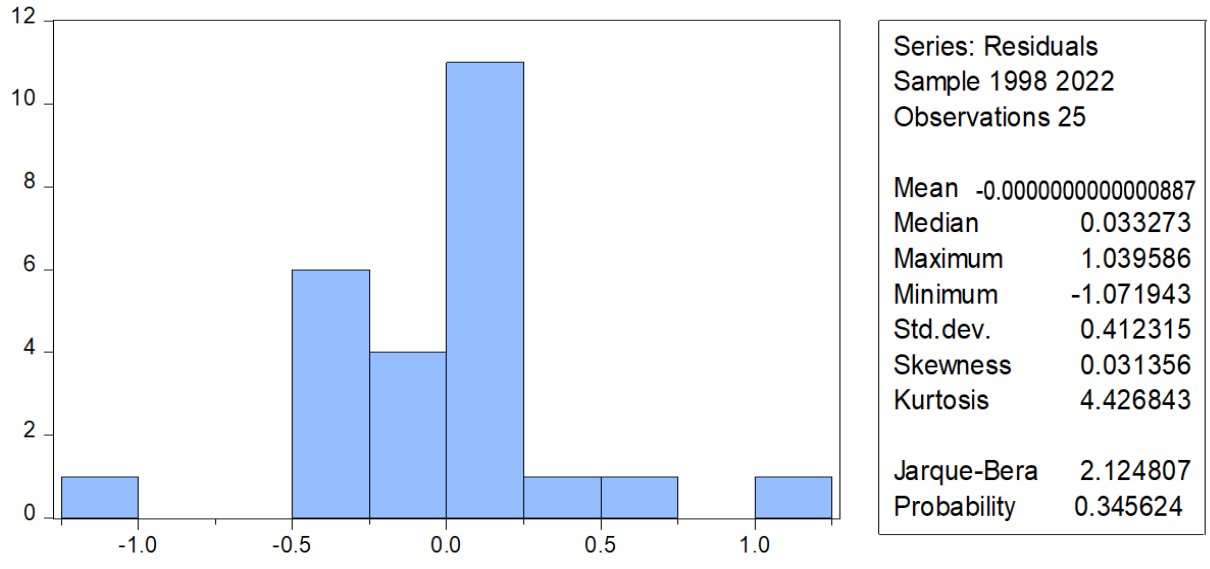

Figure 3. Normality test (Model 3).

4.5. Stability Test

The CUSUM (cumulative sum) test is used to test the constancy of the coefficients in a model to see if there are periods when the probability distribution of a time series varies. This is due to possible but unanticipated changes in the parameters of regression models; over time, it may cause structural breaks, which can lead to forecasting errors and unreliability of models.

4.5.1. CUSUM Test (Model 1)

Figure 4 shows that the model is within the 5% level of significance, which implies that the model is stable.

