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Effect of Public Debt and Institutional Quality on Economic Performance in Nigeria: An ARDL Based Approach

OLURIN ENITAN OLUROTIMI PhD
Department of Accounting and Finance, Mountain Top University, Ibafo, Ogun State, Nigeria.
eoolurin@mtu.edu.ng

Abstract
Public debt which allows government to finance their operations when revenue from taxes and other sources falls short of expenditures plays a crucial role in the economy and public finance of both developed and developing nations around the world. The optimism is that such decision will spur growth in the economy without due consideration for the state of the institutional structures available in the economy. This study investigates the effect of public debt on macroeconomic performance in Nigeria and the role institutional quality can play. This study employed the Autoregressive Distributed La (ARDL) bound testing technique and error correction model (ECM) following the framework established by Pesaran, Shin, and Smith 92001). The study utilized the augmented Dickey-Fuller (DF) and Phillips- Perron (PP) tests to verify the outcome properties of the time series. The results off the estimation indicate that money supply growth significantly affected economic growth positively, exchange rate significantly affected economic growth negatively, institutional quality and debt significantly affected real interest rate positively, and debt positively affected inflation, whereas the interaction of debt and institutional quality affects real interest rates and inflation negatively. In addition, the study recommends that the Federal Government of Nigeria should sustain an enhanced institutional quality environment to continually engender positive effects on economic performance.

Keywords: Institutional quality, Autoregressive Distributed Lag, Macro-economic performance, Public Debt and Public Finance.
JEL Classification: E23, E43, F21, F34, F43, O47.

Introduction

Across the globe, enhancing economic growth has consistently remained a primary objective for governmental executive branches and political decision-makers, aiming to enhance overall macroeconomic performance (OECD, 2019). Particularly for sovereign nations, especially those in the developmental phase facing challenges like domestic investment and savings rates, bolstering macroeconomics are paramount. This entails achieving full employment, maintaining low and stable inflation, sustaining a positive balance of payments, ensuring a balanced government budget, safeguarding the environment, and promoting greater income equality (Nasir, Huynh, Do & Nguyen, 2020).

Given the economic circumstances of many developing countries, improving macroeconomic performance has been a focal point across all levels of government, often involving the utilization of public debt. Public debt, encompassing funds borrowed by the government through instruments like Treasury Bills, Treasury Bonds, and Sovereign Bonds (Sasaki, 2009 is aimed at addressing funding shortfalls and facilitating investment objectives (Moki, 2020). It enables the financing of infrastructure projects and helps alleviate a country's budgetary disparities (Balassone, Francese & Pace, 2011). According to Weeks (2018), public debt can be instrumental in financing investments and infrastructure, thereby fostering economic growth, enhancing productivity, reducing unemployment, and overall improving a country's economy.

Moreover, the occurrence of global economic crises has underscored the necessity for countries, particularly emerging ones, to resort to borrowing to balance escalating spending against dwindling capital flows (Ogboona, Ibenta, Chris-Ejiogu & Atsanan, 2019). Addressing unfavourable balance payments and budget deficits stands out as the primary rationale for governments resorting to borrowing from both domestic and foreign sources (Lucky & Godday, 2017. However, concerns have been raised by the public regarding the potential impact of high levels of public debt on Nigeria's

economic growth (Ehikioya & Omankhanle, 2021; Chimezie, Omankhanle, & Eriabie, 2020). Nigeria faces the dual challenge of spurring economic growth while grappling with mounting debt burdens due to budget deficits, declining net export balances, falling crude oil prices, and increased payments to foreign entities. Since the 2016 economic recession, the Nigerian government has displayed a renewed inclination towards borrowing without clear investment strategies to ensure debt servicing.

Despite Nigeria's debt relief from the Paris Club in 2005, the country's public debt has surged, rendering it one of the most indebted countries in sub-Sahara, contributing to sluggish GDP growth, stagnating export expansion, and declining per capita income (Yusuf & Mohd, 2021). Notably, Nigeria's external debt soared by an average of 18507.56 US$ million between 2000 and 2022, reaching a record 103312.80 US$ in the second quarter of 2022 (DMO, 2023). The escalating public debt has led to queries about the causal relationship between public debt and macroeconomic performance, with differing views regarding its impact (Odior & Arinze, 2017). While some argue that public debt has no bearing on macroeconomic performance, others contend that it does not influence it (Muhdi & Sasaki, 2022). The assertion that public debt significantly improves the economy prompts countries to utilize loans as stimulus, emphasizing the need for transparency and justification for government borrowing (Chimezie, Omankhanle & Eriabie (2020). However, many studies overlook the influence of institutional quality on the link between public debt and macroeconomic performance. Institutions, defined as humanly devised constraints shaping political, economic and social interaction (North, 1990), are pivotal in economic growth and development (Acemoglu, Johnson &Robinson, 2005; Bardhan, 2001).

Thus, it is imperative to scrutinize this claim within the Nigeria context, especially considering the persistent rise in public debts of the Federal Government over the years. It is in light of this assertion that this study aims to find out how the institutions in Nigeria contribute to or discourage the effect that public debt could have on the economic growth of Nigeria. This study contributes to the existing literature by considering the institutional quality impact on public debt in Nigeria which to the best knowledge of the author is quite limited in the literature. The paper is organized as follows. The next section presents an overview of the literature on the topic. Section 3 introduces the method, data, and econometric approach while section 4 presents the empirical results. Finally, section 5 concludes this study with a discussion of our findings.

Literature Review

Theoretical Framework

The theoretical foundations of this study rest upon three theories: the Debt Crowding Hypothesis, the Debt Overhang Hypothesis, and the Debt Laffer Curve Hypothesis. The Debt Crowding-Out Hypothesis, stemming from John Maynard Keynes' work in 1936, forms the basis for theories regarding the impact of debt on economic performance. According to conventional theory, an increase in government debt burdens future generations, particularly over the long term (Jhingan, 2011). If domestic and international borrowing is used to cover government deficits, interest rates, disposable income, and wages may all rise, leading to decreased corporate profitability and reduced private investment (Coulibaly et al., 2020). This could either discourage private investment or "crowd it out", resulting in a decrease in an economy's productivity level. Due to the rapid growth of debt, consumers may perceive themselves as wealthier due to the rapid increase in public debt and engage in more spending in the short term, boosting demand for products and services, output, and employment. However, in the long run, higher interest rates could hinder economic growth and reduce private sector participation in a market-based economy, leading to decreased consumption, diminished welfare, and economic contraction (Ogunjimi, 2019).

