Linear Autoregressive Distribution Lags (ARDL) Versus A Non-Linear Autoregressive Distribution Lags (NARDL) Analysis of Tax Revenue-Growth Nexus in Nigeria

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Abstract
This study examines the impact of tax revenue on economic growth in Nigeria. Annual time series data from 1985 to 2022 collected from various sources were used. The results of the short-run ARDL Bounds Test showed that PPT, PPT(-1) and VAT(-1) are positively and statistically significant with economic growth proxied by RGDP; VAT(-2) is negatively and statistically significant with it while CIT, CED and VAT are insignificant. The results of the long-run ARDL Bounds Test showed that while PPT(-1) and CED(-1) are positively and statistically significant with RGDP; CIT(-1) and VAT(-1) are insignificant. The results of the short-run NARDL model where the variables are divided into positive(POS) and negative(NEG) changes show that Δ(PPT_POS), Δ(PPT_NEG(-1)), Δ(PPT_NEG(-2)), Δ(CIT_NEG(-2)), Δ(CED_POS), Δ(CED_POS(-2)), Δ(VAT_POS(-1)) and Δ(VAT_NEG) are positively and statistically significant with economic growth proxied by RGDP; Δ(PPT_NEG), Δ(CED_POS(-1)) and Δ(CED_NEG) are negatively and statistically significant with it while Δ(PPT_POS(-1)), Δ(PPT_POS(-2)), Δ(CIT_POS), Δ(CIT_NEG), Δ(CIT_NEG(-1)), Δ(CED_NEG(-1)), Δ(CED_NEG(-2)) and Δ(VAT_POS) are insignificant with RGDP. The results of the long-run NARDL model reveal that PPT_POS(-1), PPT_NEG(-1) and VAT_NEG are positively and statistically significant with RGDP while CIT_POS, CIT_NEG(-1), CED_POS(-1), CED_NEG(-1) and VAT_POS(-1) are insignificant with it.

Keywords: *Tax revenue, economic growth, ARDL, NARDL, Nigeria*

1.0 Introduction

Any responsible government's first priority should be to make sure its citizens have access to enough public goods and services to improve their standard of living. The manner in which these promises are fulfilled is primarily determined by the amount of money the government raises through different means. Taxes are a sensible approach to raise the money required to pay for essential services, which are required by the majority of people in a specific area. To pay for government expenses, taxes are imposed as a mandatory payment on individuals, groups, corporations, and properties. Tax is a compulsory contribution or a mandatory imposition by a government on its subjects under a coercive law so as to generate the much needed revenue to achieve the numerous objectives of the government.

Tax revenue, which is as old as any human society, and whether direct or indirect, is a major source of funds to any government in this world (Egbadju & Oriavwote,2016). Existing research studies show that taxes provide the needed fund to finance public goods, control unfavorable economic conditions, regulate the production and consumption of goods and services, safeguard emerging industries, and lessen income inequality, among other benefits (Asaolu et al., 2018). Tax income will rise when it is managed effectively and efficiently, and citizens will expect that their money will be used to fund amenities that raise living standards. A country's internal resources are mobilized by a tax system, which is a veritable tool that fosters economic growth. Economic growth is defined as a continuous, long-term increase in the net national product or per capita national production (Egbadju & Oriavwote, 2016). This implies that the rate of increase in total output must be greater than the rate of population growth. According to Gwa and Kase (2018), another way to gauge economic growth is to consider the notion that the goods and services that satisfy the requirements of the largest number of people should make up the majority of the nation's output. Several theories of economic growth include the Harrod-Domar theory of growth, the Kaldor model of distribution, the Pasinetti model of profit and growth, Joan Robinson's model of capital accumulation, Meade's Neo Classical model of economic growth, and the Slow model of long-run growth (Gwa & Kase, 2018). Economic growth can be predicted using four main variables: capital formation, technological advancement, human resources, and national resources. Economists use gross domestic product(GDP), which is characterized as an increase in the value of goods and services generated over time, as a stand-in for economic growth.