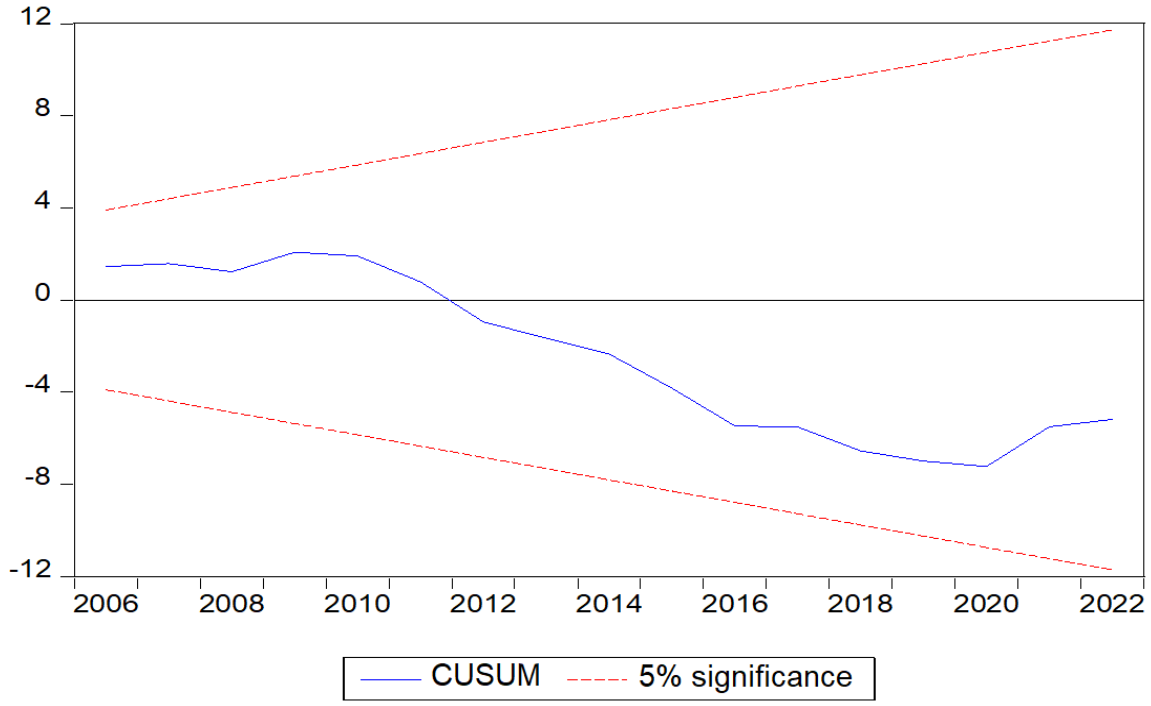

Figure 4. CUSUM test model 1.

4.5.2. CUSUM Test (Model 2)

Figure 5 shows that the model is within the 5% level of significance, which implies that the model is stable.