Classical economists view debt as a future tax imposed by the government inhibiting both current and future generations from accumulating wealth and living fulfilling lives. They advocate for minimizing government borrowing and restricting it to necessary public spending, particularly in funding essential infrastructure improvements that enhance economic productivity (Komlan & Essosinam, 2022). They argue that heavy government borrowing from domestic financial markets discourages private sector investment and disrupts a nation's natural economic growth process by diverting limited resources from effective private sector management to fund system inefficiencies (Malachy et al., 2022). This viewpoint underscores the belief that government debt is detrimental to

the economy, particularly when it undermines both fiscal discipline in the budgeting process and the financial inclusion of the private sector (Ono & Uchida; Àkos & Istvàn, 2019).

The Debt-Overhang Hypothesis, proposed by Howard in 1972, addresses situations where a nation's debt exceeds its ability to repay. This occurs when the expected repayment of debt surpasses the actual contracted amount, resulting in a significant burden on the current GDP to guarantee loans, discouraging investment (Eme & Olugboyega, 2012). Debt overhang reflects creditors' lack of confidence in the debtor country's ability to fully repay its debt, leading to debt servicing acting as an implicit tax that stifles investment, constraints economic growth, and makes it challenging for highly indebted countries to escape poverty (Komlan & Essosinam, 2022). In the context of developing countries, servicing massive public debt depletes national revenue, generates instability, and delays growth to the extent that the country's return to growth paths becomes uncertain, even with substantial reform measures (Àkos & Istvàn, 2019). Additionally, heavy debt loads induce capital flight, decrease domestic savings and investment, shrink the tax base' impair debt servicing capacity, and hamper growth by diverting funds from other uses to repay debt, reducing import capacity, global competitiveness and investment (Festus et., 2022; Madow et al., 2021).

The Debt Laffer curve hypothesis, introduced by Arthur Laffer in 1974, posits a point at which public debt stimulates economic growth, beyond which debt has detrimental effects. When debt surpasses a certain threshold, a country's repayment capacity begins to deteriorate, leading to debt overhang and debt service problems. Excessive government borrowing leads to inefficiencies that ultimately impede economic growth, creating a nonlinear relationship between government debt and economic growth (Komlan & Essosinam, 2022). This theory suggests that reducing the nominal value of debt obligations can alleviate the distortion caused by implicit taxes, thereby increasing the debtor's capacity for investment and repayment (Eze et al., 2019). The debt laffer curve serves as a tool for creditors to evaluate a debtor's country's solvency, particularly in the context of debt overhang, as debt forgiveness can enhance the expected value of future repayments by reducing default risk (Sacks & Caravan, 1989; Krugman, 1988).

In addition to these theories enumerated above, the study is also premised on the institutional school of economic thought. According to North (1190), "Institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction. Economic institutions are indispensable due to their influence on the structure of economic incentives. Economic institutions help to allocate resources to their most efficient use, as it guides against misallocation of resources (Acemoglu et.al, 2005). It was further emphasized that institutional quality facilitates and encourages factor accumulation and innovation and also ensures the efficient allocation of resources to productive activities (Ang. 2008).

Empirical Review

The empirical evidence regarding the relationship between debt and macroeconomic performance presents varying predictions concerning both the direction and strength of these associations (Elmendorf and Mankiw, 1999; Cochrane, 2011; Lucky and Godday, (2017); Attapattu and Padmasiri, 2018). In a related study, Checherita-Westphal and Rother (2010) used the fixed effects technique to assess the impact of public debt on economic performance in 12 European countries during the period 1970 – 2010. The study concluded that once the debt is between 90 –100 per cent of GDP, there is a non-linear negative relationship between public debt and economic growth. Reinhart and Rogoff (2010) analyzed data from 20 developed economies spanning from 1949 to 2009, indicating a negative correlation between high debt levels and economic growth. The study concluded that at a public debt threshold of 90 per cent of GDP, there was no substantial evidence to support a link between public debt and economic growth. Yusuf and Mohd (2021) investigated the effect of government debt on Nigeria's economic growth using annual data from 1980 to 2018 and the Autoregressive Distributed Lag technique. The findings revealed that external debt hindered long-term growth while short-term effects were growth-enhancing. Domestic debt, on the other hand, positively impacted long-term growth despite short-term adverse effects. The study suggested that directing borrowed funds towards diversifying the productive base of the economy could improve long-term economic growth, broaden the revenue base, and enhance the capacity to repay outstanding debts when due.

Essien et al., (2012) examined the impact of public sector borrowings on various variables in Nigeria. The study finds no significant influence of both external and domestic debts on the general price level and overall economic performance. Similarly, Igbodika et al., (2016) assessed the impact of domestic debt on economic on economic growth in Nigeria from 1987 to 2014 using the OLS technique, concluding that domestic debt positively and significantly affected Nigeria's GDP. Conversely, Elom-Obed et al., (2017) and Eze et al. (2019) highlighted the adverse and significant impacts of both domestic and external debts on economic growth in Nigeria.

Ehikioya and Omankhanlen (2021) examined the impact of public debt on economic growth in Nigeria using the Johansen cointegration test, Ordinary Least Square technique, and Vector Error Correction Model, based on data from 1981 to 2019. The study revealed a long-run equilibrium relationship between public debt and economic growth in Nigeria, with evidence of an adverse impact of public debt on economic performance, particularly significant with the lag variable. The study also demonstrated the influence of inflation, interest rates, oil prices, and investment on economic growth in Nigeria, suggesting the need for policymakers to support private sector-led investment initiatives to enhance economic performance.

Edeminam (2021) examined the impact of public debt on economic growth in Nigeria using annual time series data from 1990 to 2019, employing statistical methods such as the Augmented Dickey-Fuller unit root test, Johansen cointegration test, and Vector Error Model. The empirical results reveal a negative and significant long-run impact of public debt on economic growth with an insignificant negative impact observed in the short-run. Furthermore, the study highlighted the significant negative impact of the debt servicing-to-GDP ratio on economic growth. Notably, no causality was found between public debt and economic growth. The study recommended that Nigeria's public authorities reduce reliance on public debt and focus on revenue diversification to improve economic performance while strengthening public institutions to ensure efficient utilization of resources.

Hlongwane (2023) employed a bound test to explore the relationship between various macroeconomic variables and economic growth in South Africa, finding a negative effect of external debt on real GDP growth both in the short and long run. Policy implications from the study include the need for improved debt management and the utilization of debt-to-equity swaps through privatization to manage public debt more effectively. Abubakar and Mamman (2021) utilized a two-stage least squares regression to examine the effects of public debt on growth in 37 OECD countries, revealing a significant negative effect of debt on economic growth, larger than the positive transitory effect. Additionally, while all country groups experienced negative permanent effects, not all experienced positive transitory effects.