Several studies that have linked tax revenue with economic growth found strong relationship between them. However, the results of these studies have been mixed with some reporting positive relationship; negative relationship or no relationship at all among the variables of interests. For as much as the results from previous studies have shown mixed outcomes, the main objective of this study is to investigate the impact which tax revenue may have on economic growth in Nigeria. This study differs in some ways from previous studies reviewed. Firstly, it uses more recent data from 1985 to 2022 which none to the best of my knowledge has used. It also uses two estimation techniques which are the autoregressive distribution lag (ARDL) and the non- autoregressive distribution lag (NARDL) models while others used either of the two models(Asaolu et al. 2018 as well and Akpokhio & Ekperiware, 2022). Following this introduction, the rest of the paper is divided into five sections with the literature review in section two, methodology in section three, discuss of results in section four and the fifth section concludes this paper.

2.0 Literature Review

2.1 The Benefits Received Theory.

This theory holds that the taxation of individuals by the state should be commensurate with their benefits. This suggests that the more benefits a person receives from state efforts, the more taxes they should pay to the government. The goal of this idea is to ensure that the benefits that each individual receives from using public services are as closely correlated with their tax obligations as possible. As a result, the benefits received serve as the foundation for allocating the tax burden in a specific manner. This requires an exchange or contractual relationship between the state and the taxpayers in which the state provides specific goods and services and the cost of those goods and services is contributed in proportion to the benefits received (Eyitope, 2022)

2.2 Empirical Literature

Anaeto et al. (2023) undertook a research to ascertain if federally collected tax revenue had any effect on economic growth in Nigeria. Annualized time series data from 1999 to 2020 collected from CBN and National Bureau of Statistics (NBS) were used in this study. The results of the Vector Error Correction Model (VECM) revealed that petroleum profits tax (PPT), Companies Income Tax (CIT) and Value Added Tax (VAT) had a positively significant effect on economic growth which was proxied by gross domestic products (GDP)

Ogbodo and Arinze (2023) studied the influence of tax composition on economic growth in Nigeria. Annual time series data from 1999 to 2020 collected from CBN and National Bureau of Statistics (NBS) were used in this study. The results of the Autoregressive Distributive Lag (ARDL) regression revealed that while PPT had a positively significant effect on GDP; CIT was insignificant with it.

Osamor et al.(2023) undertook a research to determine the extent to which tax revenue spurred economic growth in Nigeria. Annual time series data from 2011 to 2020 collected from CBN and Federal Inland Revenue Services (FIRS) were used in this study. The results of the Autoregressive Distributed Lags (ARDL) model revealed that PPT, CIT, VAT and Customs and Excise Duties (CED) were all insignificant with GDP.

Otekunrin et al.(2023) empirically tested the impact of oil and non-oil tax revenue on economic growth in Nigeria The study made use of secondarily sourced data for 39 years spanning 1980 to 2019 obtained from CBN and FIRS. The results of the Error Correction Model (ECM) revealed that while PPT and CED had a positive and significant effect on GDP; VAT and CIT had a negative and significant effect on GDP.

Ayeni and Omodero (2022) attempted an empirical study of tax revenue influenced economic growth in Nigeria. The study used secondary data over the period from 2000 to 2021 obtained from CBN and FIRS. The Vector Error Correction Model (VECM) results showed that while PPT and VAT had a positive and significant effect on GDP; CIT had a negative and significant effect on it.

Eyitope (2022) studied whether there is any relationship between tax revenue and economic growth in Nigeria. The researchers used annually sourced time-series data collected from CBN and FIRS over the period of 32 years spanning 1990 to 2021 was used. The ordinary least squares

(OLS) results showed that while CIT had a positive and significant effect on GDP; PPT had a negative but insignificant effect on it.

Ologbenla (2022) empirically tested whether taxation impacted the performance of output in Nigeria. The study used secondary time-series data over the period from 1994 to 2020 obtained from CBN and FIRS. The results of the ARDL-ECM model revealed that while VAT was negatively significant with GDP; PPT and CIT were positively significant with it.

Nwachukwu et al. (2022) undertook a research to determine if there is any relationship between taxation and economic growth in Nigeria. Annual secondary data which covered the period 1987 to 2021 was used. The OLS regression results showed that all the variables of interests-PPT, VAT, CIT and CED-were positively and statistically significant.

Akpokhio and Ekperiware (2022) carried out a research on the extent to which PPT, VAT and CIT impacted the growth of the Nigerian economy. Annual secondary time series data which covered the period 1981 to 2021 collected from CBN and FIRS were used. The ARDL regression results showed that only PPT was statistically positive while VAT and CIT were insignificant.

Onoja and Ibrahim (2021) researched to ascertain the extent to which in Nigeria. Secondary data collected from annual CBN and FIRS reports were used covering 15 years from 2003 to 2017. The OLS regression results showed that while PPT was statistically insignificant; VAT and CIT were positively significant.