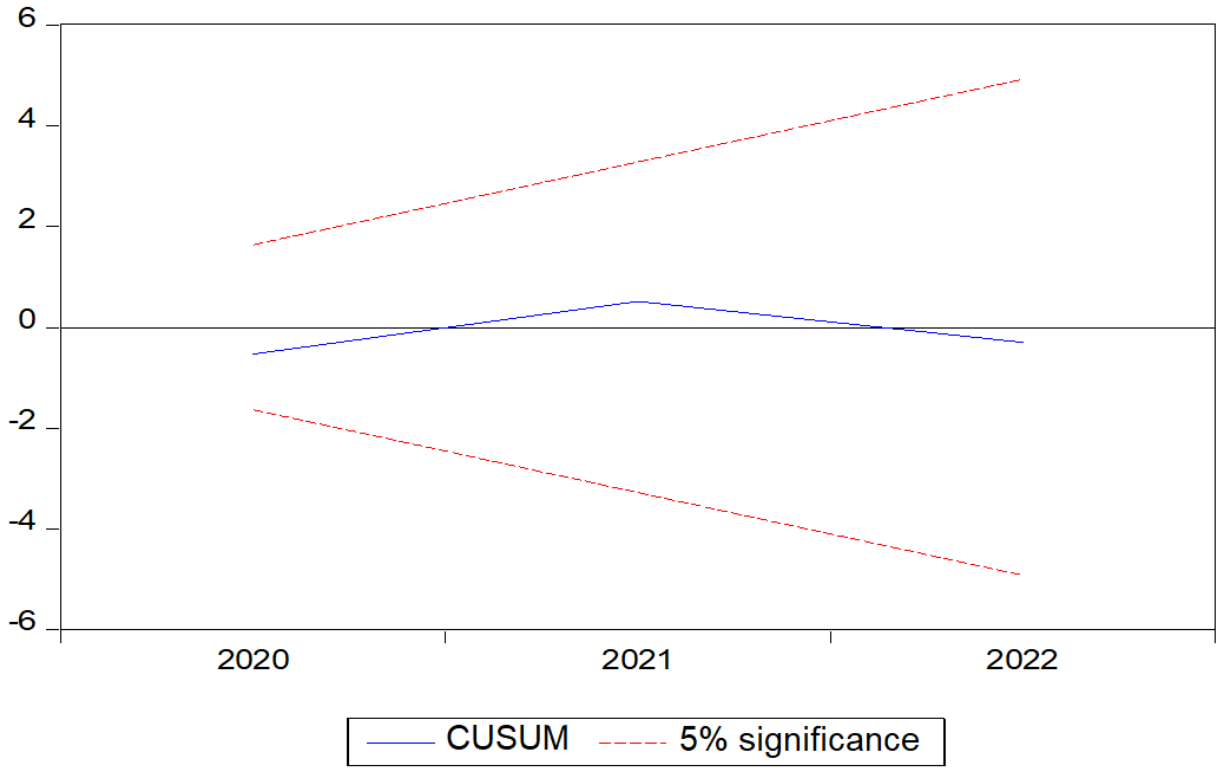

Figure 5. CUSUM test model 2.

4.5.3. CUSUM Test (Model 3)

Figure 6 shows that the model is within the 5% level of significance, which implies that the model is stable.

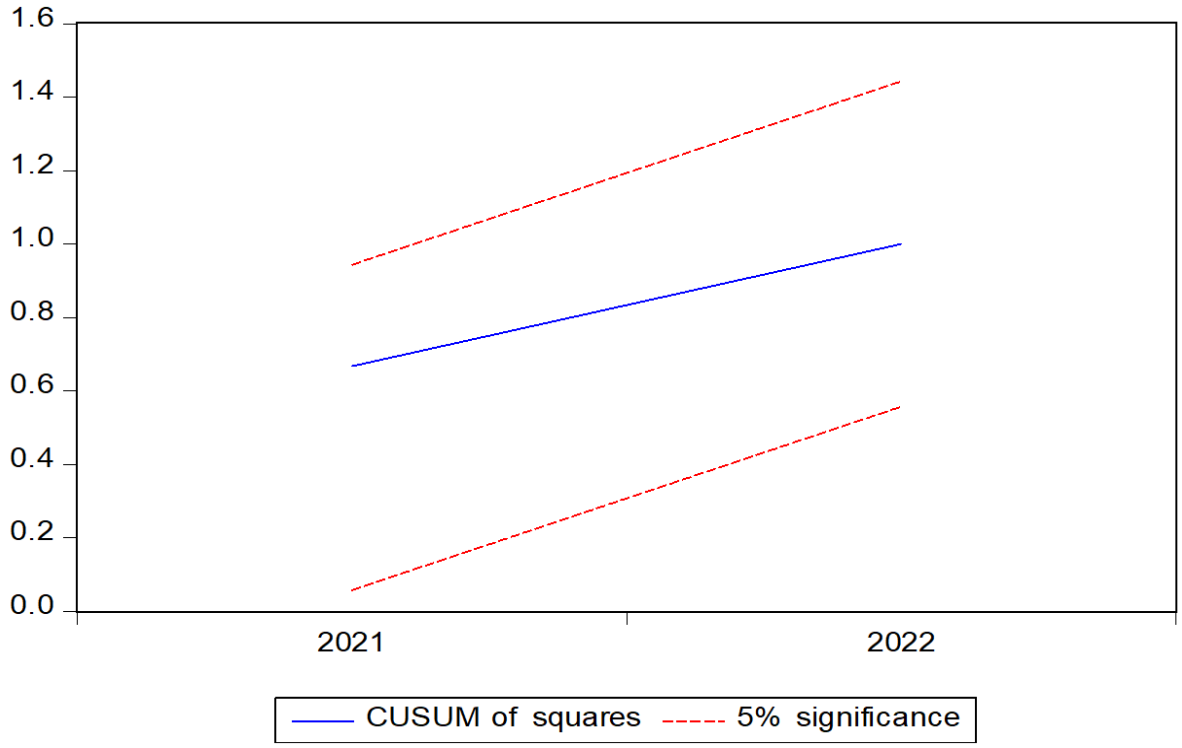

Figure 6. CUSUM test model 3.