Data and Methodology

Data Description and Source

The study employed the Autoregressive Distributed Lag (ARDL) bound testing technique and error correction model (ECM) following the framework established by Pesaran, Shin, and Smith (2001). This model is advantageous as it addresses endogeneity and simultaneity issues, allowing for inferences to be drawn from the dynamic behaviour of economic variables. In contrast to the Engle-Granger (1987) single equation approach and the maximum likelihood method proposed by Johansen (1991, 1995), the ARDL bound testing approach offers several significant advantages. Firstly, it can analyze long-term relationships between variables regardless of their order of integration (I (0), I (1), or mutually integrated). Secondly, it distinguishes between dependent and explanatory variables, overcoming limitations of the Engle-Granger method while simultaneously estimating short-run and long-run components, mitigating issues related to omitted variables and autocorrelation. Lastly, unlike the Engle-Granger and Johansen cointegration, the ARDL approach yields consistent short-run estimates and super-consistent long-run estimates even with small samples (Pesaran et al., 2001).

Annual data from 1991 to 2021 for real interest, public debt as a percentage of GDP, inflation (Consumer Price Index), money supply growth rate, exchange rate, and Gross Domestic Product (GDP) –serving as a proxy for economic growth) were collected from the World Development Indicators (2023). The exchange rate and money supply growth rate were included as control variables. Institutional quality data were sourced from the International Country Risk Guide (ICGR)

complied by the Political Risk Services (PRS) group (2023). In line with Law, Lee and Singh (2018), the overall institutional factors are measured by five indicators such as (i) democratic accountability (ranging 0-6), (ii) government stability (ranging 0-12), (iii) bureaucratic quality (ranging 0-4), (iv) corruption control (ranging 0-6) and (v) law and order (ranging 0-6). Following Law et al (2018), an overall institution variable is constructed by summing the five ICRG indicators. Sub-indicators of the institutional quality index are rescaled from 0-10 to maintain comparability. A higher number indicates a higher level of institutional quality, whilst lower values indicate a lack of institutional features. The main idea behind rescaling institutional quality indicators is to make them follow the same pattern so that interpretations are consistent (Muye & Muye, 2017).

Model Specification

The functional relationship between the dependent and independent variables is expressed in the following equation:

GDPGR = f (DEBT, INST, DEBT*INST, EXCR, MSGR)……………………………….. (1(i)
REINT= f (DEBT, INST, DEBT*INST, EXCR, MSGR)………………………….. …… (1(ii)
INFL = f (DEBT, INST, DEBT*INST, EXCR, MSGR)………………………………..1(iii)
UNEMP= f (DEBT, INST, DEBT*INST, EXCR, MSGR)…………………………….. (1(iv)

Where:
GDPGR = Gross Domestic Product growth rate (proxy for economic growth)
DEBT = Public Debt as a percentage of GDP (proxy for Debt)
INST = Institutional factor index
DEBT*INST= Interaction of Institutional factor and Debt
EXCR = Exchange rate
MSGR = Money Supply growth rate

Further, converting the equation (1) in the ARDL framework according to Pesaran et al (2001) as follows:

$$\Delta GDPGR_t = \alpha_0 + \sum_{i=1}^{a}\alpha_{1i}\Delta GDPGR_{t-1} + \sum_{i=0}^{b}\alpha_{2i}\Delta DEBT_{t-2} + \sum_{i=0}^{c}\alpha_{3i}\Delta INST_{t-1} + \sum_{i=0}^{d}\alpha_{4i}\Delta DEBT*INST_{t-1}$$
$$+\sum_{i=0}^{e}\alpha_{5i}\Delta EXCR_{t-1} + \sum_{i=0}^{f}\alpha_{6i}\Delta MSGR_{t-1} + \beta_1(GDPGR)_{t-1} + \beta_2(DEBT)_{t-1} + \beta_3(INST)_{t-1}$$
$$\beta_4(DEBT*INST)_{t-1} + \beta_5(EXCR)_{t-1} + \beta_6(MSGR)_{t-i} + \varepsilon_t \text{...}(2)$$

$$\Delta REINT_t = \alpha_0 + \sum_{i=1}^{a}\alpha_{1i}\Delta REINT_{t-1} + \sum_{i=0}^{b}\alpha_{2i}\Delta DEBT_{t-2} + \sum_{i=0}^{c}\alpha_{3i}\Delta INST_{t-1} + \sum_{i=0}^{d}\alpha_{4i}\Delta DEBT*INST_{t-1}$$
$$+\sum_{i=0}^{e}\alpha_{5i}\Delta EXCR_{t-1} + \sum_{i=0}^{f}\alpha_{6i}\Delta MSGR_{t-1} + \beta_1(GDPGR)_{t-1} + \beta_2(DEBT)_{t-1} + \beta_3(INST)_{t-1}$$
$$\beta_4(DEBT*INST)_{t-1} + \beta_5(EXCR)_{t-1} + \beta_6(MSGR)_{t-i} + \varepsilon_t \text{...}(3)$$

$$\Delta INFL_t = \alpha_0 + \sum_{i=1}^{a}\alpha_{1i}\Delta INFL_{t-1} + \sum_{i=0}^{b}\alpha_{2i}\Delta DEBT_{t-2} + \sum_{i=0}^{c}\alpha_{3i}\Delta INST_{t-1} + \sum_{i=0}^{d}\alpha_{4i}\Delta DEBT*INST_{t-1}$$
$$+\sum_{i=0}^{e}\alpha_{5i}\Delta EXCR_{t-1} + \sum_{i=0}^{f}\alpha_{6i}\Delta MSGR_{t-1} + \beta_1(GDPGR)_{t-1} + \beta_2(DEBT)_{t-1} + \beta_3(INST)_{t-1}$$
$$\lambda\beta_4(DEBT*INST)_{t-1} + \beta_5(EXCR)_{t-1} + \beta_6(MSGR)_{t-i} + \varepsilon_t \text{...}(4)$$

$$\Delta UEMPL_t = \alpha_0 + \sum_{i=1}^{a} \alpha_{1i} \Delta UEMPL_{t-1} + \sum_{i=0}^{b} \alpha_{2i} \Delta DEBT_{t-2} + \sum_{i=0}^{c} \alpha_{3i} \Delta INST_{t-1} + \sum_{i=0}^{d} \alpha_{4i} \Delta DEBT * INST_{t-1}$$
$$+ \sum_{i=0}^{e} \alpha_{5i} \Delta EXCR_{t-1} + \sum_{i=0}^{f} \alpha_{6i} \Delta MSGR_{t-1} + \beta_1 (GDPGR)_{t-1} + \beta_2 (DEBT)_{t-1} + \beta_3 (INST)_{t-1}$$
$$\beta_4 (DEBT * INST)_{t-1} + \beta_5 (EXCR)_{t-1} + \beta_6 (MSGR)_{t-i} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(5)$$