Ogbonna and Amah (2021) examined the impact of taxation on economic growth in Nigeria. Time series data from the period 2009 to 2018 were used in the study and analyzed with OLS regression technique. The result revealed that PPT and CED had a positively significant impact on economic growth in Nigeria.

Enehe (2020) set out to investigate the effects of tax revenue on economic growth in Nigeria. The OLS method was used to analyze the time series data relating to PPT, CED and GDP for 35 years over 1984 to 2018. The results showed that both PPT and CED positively and significantly impacted GDP.

Agunbiade and Idebi (2020) evaluated the impact of tax revenue on economic growth in Nigeria. The VECM regression was employed for the empirical study of time series secondary data obtained from NBS and FIRS which covered the periods between 1981 to2019. The results found a positive and significant relationship between PPT as well as CED and GDP but a negative and significant relationship for VAT and GDP.

Alexander et al. (2019) studied the impact of taxation on economic growth in Nigeria. The OLS regression technique was used to analyze the time series data from 1980 to 2018 sourced from CBN and FIRS reports. The results indicated that PPT and VAT were negatively significant with GDP while PIT was positively significant with it

Ideh (2019) embarked on a research to evaluate the contribution of tax revenue on the growth of the Nigerian economy. Secondarily sourced time series data from CBN and FIRS over the period 2003 to 2017 were used in the study and analyzed with OLS regression technique. The result revealed that PPT had a negative and significant impact on GDP.

Gwa and Kase (2018) carried out a research to determine the extent to which tax revenue had contributed to the growth of the Nigerian economy. *The study used annual* secondary time-series data obtained from CBN and FIRS covering the period 1997 to 2016. The OLS results indicated that CIT and VAT were positively significant with GDP while PPT was insignificant with it

Asaolu et al. (2018) embarked on this research to investigate the effect of tax revenue on economic growth in Nigeria. The study used secondarily sourced data spanning 22 years from 1994 to 2015 collected from CBN statistical bulletin. The ARDL results indicated that CED and VAT were positively significant with GDP; CIT was negatively significant with it but PPT was insignificant.

Okpe et al. (2017) empirically examined the impact which tax revenue has had on economic growth in Nigeria. The researchers used secondary time-series data from 2000 to 2014 collected from CBN Statistical Bulletin. The OLS results indicated that CIT was positively significant with GDP but PPT and CED were insignificant with it.

3.0 METHODOLOGY

This study investigates whether there is any relationship that exists between the dependent variable (RGDP) and the independent variables (PPT, CIT, CED and VAT). Annual time series secondary data obtained from the Central Bank of Nigeria (CBN) statistical bulletin covering the period 1983 to 2022 as well as data from world development indicators from 1970 to 2022 were used in this research study. Data collected are analyzed using EViews 13 in the following order: model specification, description of estimation techniques used, descriptive statistics, correlation analysis, unit root test, estimation of the regression models and then performance of some diagnostics tests

3.1 MODEL SPECIFICATION.

With respect to our variables of interest in this study, the hypothesized functional long-run relationship of growth equation and four other tax revenue variables is given below as:

$$RGDP_t = f(PPT_t, CIT_t, CED_t, VAT_t) \quad (1)$$

where RGDP = real gros domestic products; PPT = petroleum profits tax; CIT = company income tax; CED = customs and excise duties; VAT = value added tax.

By taking the log of natural numbers on both sides or by expressing it as double log-linear estimation model, equation (1) above can be re-written as:

$$logRGDP_t = \beta o + \beta_1 logPPT_t + \beta_2 logCIT_t + \beta_3 logCED_t + \beta_4 logVAT_t + \mu_t \quad (2)$$

where: β_0 is the intercept or constant; β_1, β_2, β_3 are the regressors coefficients; log is the logarithm of natural numbers; μ_t is the white noise error term/ stochastic disturbance term which is serially uncorrelated disturbance with zero means and constant variance-covariance (Pesaran, 1995); t is the index of time. A priori expected signs of coefficients are $\beta_1>0$, $\beta_2>0$, $\beta_3>0$.

3.2 DESCRIPTION OF ESTIMATION TECHNIQUES USED(ARDL and NARDL).

This study uses both the linear autoregressive distribution lag (ARDL) bounds testing approach to cointegration as well as the non-linear autoregressive distribution lag (NARDL) bounds testing approach to cointegration in estimating both the short-run dynamic and long-run relationship among the variables of interest.