4.6. Serial Correlation Test

Serial Correlation measures the relationship between a variable's previous and current values so that the presence of correlations and direction of relationship between previous and current values at different points in time can be identified.

We used the following hypothesis to interpret the results:

H_0: No Serial Correlation.

H_1: Presence of Serial Correlation.

4.6.1. Serial Correlation Test (Model 1)

Table 15 shows that the null hypothesis cannot be rejected with a p-value of 0.6491, which is greater than the 0.05 level of significance at a 95% confidence interval , which implies that the ECM is a good fit.

Table 15. Breusch-Godfrey serial correlation LM test (Model 1).

F-statistic	**0.22**	**Prob. F (1,16)**	**0.65**
Obs.*R-squared	0.35	Prob. Chi-square (1)	0.56

4.6.2. Serial Correlation Test (Model 2)

Table 16 shows that the null hypothesis cannot be rejected with a p-value of 0.1771, which is greater than the 0.05 level of significance at a 95% confidence interval for rejecting the null hypothesis, which implies that the ECM is a good fit.

Table 16. Breusch-Godfrey serial correlation LM test (Model 2).

F-statistic	**15.4**	**Prob. F (2,1)**	**0.18**
Obs*R-squared	24.2	Prob. Chi-square (2)	0.00

4.6.3. Serial Correlation Test (Model 3)

Table 17 shows that the null hypothesis cannot be rejected with a p-value of 0.1771, which is greater than the 0.05 level of significance at a 95% confidence interval, which implies that the ECM is a good fit.

Table 17. Breusch-Godfrey serial correlation LM test (Model 3).

F-statistic	**2.15**	**Prob. F (1,1)**	**0.38**
Obs.*R-squared	17.1	Prob. Chi-square (1)	0.00

4.7. Regression Results

4.7.1. Model 1

We evaluated the effect of Rule of Law on the relationship between government recurrent and capital expenditure and economic growth in Nigeria, and ARDL (1, 0, 0, 0, 0, 0, 0, 0) was selected to be the best model to test the relationship between real GDP and the regressors. The ARDL short-run model was estimated for Model 1; seeTable 10.

The results in Table 18 show that the equation is statistically significant at a 99% confidence interval. Furthermore, while the adjusted R-squared is not high at 42.93 %, the R-squared is relatively high at 61.19 %, with the F-statistic of 0.01 showing that the model is a good fit. For the model, the optimum selected model is one in which the variables are lagged as follows: GDP (1 year), while REXP, CEXP, REXP*ROL, CEXP*ROL, ROL, INFR, and LNDR are not lagged at all. The result of Model 1 shows that rule of law significantly moderates the relationship between disaggregated public expenditure and economic growth in Nigeria.

Table 18. Short run model (Model 1).

Variables	**Coefficient**	**Std. error**	**t-statistic**	**Prob.***
RGDP(-1)	-0.03	0.29	-0.09	0.93
REXP	-6.03	14.3	-0.42	0.7
CEXP	4.78	13.9	0.34	0.73
REXP_ROL	-5.82	12.3	-0.48	0.64
CEXP_ROL	2.00	12.3	0.16	0.87
ROL	8.42	33.3	0.25	0.80
INFR	-0.21	0.203	-1.05	0.31
LNDR	0.23	0.38	0.60	0.56
C	-7.41	37.1	-0.2	0.84
R-squared	0.613	Mean dependent var		4.79
Adjusted R-squared	0.43	S.D. dependent var		3.62
S.E. of regression	2.73	Akaike info criterion		5.11
Sum squared resid	126.0	Schwarz criterion		5.6
Log likelihood	-57.5	Hannan-Quinn criteria		5.24
F-statistic	3.35	Durbin-Watson stat		2.12
Prob (F-statistic)	0.02			

***Note:** P-values and any subsequent tests do not account for model selection.

In addition, the result of the estimated ARDL short run model estimation shows that for Model 1, in the short run, the selected explanatory variables displayed varying signs as they relate to the growth rate of the economy.