Equations (2-5) are the ARDL representation of equation (1), where Δ signifies the operator of the first difference, α's parameters measure the short-run relationship. Similarly, β's parameters are associated with lagged term captures in the long-run relationships. Equations (2–5) will be estimated through ordinary least squares. In the second step, the Wald test will be used to obtain the F-test. In the third step, the hypothesis shown below is tested:

H0: β1 = β2 = β3 = β4 = β5 = β6 = 0

H1: β1 ≠ β2 ≠ β3 ≠ β4 ≠ β5 ≠ β6 = 0

Empirical Results and Discussion

Descriptive Statistics of the Data

Table 1: Descriptive Statistics of the variables

	DEBT	DEBTINST	EXCR	GDPGR	INFL	INST	MSGR	REINT	UNEMPLY
Mean	33.606	127.449	137.819	4.319	20.453	3.897	25.426	3.200	4.181
Median	26.500	108.110	128.935	4.400	12.950	4.000	21.185	5.750	3.900
Maximum	75.000	278.530	401.150	15.300	85.000	4.610	87.760	18.200	6.000
Minimum	7.300	25.500	8.040	-2.000	5.400	2.680	-0.790	-31.500	3.700
Std. Dev.	20.927	72.822	106.984	4.013	20.086	0.444	18.800	10.275	0.664
Skewness	0.668	0.462	0.792	0.439	2.024	-0.740	1.349	-1.402	1.807
Kurtosis	2.231	2.040	2.961	3.280	5.956	3.154	5.219	5.528	4.882
Jarque-Bera	3.167	2.365	3.348	1.132	33.512	2.949	16.277	18.994	22.134
Probability	0.205	0.306	0.188	0.568	0.000	0.229	0.000	0.000	0.000
Sum	1075.400	4078.370	4410.220	138.200	654.500	124.710	813.620	102.400	133.800
Sum Sq. Dev.	13575.580	164395.300	354812.200	499.229	12506.820	6.124	10956.800	3272.560	13.669
Observations	32	32	32	32	32	32	32	32	32

Source: Author's Computation, 2024

Before proceeding with the empirical analysis of the role played by institutional factors in the nexus between public debt and macroeconomic performance in Nigeria, the descriptive characteristics of the variables are examined to provide necessary information on them. Descriptive statistics provides the opportunity to have the feel of the data. The mean value which is the average value of the variables shows that DEBT, DEBT*INST, EXCR, GDPGR, INFL, INST, MSGR, REINT and

UNEMPLY is 33.606, 127.449, 137.819, 4.319, 20.453, 3.897, 25.426, 3.200 and 4.181 respectively. The average value of DEBT, DEBT*INST, EXCR, INFL, MSGR and UNEMPLY are greater than their median value of the variable. It implies that their data distributions in Nigeria are skewed to the right. The Jarque-Bera statistic indicates that the DEBT is normally distributed. Similarly, all other variables such as DEBT*INST, EXCR, and INST are normally distributed based on the p-values of their respective Jarque-Bera statistics, unlike INFL, MSGR, REINT and UNEMPLY which are not normally distributed. Furthermore, the data distributions of INST, GDPGR and REINT, appeared skewed to the left, as their means are less than the median values. The comparison of standard deviation and mean values of all the variables suggests that the average values represent that data somewhat. The coefficients of skewness indicate that all the variables apart from INST and REINT are positively skewed. These suggest that all the variables portray elements of asymmetries in their data either by skewing to the right or the left, none is symmetrical in data distribution. In addition, the coefficients of Kurtosis suggest that GDPGR, MSGR, INFL, REINT and UNEMPLY are leptokurtic due to the premise that their coefficients are more than 3, implying that their data distributions are more heavily concentrated about the mean than a normal distribution. However, DEBT, DEBT* INST and EXCR are platykurtic as their coefficients are less than 3, implying that their data distributions are less heavily concentrated about the mean than a normal distribution.

Correlation Analysis

Multi-collinearity is tested by looking at the correlation in Table 2. Previous research (Gujarati & Porter, 2009) suggests that a multi-collinearity issue may arise if the correlation between two or more variables is higher than 0.8. The maximum value here is 0.955 between DEBT and DEBT*INST, this may be due to their interaction.

Table 2: Correlation Matrix of the variables

	DEBT	DEB*INST	EXCR	GDPGR	INFL	INST	MSGR	REINT	UNEMPLY
DEBT	1.000								
DEBT*INST	0.955	1.000							
EXCR	-0.374	-0.276	1.000						
GDPGR	-0.180	-0.190	-0.143	1.000					
INFL	0.236	0.175	-0.428	-0.386	1.000				
INST	-0.389	-0.124	0.399	0.026	-0.326	1.000			
MSGR	0.316	0.246	-0.430	-0.029	0.090	-0.244	1.000		
REINT	-0.261	-0.226	0.274	0.332	-0.573	0.238	-0.228	1.000	
UNEMPLOY	0.180	0.126	0.606	-0.220	0.143	-0.157	-0.237	0.155	1.000

Source: Author's Computation, 2024

Unit Root Tests of the Variables

It is commonly believed that the simple time series around a deterministic pattern is stationary or at least stable; this is not always accurate. Nevertheless, the co-integration technique of ARDL does not require unit roots to be pretested. However, to prevent ARDL from crashing in the presence of an embedded stochastic pattern of I (2), the study performs unit root tests to know the number of unit roots in the series. To verify the outcome properties of the time series, this study used augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests.

The null hypothesis for the test (both ADF and PP) asserts that the data series in question has a unit root while the alternative hypothesis asserts that the series is stationary. As shown in Tables 4 and 5, GDPGR, INST, MSGR, INFL, REINT and UNEMPLY are stationary at levels, while the other variables DEBT, DEBT*INST and EXCR became stationary after the first differencing both under ADF and PP. This depicts that the series has a combination of I(0) and I(1) which makes ARDL appropriate for estimation.