3.2.1 AUTOREGRESSIVE DISTRIBUTION LAG (ARDL)

The ARDL was developed by Pesaran and Shin (1995). The test for the existence of cointegration among variables has been considered for decades. The two common ones are the two-step residual-based approaches of Engle and Granger (1987) as well as the system-based reduced rank regression procedure of Johansen & Juselius (1990); Johansen(1991, 1995) which considered the null hypotheses of no-cointegration. These and other methods involve pre-testing for unit roots in which the variables of interest must be integrated of the same order. The ARDL approach, however, has an added advantage of yielding normal asymptotically consistent estimates of the long-run coefficients whether or not the underlying regressors are purely I(1), i.e. nonstationary, purely I(0), i.e. stationary or mutually cointegrated (Pesaran & Shin, 1995, 1999; Pesaran et al., 2001). The essence of pre-testing in ARDL bounds testing approach is only to ensure that none of the variables is of the second order, i. e. I(2) for short. The ARDL-based approach is very efficient when compared to other traditional cointegration techniques more importantly it is applicable for small samples (such as the case in our study) and for finite sample sizes. It permits the use of different optimal lag orders for different variables and the use of an appropriate lag length is sufficient to correct for both residual serial correlation and problem of endogeneity bias in variables (Pesaran & Shin, 1999). It allows a single equation to be used to estimate the relationships among variables, both for the long-run and the short-run parameters simultaneously. This single-equation set-up makes it very easy to interpret and implement (Salisu, 2015)

The general form of the ARDL (p, q) model is written as:

$$Y_t = \alpha_0 + \sum_{i=1}^{p} Y_{t-1} + \sum_{i=0}^{q} X_{t-i} + \mu_t \quad (3)$$

where p is the optimum lag order of the dependent variable and q is/are the optimal lag order(s) of the independent variable(s).

Equation (2) above can be represented in an ARDL model as:

$$\Delta logRGDP_t = \beta o + \beta_1 logRGDP_{t-1} + \beta_2 logPPT_{t-1} + \beta_3 logCIT_{t-1} + \beta_4 logCED_{t-1} + \beta_5 logVAT_{t-1} + \sum_{i=1}^{p} \pi_1 \Delta \text{logRGDP}_{t-1} + \sum_{i=1}^{q} \pi_2 \Delta\, log\text{PPT}_{t-1} + \sum_{i=1}^{q} \pi_3 \Delta\, log\text{CIT}_{t-1} + \sum_{i=1}^{q} \pi_4 \Delta\, log\text{CED}_{t-1} + \sum_{i=1}^{q} \pi_5 \Delta\, log\text{VAT}_{t-1} + \mu_t \quad (4)$$

where β_1 to β_4 are the long-run multipliers of the regressors, π_1 *to* π_4 are the short-run dynamic coefficients of the regressors. Δ is the first order difference operator.

In order to establish that a long-run relationship exists among the variables considered, we first estimate equation 4 above to obtain the short-run regression output. Secondly, we perform a joint significance test using the bounds testing to cointegration technique. The null hypothesis of there is no cointegration is Ho: $\beta_1 = \beta_2 = \beta_3 = 0$ against the alternate hypothesis of there is cointegration is Ho: $\beta_1 \neq \beta_2 \neq \beta_3 \neq 0$.

Pesaran et al. (2001) provided two sets of asymptotic critical values which are the I(0) and the I(1) bounds. Of these two polar cases, they assumed that all the regressors/forcing variable (**x_t**) are either on the one hand, purely I(0) or, on the other hand, purely I(1). We then decide if a long-run relationship exists among the variables or not by comparing the Wald test(F-statistic) with the asymptotic critical I(0), I(1) values. If the F-statistic is higher than the I(1) bound, we reject the null hypothesis of no cointegration and accept the alternate hypothesis that there is cointegration. However, if the F-statistic is lower than the I(0) bound, we would not fail to reject the null hypothesis of no cointegration. If the F-statistic is between the I(0) and I(1) bound, the result is inconclusive.