4.7.2. Model 2

We evaluated the effect of Control of Corruption on the relationship between government recurrent and capital expenditure and economic growth in Nigeria with EViews, evaluating 2,187 models, and ARDL (1, 2, 1, 2, 2, 2, 2, 2) was selected to be the best model to test the relationship between real GDP and the regressors. Given the outcome of the Bounds test, the ARDL ECM long-run model was estimated for Model 2; see Table 19.

Table 19 shows that the cointegration equation effect is statistically significant at a 99% confidence interval. Furthermore, both the R-squared (the proportion of the variation in the dependent variable that is predictable by the

independent variables) and the adjusted R-squared (which shows whether increasing the number of independent variables improves the regression model or not) are very high at 98.78 % and 97.07%, respectively, with the F-statistic of 0.000000 showing that the model is a good fit. For long-run real GDP, the optimum selected model is one in which the variables are lagged as follows: GDP (1 year), REXP (2 years), and CEXP (1 year). The model also includes two years for REXP*COC, two years for CEXP*COC, two years for COC, two years for INFR, and two years for LNDR. The result of Model 2 shows that control of corruption has a significant moderating effect on the relationship between disaggregated public expenditure and economic growth in Nigeria.

Table 19. ARDL error correction long run model (Model 2).

ECM regression				
Variables	**Coefficient**	**Std. error**	**t-statistic**	**Prob.**
C	-334.0	23.1	-14.48	0.01
D(LNREXP)	-6.21	3.35	-1.86	0.16
D(LNREXP(-1))	37.3	5.97	6.25	0.01
D(LNCEXP)	41.6	3.52	11.8	0.01
D(REXP_COC)	12.8	3.03	4.22	0.02
D(REXP_COC(-1))	50.1	6.5	7.72	0.01
D(CEXP_COC)	33.5	3.01	11.1	0.00
D(CEXP_COC(-1))	-8.8	0.61	-14.3	0.00
D(COC)	-338.0	22.8	-14.8	0.00
D(COC(-1))	-352. 0	48.5	-7.27	0.01
D(INFR)	-0.79	0.08	-9.54	0.00
D(INFR(-1))	0.48	0.03	14.4	0.00
D(LNDR)	-2.74	0.23	-11.75	0.00
D(LNDR(-1))	-0.58	0.19	-3.13	0.05
CointEq(-1)*	-1.12	0.08	-14.5	0.00
R-squared	0.99	Mean dependent var		0.01
Adjusted R-squared	0.97	S.D. dependent var		3.47
S.E. of regression	0.59	Akaike info criterion		2.08
Sum squared resid	3.53	Schwarz criterion		2.81
Log likelihood	-11.0	Hannan-Quinn criteria.		2.28
F-statistic	57.8	Durbin-Watson stat		3.42
Prob (F-statistic)	0.00			

***Note:** p-values and any subsequent tests do not account for model selection.

4.7.3. Model 3

We evaluated the effect of Regulatory Quality on the relationship between government recurrent and capital expenditure and economic growth in Nigeria with EViews, evaluating 2,187 models, and ARDL (1, 2, 2, 2, 2, 2, 2, 2) was selected to be the best model to test the relationship between real GDP and the regressors.