Table 3: Unit Roots Test for Stationarity (Augmented Dickey-Fuller)

Variables	Level		First Differences	
	Intercept	Intercept and Trend	Intercept	Intercept and Trend
GDPGR	-3.6858***	-3.5992***		
DEBT	-2.0898	-1.5636	-4.6329***	-8.9121***
DEBT*INST	-1.7328	-1.5803	-4.6728***	-4.7674***
INST	-3.4821**	-3.4035**		
EXCR	1.9663	-0.2877	-3.9038***	-4.3154***
MSGR	-3.1251**	-3.6671**		
INFL	-2.3464**	-8.9379***		
REINT	-3.3529**	-3.9331**		
UNEMPLY	-4.2153**	-3.8513**		

***,**, * denote levels of significance at 1%, 5% and 10% respectively

Source: Author's Computation, 2024

Table 4: Unit roots Test for Stationarity (Phillips Peron)

Variables	Level		First Differences	
	Intercept	Intercept and Trend	Intercept	Intercept and Trend
GDPGR	-3.8126***	-3.7339***		
DEBT	-2.1655	-1.7782	-4.6315***	-4.8336***
DEBT*INST	-1.7328	-1.5803	-4.6783***	-4.7647***
INST	-3.6061**	-3.3513**		
EXCR	2.2031	-0.4207	-3.8212***	-4.1879***
MSGR	-2.9110*	-3.5137*		
INFL	-3.3371**	-4.0512**		
REINT	-3.3529**	-4.0048**		
UNEMPLY	-2.1185**	-3.6196**		

***,**, * denote levels of significance at 1%, 5% and 10% respectively

Source: Author's Computation, 2024

Table 5: Bound Testing

Dependent Variables	F-test	Decision
F (REINT[DEBT, INST, DEBT*INST, EXCR, MSGR]	11.398	Cointegrated
F (INFL[DEBT, INST, DEBT*INST, EXCR, MSGR]	6.960	Cointegrated
F (GDPGR[DEBT, INST, DEBT*INST, EXCR, MSGR]	4.003	Cointegrated
F (UNEMPLY[DEBT, INST, DEBT*INST, EXCR, MSGR]	6.621	Cointegrated
Critical Values	Lower Bound I (0)	Upper Bound I (1)
1%	3.41	4.68
2.50%	2.96	4.18
5%	2.62	3.79

10%	2.26	3.35

Source: Author's Computation, 2024

Table 5 shows the results of the bounds test which either indicates the existence of a long-run relationship (cointegration) if the F- F-statistics value is higher than the lower and the upper bound critical values, or no cointegration if the F-statistics value is less than the lower and the upper bound critical values. Where the F-statistics fall between the lower and the upper critical values, there is inconclusiveness. However, following Dolado, Ercisson & Kremers (1992) and Bannerjee, Dolado & Mestre (1998), the error correction term will be a useful way to establish cointegration in inconclusive cases. As can be seen from Table 5, the F-statistics values for the four models are beyond the critical values at all levels. This depicts the existence of a long-run relationship requiring the estimation of long and short-run dynamics as revealed in Tables 6 to 9.

After, confirming the presence of cointegration based on the ARDL approach, in the next step, the "error correction model" (ECM, hereafter) is estimated. There are two purposes for estimating the ECM. First, it helps to investigate the short-run dynamics. Second, the ECM also provides information about the speed of adjustment of the model. Keeping in mind the benefits, we have specified the following ECM models:

$$\Delta GDPGR_t = \beta_0 + \sum_{i=1}^{a}\beta_{1i}\Delta GDPGR_{t-1} + \sum_{i=0}^{b}\beta_{2i}\Delta DEBT_{t-2} + \sum_{i=0}^{c}\beta_{3i}\Delta INST_{t-1} + \sum_{i=0}^{d}\beta_{4i}\Delta DEBT * INST_{t-1}$$

$$+ \sum_{i=0}^{e}\beta_{5i}\Delta EXCR_{t-1} + \sum_{i=0}^{f}\beta_{6i}\Delta MSGR_{t-1} + \gamma_1 ECT_{t-1} + \varepsilon_t \quad \text{.....(6)}$$

$$\Delta REINT_t = \beta_0 + \sum_{i=1}^{a}\beta_{1i}\Delta REINT_{t-1} + \sum_{i=0}^{b}\beta_{2i}\Delta DEBT_{t-2} + \sum_{i=0}^{c}\beta_{3i}\Delta INST_{t-1} + \sum_{i=0}^{d}\beta_{4i}\Delta DEBT * INST_{t-1}$$

$$+ \sum_{i=0}^{e}\beta_{5i}\Delta EXCR_{t-1} + \sum_{i=0}^{f}\beta_{6i}\Delta MSGR_{t-1} + \gamma_1 ECT_{t-1} + \varepsilon_t \quad \text{.....(7)}$$

$$\Delta INFL_t = \beta_0 + \sum_{i=1}^{a}\beta_{1i}\Delta INFL_{t-1} + \sum_{i=0}^{b}\beta_{2i}\Delta DEBT_{t-2} + \sum_{i=0}^{c}\beta_{3i}\Delta INST_{t-1} + \sum_{i=0}^{d}\beta_{4i}\Delta DEBT * INST_{t-1}$$

$$+ \sum_{i=0}^{e}\beta_{5i}\Delta EXCR_{t-1} + \sum_{i=0}^{f}\beta_{6i}\Delta MSGR_{t-1} + \gamma_1 ECT_{t-1} + \varepsilon_t \quad \text{.....(8)}$$

$$\Delta UNEMPLY_t = \beta_0 + \sum_{i=1}^{a}\beta_{1i}\Delta UNEMPLY_{t-1} + \sum_{i=0}^{b}\beta_{2i}\Delta DEBT_{t-2} + \sum_{i=0}^{c}\beta_{3i}\Delta INST_{t-1} + \sum_{i=0}^{d}\beta_{4i}\Delta DEBT * INST_{t-1}$$

$$+ \sum_{i=0}^{e}\beta_{5i}\Delta EXCR_{t-1} + \sum_{i=0}^{f}\beta_{6i}\Delta MSGR_{t-1} + \gamma_1 ECT_{t-1} + \varepsilon_t \quad \text{.....(9)}$$

In all equations (6–9), the term (ECTt-1) denotes the error correction term, and its coefficient captures the speed of adjustment. All other variables in the above expressions are already defined.

Estimation of Long and Short-run Dynamics (Cointegration Test)

One of the advantages of ARDL in line with Pesaran et al., (2001) is the estimation of both the short run and long run simultaneously in addition to estimating a time series equation with a combination of stationary and non-stationary order of I(0) and I(1) and its potentials of addressing endogeneity and simultaneity problems. Table 6 presents the result of the estimated long-run and short-run dynamics of the specified below.