Once we have established that there is cointegration among the variables of interest, we go ahead and estimate the error correction version of the ARDL model in Equation 5.

$$\Delta logRGDP_t = \pi_0 + \sum_{i=1}^{p} \pi_1 \Delta\, log\mathrm{RGDP}_{t-1} + \sum_{i=1}^{q} \pi_2 \Delta\, log\mathrm{PPT}_{t-1} + \sum_{i=1}^{q} \pi_3 \Delta\, log\mathrm{CIT}_{t-1} + \sum_{i=1}^{q} \pi_4 \Delta\, log\mathrm{CED}_{t-1} + \sum_{i=1}^{q} \pi_5 \Delta\, log\mathrm{VAT}_{t-1} + \gamma\mathrm{ECT}_{t-1} + \mu t \quad (5)$$

$where\ \pi_1\ to\ \pi_4$ are the short-run dynamics coefficients of the model's adjustment long-run equilibrium. γ is the speed of adjustment parameter which is always negative in most cases but could be zero. At -1, γ signifies an instantaneous and perfect convergence to equilibrium while at 0 means that there is no convergence to equilibrium after the process had a shock. ECT_{t-1} is the error correction term/ equilibrium correction term which is the extracted residuals from the regression of the long-run model, i. e., equation 5, forming the ARDL-ECM model.

3.2.2 NON-LINEAR AUTOREGRESSIVE DISTRIBUTION LAG (NARDL)

The NARDL was developed by Shin et al. (2011). The non-linear autoregressive distribution lag (NARDL) bounds testing approach to cointegration is the extension of the linear autoregressive distribution lag(ARDL) of Pesaran & Shin(1995; 1999); Pesaran et al., (2001). ARDL is based on two fundamental assumptions—linearity and symmetrical adjustment—which are its greatest weaknesses. Given that economic and financial factors are becoming more interconnected and exhibiting increasingly chaotic behaviours, these assumptions are both overly limiting and unreasonable. Linearity indicates proportionate change, which means that the dependent variable will change by y% for every 1% change in the independent variable. Symmetrical means a variable increases and decreases at the same rate both below and above equilibrium. NARDL is a nonlinear dynamic framework that is both basic and flexible enough to represent a dynamic asymmetric relationship in both the short and long term in a cohesive and simultaneous manner. Its ability to generate or infer asymmetric cumulative dynamic multipliers gives it the flexibility to identify asymmetric adjustment patterns resulting from shocks to the independent variables that are either positive or negative. To accommodate the possible asymmetric impact of tax revenue on economic growth, we rephrase the ARDL models in equation 4 using a nonlinear construction. In order to do this, we divide the expected asymmetric behaviour of tax revenue's influence on economic growth into positive and negative changes using the NARDL approach. This is required because variations in tax revenue (PPT, CIT, CED, VAT) are unlikely to have the same effect on economic growth (RGDP); and this means that estimates will be distorted if this unequal influence is disregarded, particularly when it matters most (Babatunde, 2018)

Thus, equation 4 above, which is a linear or symmetric ARDL model, can be represented in a nonlinear or asymmetric ARDL model as shown in equation 6 below. In order to determine asymmetric ARDL model requires the decomposition of the main variable(s) of interest into positive and negative component along with any control variable(s) used. The partial sums of positive and negative changes in tax revenue are given by PPT^+ and PPT^-, CIT^+ and CIT^-, CED^+ and CED^-, VAT^+ and VAT^-. Note that only the main independent variable(s) of interest is(are) decomposed into the positive and negative shock as shown in equation 6 below.

$$\Delta logRGDP_t = \beta_o + \beta_1 logRGDP_{t-1} + \beta_2 logPPT^+_{t-1} + \beta_3 logPPT^-_{t-1} + + \beta_4 logCIT^+_{t-1} + \beta_5 logCIT^-_{t-1} + + \beta_6 logCED^+_{t-1} + \beta_7 logCED^-_{t-1} + \beta_8 logVAT^+_{t-1} + \beta_9 logVAT^-_{t-1} + \mu_t \quad (6)$$

where POS^+ = positive changes or shocks in tax revenue; NEG^- = negative changes or shocks in tax revenue.

4.0 DATA ANALYSIS AND DISCUSSION OF RESULTS.

Table 4.1 Univariate Data Analyses (Descriptive Statistics)

Variables	N	Mean	Minimum	Maximum	Std Deviation
RGDP	42	197.3	27.75	546.68	168.2
PPT	42	844.9	4.38	3201.3	1001.8
CIT	42	95.5	0.634	357.75	103.1
CED	42	363461.9	0.000	1409213.9	465709.3
VAT	42	359.9	0.0000	2072.85	495.56

Source: Researcher's Computations (2023) Using EViews13 Software.