Given the outcome of the Bounds test, the ARDL ECM long run model was estimated for Model 3; see Table 20. The result in Table 20 shows that the cointegration equation effect is statistically significant at a 99% confidence interval. Furthermore, both the R-squared (the proportion of the variation in the dependent variable that is predictable by the independent variables) and the adjusted R-squared (which shows whether increasing the number of independent variables improves the regression model or not) are very high at 98.59 % and 96.24%, respectively, with the F-statistic 0.000000 showing that the model is a good fit. For the long-run real GDP, the optimum selected model is that in which the variables are lagged as follows: GDP (1 year), REXP (2 years), and CEXP (2 years). The model also includes the variables REXP*REQ (2 years), CEXP*REQ (2 years), REQ (2 years), INFR (2 years), and LNDR (2 years). The results of Model 3 indicate that regulatory quality has a significant moderating effect on the relationship between disaggregated public expenditure and economic growth in Nigeria.

Table 20. Error correction long-run model (Model 3).

ECM regression				
Variables	**Coefficient**	**Std. error**	**t-statistic**	**Prob.**
C	227.4	19.44	11.7	0.01
D(LNREXP)	31.3	3.74	8.38	0.01
D(LNREXP(-1))	-64.3	6.0	-10.7	0.01
D(LNCEXP)	-46.02	4.0	-11.6	0.01
D(LNCEXP(-1))	86.2	7.06	12.2	0.01
D(REXP_REQ)	48.7	3.72	13. 1	0.01
D(REXP_REQ(-1))	-66.5	5.99	-11.1	0.01
D(CEXP_REQ)	-54.6	4.22	-12.9	0.01
D(CEXP REQ(-1))	88.2	7.59	11.6	0.01
D(REQ)	7.23	16.0	0.45	0.7
D(REQ(-1))	-74.6	15.6	-4.78	0.04
D(INFR)	-0.39	0.05	-8.38	0.01
D(INFR(-1))	0.43	0.04	10.97	0.01
D(LNDR)	-0.37	0.11	-3.25	0.08
D(LNDR(-1))	-0.89	0.17	-5.22	0.04
CointEq(-1)*	0.13	0.01	11.7	0.01
R-squared	0.99	Mean dependent var		0.01
Adjusted R-squared	0.96	S.D. dependent var		3.47
S.E. of regression	0.67	Akaike info criterion		2.31
Sum squared resid	4.08	Schwarz criterion		3.09
Log likelihood	-12.8	Hannan-Quinn criteria		2.52
F-statistic	42.0	Durbin-Watson stat		2.98
Prob(F-statistic)	0.00			

*** Note:** p-values and any subsequent tests do not account for model selection

4.8. Test for Heteroskedasticity

In regression analysis, it is assumed that the error term is the same across all values of independent variables; this is known as homoscedasticity. If this assumption does not hold, then the estimates are not efficient, and their standard errors become biased. Thus, heteroscedasticity is the opposite of homoscedasticity, and the effect of heteroscedasticity is that the size of the error term differs across values of an independent variable and the standard deviations of predicted variable are non-constant.

We used the following hypothesis to interpret the results displayed.

H_0: Heteroskedasticity.

H_1: Homoskedasticity.

4.8.1. Heteroskedasticity Test (Model 1)

The result in Table 21 shows that the null hypothesis cannot be rejected with a p-value of 0.9075, which is greater than the 0.05 level of significance at a 95% confidence interval for rejecting the null hypothesis, which implies that the model is free from heteroskedasticity (i.e., it is homoscedastic).

Table 21. Heteroskedasticity test: Breusch-Pagan-Godfrey (Model 1).

F-statistic	**0.40**	**Prob. F(8,17)**	**0.91**
Obs.*R-squared	4.09	Prob. Chi-square (8)	0.85
Scaled explained SS	1.69	Prob. Chi-square (8)	0.99

4.8.2. Heteroskedasticity Test (Model 2)

Table 22 shows that the null hypothesis cannot be rejected with a p-value of 0.8103, which is greater than the 0.05 level of significance at a 95% confidence interval for rejecting the null hypothesis, which implies that the model is free from heteroskedasticity (i.e., it is homoscedastic).

Table 22. Heteroskedasticity test: Breusch-Pagan-Godfrey (Model 2).