Table 6: Long run and Short-run Dynamics of Model 1

Panel A: Dependent Variable: GDPGR (Long run)				
Variable	Coefficient	Std. Error	t-Statistics	Prob.
DEBT	-1.47558	0.870043	-1.695987	0.1105
DEBT*INST	0.400683	0.235526	1.70123	0.1095

EXCR	0.011887	0.014064	0.845194	0.4113
INST	-7.559602	9.601509	-0.787335	0.4433
MSGR	0.173752	0.098198	1.76941	0.0971
C	27.345548	36.442978	0.750365	0.4646

Panel B: Goodness-of-it Measures

R2	0.774175
Adjusted R2	0.563406
F-statistics	3.673087
Prob. (F-statistics	0.008692
Durbin Watson stat	2.311773

Panel C: Diagnostic Statistical Checking

	Test Statistics	Probability
Serial correlation LM test (Breusch-Godfrey)	9.082983	0.1107
Heteroscedasticity test (Breusch-Pagan-Godfrey	17.09308	0.2513
Normality test (Jacque-Bera)	2.000337	0.3678
ARCH test for Heteroscedasticity	0.028277	0.8665
Reset specification test	0.036459	0.8513

Panel D. Short Run Dynamics

D(GDPGR(-1))	-0.576241	0.177546	-3.245582	0.0054
D(DEBT)	0.217592	0.536538	0.405548	0.6908
D(DEBTINST)	-0.028988	0.131421	-0.220572	0.8284
D(DEBTINST(-1))	-0.02388	0.015346	-1.556115	0.1405
D(EXCR)	-0.08791	0.035014	-2.510728	0.0240
D(INST)	2.677553	4.510206	0.593665	0.5616
D(MSGR)	0.00667	0.03588	0.185906	0.8550
D(MSGR(-1))	-0.063803	0.035984	-1.773114	0.0965
CointEq(-1)	-0.544151	0.185647	-2.931102	0.0003

Cointeq = GDPGR - (-1.4756*DEBT + 0.4007*DEBTINST + 0.0119*EXCR
-7.5596*INST + 0.1738*MSGR + 27.3455)

Source: Author's Computation, 2024

Table 7: Long run and Short-run Dynamics of Model 2

Panel A: Dependent Variable: REINT (Long run)

Variable	Coefficient	Std. Error	t-Statistics	Prob.
DEBT	1.153146	0.736613	1.565472	0.1370
DEBT*INST	-0.327653	0.191994	-1.706576	0.1072
EXCR	0.000006	0.012816	0.00049	0.9996
INST	26.232608	10.241512	2.5614	0.0209
MSGR	0.156715	0.0909	1.724041	0.1040
C	-98.826175	39.6332	-2.49352	0.0240

Panel B: Goodness-of-it Measures

R2	0.847195
Adjusted R2	0.723041
F-statistics	6.823754
Prob. (F-statistics	0.000266
Durbin Watson stat	2.552779

Panel C: Diagnostic Statistical Checking

	Test Statistics	Probability
Serial correlation LM test (Breusch-Godfrey)	4.549889	0.1028
Heteroscedasticity test (Breusch-Pagan-Godfrey	14.21536	0.3589
Normality test (Jacque-Bera)	0.220686	0.895527
ARCH test for Heteroscedasticity	0.029834	0.8629
Reset specification test	0.63143	0.4392

Panel D. Short Run Dynamics

D(REINT(-1))	0.293522	0.138375	2.121218	0.0499
D(DEBT)	4.491925	1.159429	3.874256	0.0013
D(DEBT*INST)	-0.98842	0.276448	-3.575435	0.0025
D(EXCR)	0.000007	0.014872	0.00049	0.9996
D(INST)	39.377611	9.921088	3.969082	0.0011
D(INST(-1))	-13.713708	4.189671	-3.273218	0.0048
D(MSGR)	-0.05314	0.075138	-0.707225	0.4896
D(MSGR(-1))	-0.114277	0.079545	-1.436627	0.1701
CointEq(-1)	-1.160362	0.161717	-7.175257	0.0000

Cointeq = REINT - (1.1531*DEBT -0.3277*DEBTINST + 0.0000*EXCR +
26.2326*INST + 0.1567*MSGR -98.8262)

Source: Author's Computation, 2024

Table 8: Long run and Short-run Dynamics of Model 3

Panel A: Dependent Variable: INFL (Long run))

Variable	Coefficient	Std. Error	t-Statistics	Prob.
DEBT	5.927588	3.919409	1.512368	0.1469
DEBT*INST	-1.394512	0.996194	-1.39984	0.1777
EXCR	0.052487	0.075532	0.694891	0.4955
INST	-1.85916	38.973076	-0.047704	0.9625
MSGR	0.168027	0.356175	0.471756	0.6425
C	-0.617924	156.540187	-0.003947	0.9969

Panel B: Goodness-of-it Measures

R2	0.844185
Adjusted R2	0.762177

F-statistics	10.29395
Prob. (F-statistics	0.00001
Durbin Watson stat	2.266598

Panel C: Diagnostic Statistical Checking

	Test Statistics	Probability
Serial correlation LM test (Breusch-Godfrey)	1.509067	0.4702
Heteroscedasticity test (Breusch-Pagan-Godfrey	14.86709	0.1370
Normality test (Jacque-Bera)	1.246888	0.5361
ARCH test for Heteroscedasticity	0.023936	0.8770
Reset specification test	6.236492	0.9435

Panel D. Short Run Dynamics

D(INFL(-1))	-0.825599	0.155499	-5.309351	0.0000
D(DEBT)	2.641803	1.347525	1.960485	0.0648
D(DEBT*INST)	-0.848845	0.361918	-2.345403	0.0300
D(EXCR)	0.023392	0.028327	0.825805	0.4192
D(INST)	22.312533	14.690062	1.518886	0.1453
D(MSGR)	-0.172271	0.1397	-1.233151	0.2326
CointEq.(-1)	-0.445679	0.147162	-3.028485	0.0069

Cointeq = INFL - (5.9276*DEBT -1.3945*DEBTINST + 0.0525*EXCR
-1.8592*INST + 0.1680*MSGR -0.6179)

Source: Author's Computation, 2024

Table 9: Long run and Short-run Dynamics of Model 4

Panel A: Dependent Variable: UNEMPLY (Long run)

Variable	Coefficient	Std. Error	t-Statistics	Prob.
DEBT	0.000266	0.044964	0.005926	0.9953
DEBT*INST	0.001124	0.011683	0.096205	0.9242
EXCR	-0.219696	0.532853	-0.412302	0.6839
INST	0.006142	0.001186	5.18043	0.0000
MSGR	-0.000492	0.005304	-0.092841	0.9268
C	3.950864	2.055934	1.921689	0.0671

Panel B: Goodness-of-it Measures

R2	0.859368
Adjusted R2	0.816567
F-statistics	20.07816
Prob. (F-statistics	0.0000
Durbin Watson stat	1.97404