N is the number of observations in the sample. The mean is the average value in a distribution. The maximum and the minimum values tell us the highest and the lowest for each of the variables respectively. Since the mean values of all the variables are significantly lower than their maximum values, it confirms that there are no outliers in our data. The standard deviation measures how closely or widely dispersed the sample mean is from all other variables. A very low standard deviation is an indicator that the data is very close to the mean while a high one shows that the data is well spread out over a wide range of values.

4.2 Bivariate Data Analysis (Variance Inflation Factors)

Table 4.2 shows the results of the variance inflation factor(VIF) and the corresponding tolerance column. A VIF of any variable less than 10 with its tolerance level greater than 0.2 is free of multicollinearity for VIF that ranges between 5 to 10 is adjudged to have highly correlated variables(Shrestha, 2020). None of our variables of interest has a VIF more than 10 and a tolerance less than 0.2. This attests to the fact that there is no problem of multicollinearity among the variables.

Table 4.2

Variables	Variance Inflation Factors (VIF)	Tolerance
RGDP	3.249769	0.307714
PPT	1.263636	0.791367
CIT	7.481320	0.133666
CED	5.229881	0.191209
VAT	3.249769	0.307714

Source: Researcher's Computations (2023) Using EViews13 Software.

4.3 Unit Roots Tests. Pre-testing for stationarity of the variables is not compulsory or a necessary condition before the application of the ARDL bounds testing approach. However, we do this in order to forestall an exercise in futility when it is later discovered that I(2) variables are included (Nkoro & Uko, 2016).

Table 4.3. Unit Roots Tests.

ADF- Unit Roots Tests (5% is the preferred benchmark for significance level compared to 1% or 10%)												
Levels						First Difference						
Variables/ Models	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	Order of Integration I(d)	Variables/ Models	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	Order of Integration I(d)	Final Decision I(d)
RGDP	-3.34	-4.41	-3.62	-3.24	Not stationary	RGDP	0.21	-4.41	-3.62	-3.24	Not stationary	Not stationary
PPT	-3.19	-4.32	-3.58	-3.22	Not stationary	PPT	-6.54	-4.33	-3.58	-3.22	I(1)	I(1)
VAT	-1.67	-4.44	-3.63	-3.25	Not stationary	VAT	-4.51	-4.44	-3.63	-3.25	I(1)	I(1)
CIT	-2.78	-4.32	-3.58	-3.22	I(0)	CIT	-6.22	-4.33	-3.58	-3.22	I(1)	I(1)
CED	-2.56	-4.32	-3.58	-3.22	Not stationary	CED	-6.00	-4.33	-3.58	-3.22	I(1)	I(1)

PP- Unit Roots Tests (5% is the preferred benchmark for significance level compared to 1% or 10%)												
Levels						First Difference						
Variables/ Models	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	Order of Integration I(d)	Variables/ Models	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	Order of Integration I(d)	Final Decision I(d)
RGDP	-2.18	-4.32	-3.58	-3.22	Not stationary	RGDP	-5.13	-4.33	-3.58	-3.22	I(1)	I(1)
PPT	-3.19	-4.32	-3.58	-3.22	Not stationary	PPT	-8.53	-4.33	-3.58	-3.22	I(1)	I(1)
VAT	-3.71	-4.32	-3.58	-3.22	I(0)	VAT	6.98	-4.33	-3.58	-3.22	I(1)	I(0)
CIT	-2.67	-4.32	-3.58	-3.22	Not stationary	CIT	-6.69	-4.33	-3.58	-3.22	I(1)	I(1)
CED	-2.61	-4.33	-3.58	-3.22	Not stationary	CED	-6.00	-4.33	-3.58	-3.22	I(1)	I(1)

Source: Researcher's Computations (2023) Using EViews13 Software.

The results of the Augmented Dickey Fuller (ADF) test-Statistic as well as that of the Phillip-Perron (PP) test-Statistic for all the variables of interest as reported in Table 4.3 above show that at least one of the two test statistics (ADF & PP) is greater than all the tabulated critical values at the 1% Critical Value, 5% Critical Value and 10% Critical Value. This means that all the variables of interest are either I(0) or I(1), that is, stationary at levels or stationary at first differencing. When variables are not stationary, it means that they can drift apart on the long run and the regression results obtained can be spurious or nonsensical. We can go ahead with the ARDL method of estimation for as much as at least one of the variables of interest-VAT- is I(0).