F-statistic	**0.58**	**Prob. F (21,3)**	**0.81**
Obs.*R-squared	20.0	Prob. Chi-square (21)	0.52
Scaled explained SS	0.28	Prob. Chi-square (21)	1.00

4.8.3. Heteroskedasticity Test (Model 3)

At a 95% confidence level, Table 23 shows that the null hypothesis can't be thrown out because the p-value of 0.3703 is higher than the 0.05 level of significance. This means that the model doesn't have any heteroskedasticity, so it is homoscedastic.

Table 23. Heteroskedasticity test: Breusch-Pagan-Godfrey (Model 3).

F-statistic	**2.12**	**Prob. F (22,2)**	**0.37**
Obs.*R-squared	24.0	Prob. Chi-square (22)	0.35
Scaled explained SS	0.26	Prob. Chi-square (22)	1.00

5. DISCUSSION

Over the years, we observed a shift in public expenditure from capital to recurrent. Additionally, it was found that from 1996 to 1999, capital expenditure was significantly higher than recurrent expenditure. However, this trend changed from 2000 onwards, with recurrent expenditure (which includes things like wages and salaries, interest payments, subsidies, and transfers) significantly outstripping capital expenditure (which includes buying fixed assets like schools, hospitals, roads, and bridges). As a result, by the end of 2022, recurrent expenditure was about 2.5 times greater than capital expenditure. Studies such as Aluthge et al. (2021) have found that higher investments in capital expenditure have a significantly positive impact on economic growth in the short and long run compared to recurrent expenditure, which does not have a significant impact on economic growth in either the short or long run.

Second, we determined that over the years, institutional quality had a positive relationship with both recurrent expenditure and capital expenditure, with the Rule of Law variable having the strongest positive correlation with both components of public expenditure. This conclusion means that the stronger the quality of Nigeria's institutions, the greater would be the country's rate of economic growth. This finding on the situation with the Nigerian economy is critical because Ozpolat, Guven, Ozsoy, and Bahar (2016) also found and stated with the Turkish economy that efficient institutional structure resolves the uncertainties in the market and the problem of asymmetric information and thus creates a positive exogeneity, ensures the efficient distribution of the resources, and makes a positive impact on the functioning of the economy.

Third, we determined that over the years, there has been a negative relationship between real GDP and inflation rate. While this finding is contrary to economic theory, it is not unusual in the context of Nigeria. While studies such as that of Onwioduokit and Bassey (2014) have shown that inflation rates that are below threshold levels have statistically significant positive effects on GDP growth rates, the relationship between inflation rates and economic growth rates quickly changes to a negative one once inflation rates exceed threshold levels. In the case of Nigerian inflation, threshold levels have been determined to range between 1 % per annum (Fadare & Oladipo, 2023) and 5 % per annum (Aero & Ogundipe, 2016) as being conducive for economic growth for Nigeria's economy. However, Nigeria's inflation has continued on an upward trajectory for many months, such that the Nigeria Bureau of Statistics reported that by the end of April 2024, Nigeria's inflation rate was 33.69%, compared to 33.2% in March 2024. Year-on-year, Nigeria's inflation rate in April 2024 was 11.47 % higher than in April 2023, when it stood at 22.22 %.

Finally, we determined that the best ARDL model for: (i) Model 1 (the effect of Rule of Law on the relationship between government recurrent and capital expenditure and economic growth in Nigeria) is one where growth in real GDP is a function of growth in real GDP lagged by 1 year, and REXP, CEXP, REXP*ROL, CEXP*ROL, ROL, INFR, and LNDR not lagged at all; (ii) Model 2 (the effect of Control of Corruption on the relationship between government recurrent and capital expenditure and economic growth in Nigeria) is one where growth in real GDP is

a function of growth in real GDP and CEXP lagged by 1 year, and REXP, REXP*COC, CEXP*COC, COC, INFR, and LNDR all lagged by two years; and (iii) Model 3 (the effect of Regulatory Quality on the relationship between government recurrent and capital expenditure and economic growth in Nigeria) is one where growth in real GDP is a function of growth in real GDP lagged by one year and all other regressors REXP, CEXP, REXP_REQ, CEXP_REQ, REQ, INFR, and LNDR lagged by two years.