Panel C: Diagnostic Statistical Checking

	Test Statistics	Probability

Serial correlation LM test (Breusch-Godfrey)			8.25955	0.1102
Heteroscedasticity test (Breusch-Pagan-Godfrey			14.59893	0.1256
Normality test (Jacque-Bera)			0.989467	0.6097
ARCH test for Heteroscedasticity			0.142162	0.7061
Reset specification test			5.45378	0.1967
Panel D. Short Run Dynamics				
D(DEBT)	0.000146	0.024638	0.005923	0.9953
D(DEBTINST)	0.000616	0.006354	0.096872	0.9237
D(INST)	-0.120323	0.287019	-0.419217	0.6789
D(EXCR)	0.004932	0.002628	1.876727	0.0733
D(MSGR)	-0.00027	0.002913	-0.09259	0.9270
CointEq(-1)	-0.547679	0.126376	-4.33374	0.0002

Cointeq = GDPGR - (-1.4756*DEBT + 0.4007*DEBTINST + 0.0119*EXCR
-7.5596*INST + 0.1738*MSGR + 27.3455)

Source: Author's Computation, 2024

Table 10: Granger Causality Estimates

Dependent Variables	Sources of Causality									
	GDPGR	REINT	INFL	UNEMPLY	DEBT	INST	DEBT*INST	EXCR	MSGR	
GDPGR		0.368	0.339	0.179	0.023	1.565	0.255	0.243	1.326	
REINT	5.436**			0.947	1.725	5.053**	3.962	4.184**	1.012	0.381
INFL	0.344	3.933**		1.632	5.455**	6.142**	4.543**	0.836	1.631	
UNEMPLY	0.341	0.528	0.444		0.674	0.304	0.595	2.264	1.192	
DEBT	0.234	1.373	5.508**	0.493		4.801**	0.607	0.111	0.527	
INST	0.434	0.452	0.713	1.669	0.237		0.070		0.215	1.572
DEBT*INST	0.737	0.741	5.563**	0.329	0.128	1.604		0.093	0.472	
EXCR	0.548	1.532	2.262	1.223	0.127	0.727	0.165		0.494	
MSGR	1.416	0.882	0.041	2.789*	0.466	0.907	0.418	1.643		

Source: Author's Computation, 2024

Discussion of Results

For model one, where the gross domestic product growth rate (a proxy for economic growth) is the dependent variable, the money supply growth rate (MSGR) positively impacted economic growth in the long run at a 10 per cent significant level. This suggests that an increase in money supply increases economic growth ceteris paribus. This is supported by Marshall (2016) but contrary to Omodero (2019). This is supported by economic theory as an increase in money supply provides an opportunity for the expansion of economic activities. However, in the short run, the gross domestic product growth rate lags one negatively affects economic growth. In addition, the exchange rate impacted economic growth negatively at a 5 per cent significant level. This is in consonant with Edeminan (2021) but contrary to Udeh et al (2016). This is also supported by economic theory as a reduction in exchange rate encourages export which leads to expansion in economic growth. There is no other significant effect from any other variables. The goodness-of-fit measures show the value of R2 as 0.77 (77%), Adjusted R2 as 0.56 (56%), F-statistic as 3.673087 and its corresponding p-value as 0.000 and the Durbin Watson stat as 2.311773. All these measures are favourable. The diagnostics tests as depicted in Part C showed the absence of serial correlation and heteroskedasticity in the

residuals. The residuals are normally distributed according to the Jarque- Bera value and its corresponding p-value. The model is also free from wrong model specifications as depicted by the Reset specification value and its corresponding p-value.

For model two, which showed real interest rate (REINT) as the independent variable, institutional quality impacted real interest rate positively in the long run at a 1 per cent significant level. This suggests that as institutional quality increases, the real interest rate increases significantly, ceteris paribus. In the short run, real interest rate lag one affected real interest rate at 5 per cent significant level, debt positively affects real interest rate at 1 per cent significant level. This suggests that an increase in debt increases real interest. This is in consonant with economic theory, which postulates that an increase in debt spurs an increase in real interest rates. The debt and institutional quality interaction negatively affect the real interest rate at the 1 per cent level. This reveals that institutional quality contributes positively to debt to lower the real interest rate. In addition, in the short run, institutional quality positively impacted the real interest rate, while institutional quality lag one negatively impacted the real interest rate. This reveals that institutional quality lag contributes to reducing real interest rates. The goodness-of-fit measures show the value of R2 as 0.85 (85%), Adjusted R2 as 0.72 (72%), F-statistic as 6.823 and its corresponding p-value as 0.000 and the Durbin Watson statistics as 2.552. All these measures are favourable. The diagnostics tests as depicted in Part C showed the absence of serial correlation and heteroskedasticity in the residuals. The residuals are normally distributed according to the Jarque- Bera value and its corresponding p-value. The model is also free from wrong model specifications as depicted by the Reset specification value and its corresponding p-value.

For model three, no variable has any effect on the inflation rate in the long run. However, in the short run, inflation (lag one) impacted inflation negatively at 1 per cent, and debt positively impacted inflation weakly at a 10 per cent significant level. This is incongruent with Essien, Agboegbulem, Mba and Onumonu (2016). This also conforms to economic theory which asserts that debt fuels high interest rates. However, the interaction of institutional quality and debt negatively regulates the impact at a 1 per cent significant level. This suggests that the institutional quality within Nigeria reduces the impact of debt on the inflation of the nation. The goodness-of-fit measures show the value of R2 as 0.84 (8%), Adjusted R2 as 0.76 (76%), F-statistic as 10.29395 and its corresponding p-value as 0.000 and the Durbin Watson stat as 2.266. All these measures are favourable. The diagnostics tests as depicted in Part C showed the absence of serial correlation and heteroskedasticity in the residuals. The residuals are normally distributed according to the Jarque-Bera value and its corresponding p-value. The model is also free from wrong model specifications as depicted by the Reset specification value and its corresponding p-value.

For model four, in the long run, institutional quality impacted the unemployment rate positively at a 1 per cent significant level, while only the exchange rate (EXCR) positively impacted unemployment weakly at a 10 per cent significant level. No other variables impacted unemployment significantly within the study period. The goodness-of-fit measures show the value of R2 as 0.86 (86%), Adjusted R2 as 0.82 (82%), F-statistic as 20.878 and its corresponding p-value as 0.000 and the Durbin Watson stat as 1.97 approximately 2. All these measures are favourable. The diagnostics tests as depicted in Part C showed the absence of serial correlation and heteroskedasticity in the residuals. The residuals are normally distributed according to the Jarque- Bera value and its corresponding p-value. The model is also free from wrong model specifications as depicted by the Reset specification value and its corresponding p-value. Note, R2 in models reveals the explanatory power of regressors, adjusted R2 depicts the variations in the results after the effect of the regressors has been removed, F-statistics is used to measure the overall significance of the models and their corresponding p-values indicate that the models are correctly specified at the benchmark level of significance of 5%. The Durbin-Watson statistic is used to test for autocorrelation of residuals in the model, in particular, the first-order autocorrelation at approximately 2 which is the benchmark.