6. CONCLUSION

The application of various econometric tests and analyses, such as unit root tests, co-integration bounds tests, VAR lag order selection, and regression analyses, revealed the following findings:

1. The impact of institutional variables on the relationship between public expenditure and economic growth in Nigeria is significant and positive.
2. Excessive lending rates are inimical to economic growth in Nigeria as annual government deficit financing at high cost of funds continues to crowd-out the private sector.
3. If inflation rates exceed inflation threshold levels, rising inflation rates would continue to negatively impact economic growth rates in Nigeria.

In optimizing the moderating impact of institutional quality on the relationship between public expenditure and economic growth, government should adopt policies that build strong institutions through consistency in upholding the rule of law. In addition, these policies should firmly address the endemic problem of corruption. Transparency International's 2023 Corruption Perceptions Index ranked 180 countries and territories around the globe by their perceived levels of public sector corruption, scoring on a scale of 0 (highly corrupt) to 100 (very clean). Nigeria scored 25, ranking Nigeria 145th most corrupt country in the world out of 180 countries. The cited instances range from reports of bribery and extortion to political interference in the justice system. Specific policy recommendations include a need to address the endemic problem of corruption, boost the economy's industrial productivity and stimulate private sector investment participation in the economy, moderate excessive lending rates, and encourage the crowding-in of the private sector so that the private sector can readily access bank credits for business expansion.

6.1. Contributions to Knowledge

This study makes several significant contributions to the theoretical literature on public expenditure, institutional quality, and economic growth. First, while there are several studies that have considered the impact of government capital and / or recurrent expenditures on Nigeria's economy (see for example, (Aigheyisi, 2013; Aluthge et al., 2021; Nurudeen & Usman, 2010)), no study was found that considered the possibility of institutional quality variables moderating the strength or direction of relationships between recurrent and capital expenditure and economic growth in Nigeria. The results of this study showed that (a) rule of law has a significant and positive moderating effect on the relationship between disaggregated public expenditure and economic growth in Nigeria; (b) control of corruption has a significant and positive moderating effect on the relationship between disaggregated public expenditure and economic growth in Nigeria; and (c) the quality of regulations has a significant and positive moderating effect on the relationship between disaggregated public expenditure and economic growth in Nigeria.

Secondly, contrary to prior research such as that of Gukat and Ogboru (2017), which found that public expenditure did not translate into meaningful economic growth; or Olayungbo and Olayemi (2018), which found that in the short run and long run, there were negative effects of government spending on economic growth; and Onuoha and Okoye (2020), which found that while there is a positive relationship between aggregate public expenditure and economic growth, recurrent government expenditure and capital government expenditure have insignificant effects on economic growth, this study found that recurrent and capital expenditure were significant and positive predictors of economic growth in Nigeria.

Contrary to economic theory, we found a positive correlation between the lending rate control variable and Nigeria's economic growth rate. A priori expectation is that high lending rates will cripple economic growth; however, with the Nigerian situation, high lending rates being positively correlated to economic growth suggests that observed rising government borrowings and continuous deficit financing are major drivers of the high cost of funds which also effectively crowds out the borrowing activities of the private sector. In addition, the variable for controlling the inflation rate was found to be negatively related to economic growth rate in Nigeria; this implies that as the general price levels are rising, economic growth will tend downwards in Nigeria. While some degree of rise in general price levels is good for the economy, research has shown that excessive general rises in price levels above a threshold are harmful to economic growth. This is perhaps one critical reason why Nigeria's economic growth has been sticky and has become an enigma for many years.

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