Table 10 depicts the granger causality estimates of the variables. There exists uni-directional causality from GDPGR to REINT, DEBT to REINT, and INST to REINT, INST to INFL at 5 percent significant levels and from UNEMPLY to MSGR at 10 percent level. In addition there exists a bi-directional causality from INFL to DEBT and INFL to BDET*INST at 5 percent significant levels.

Conclusions and Policy Implications

In estimating the nexus between public debt and macroeconomic performance in Nigeria and the role institutional quality can play; this study adopted the ARDL approach to cointegration as espoused by Pesaran et al., (2001) to estimate the effect of public debt on the selected macroeconomic variables. The study evaluated the effect of public debt on economic growth (proxy gross domestic growth rate), real interest rate, inflation and unemployment. The study also incorporated exchange rate and money supply growth rate as moderating variables in addition to institutional quality variables coupled with its interaction with debt. The aim is to justify some of the assertions of the federal government that procurement of debt in the long run is beneficial to the economy especially when citizens complained about the growing trend of debt. The results of the estimation indicate that money supply growth significantly affected economic growth positively, exchange rate significantly affected economic growth negatively, institutional quality and debt significantly affected real interest rate positively, and debt positively affected inflation, whereas the interaction of debt and institutional quality affects real interest rate and inflation negatively. The study recommends that the Federal government of Nigeria should sustain an enhanced institutional quality environment to continually engender positive effects on macroeconomic performances. In addition, policymakers must support the private sector-led investment drive for improved economic performance. Also, the government must make sure that borrowing is based on project-specific needs that guarantee repayment of borrowed funds. Finally, the government must enforce good governance and institutional structures to discourage the misappropriation of resources and encourage economic growth.

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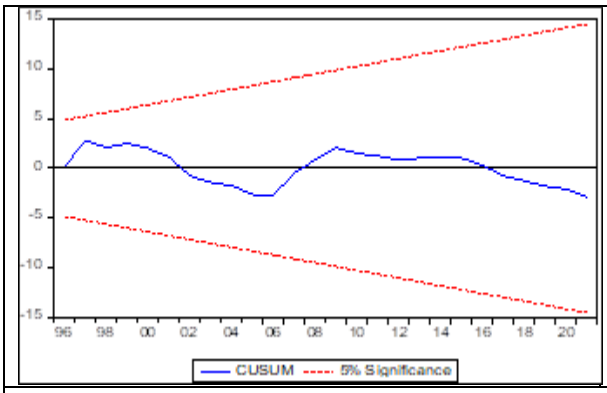
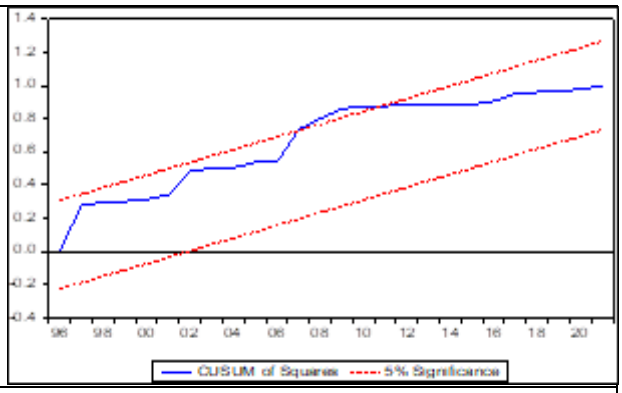
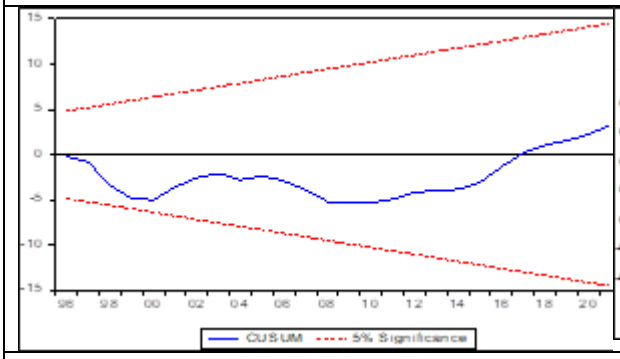
Appendix: STABILITY TESTS

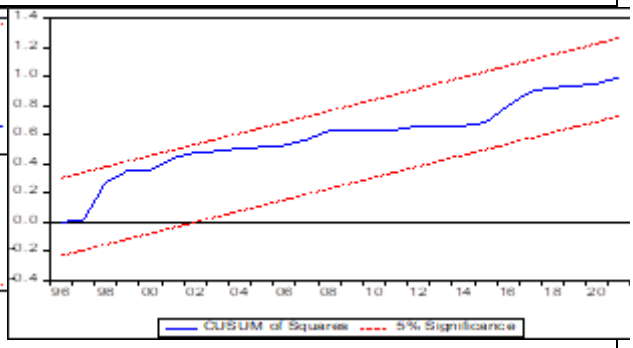
MODEL 1



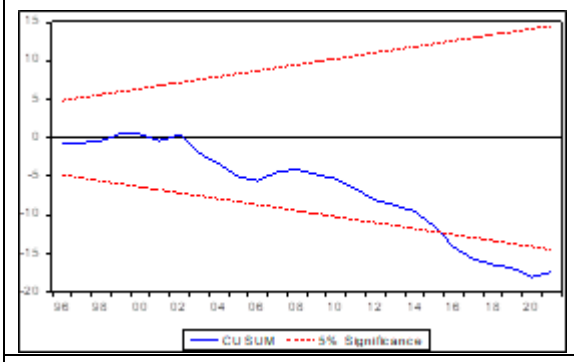


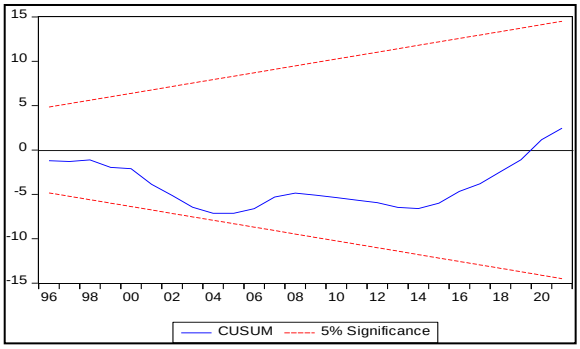
MODEL 2





MODEL 3





MODEL 4