4.4 Lag Length Selection.

Selecting the appropriate or true lag length is essential in the estimation of a parsimonious model. Some of the most commonly used criteria are the information criteria such as: the Akaike Information Criterion (AIC), the Schwarz-Bayesian Information Criterion (SBIC) as well as the Hannan-Quinn Criterion (HQC). According to Ayalew et al.(2012), selecting a lag length which is lesser than the true lag length underestimate the true lag length and picking a lag length which is higher than the true lag length overestimates the lag length. Too few lags lead to autocorrelated errors while too many lags lead to an increase in mean-square forecast errors due to over-fitting

(Lütkepohl, 1993, 2005). In this study, all the information criteria consistently choose lag1 for all variable. We, therefore, use the AIC which is the default criteria as shown in Table 4.4 below.

Table 4.4 VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1247.636	NA	1.36e+34	92.78789	93.02786	92.85924
1	-1174.994	112.9990	4.16e+32	89.25884	90.69865	89.68697
2	-1097.777	91.51652 *	1.07e+31 *	85.39090 *	88.03057 *	86.17582 *

* indicates lag order selected by the criterion

Source: Researcher's Computations (2023) Using EViews13 Software.

4.5 Model Estimation and Discussion of the Results.

Table 4.5		**Short-Run ARDL and NARDL Estimation Results**					
Symmetry(Linear ARDL) Model				Asymmetry(Non-Linear ARDL or NARDL) Model			
Variables	Coefficients	t-Statistic	P-values	Variables	Coefficients	t-Statistic	P-values
RGDP(-1)	0.724988	9.899758	0.0000	RGDP(-1)	0.452876	6.267493	0.0000
PPT	0.017548	2.707348	0.0109	Δ(PPT_POS)	0.049771	4.274336	0.0005
PPT(-1)	0.036534	4.805275	0.0000	Δ(PPT_POS(-1))	-0.014153	-1.176219	0.2548
CIT	4.38E-05	1.429728	0.1628	Δ(PPT_POS(-2))	0.009132	1.081310	0.2938
CED	0.071137	1.880034	0.0695	Δ(PPT_NEG)	-0.022904	-2.381011	0.0285
VAT	-0.009072	-0.525597	0.6029	Δ(PPT_NEG(-1))	0.073714	2.938064	0.0088
VAT(-1)	0.185384	2.634379	0.0130	Δ(PPT_NEG(-2))	0.051883	2.348395	0.0305
VAT(-2)	-0.256955	-2.640299	0.0129	Δ(CIT_POS)	8.23E-05	1.243332	0.2297
C	6.447696	0.895481	0.3774	Δ(CIT_NEG)	6.08E-05	0.466828	0.6462
Adj Rquared		0.986053		Δ(CIT_NEG(-1))	-0.000305	-1.852673	0.0804
D-W stat		2.468113		Δ(CIT_NEG(-2))	0.000393	3.359466	0.0035
Ward Test F-stat		345.6713	.000000	Δ(CED_POS)	0.297880	4.172830	0.0006
				Δ(CED_POS(-1))	-0.572573	-5.896307	0.0000
				Δ(CED_POS(-2))	0.290278	2.478440	0.0233
				Δ(CED_NEG)	-0.377850	-3.628279	0.0019
				Δ(CED_NEG(-1))	0.284001	1.762917	0.0949
				Δ(CED_NEG(-2))	-0.269330	-1.558074	0.1366

				Δ(VAT_POS)	-0.161721	-1.998885	0.0610
				Δ(VAT_POS(-1))	0.303083	3.146169	0.0056
				Δ(VAT_NEG)	0.131590	3.129395	0.0058
				Adjusted R-Squared		0.997233	
				Durbin-Watson stat		2.357805	
				Ward Test F-stat		685.7557	0.000000

Source: Researcher's Computations (2023) Using EViews13 Software.

4.5.1 Discussion of the Short-Run Regression Results.

Table 4.5 above shows the regression estimation results of the relationship between tax revenue and economic growth in Nigeria. A look at the coefficient (0.724988) of RGDP (-1) shows that it is positively significant (t-Statistics=9.899758 and p= 0.0000 at the 1% levels of significance. This result is in line with the extant literature that the dependent variable and its lag move in the same direction and must be significant (Egbadju & Jacob, 2022). This means that the current year growth can be directly affected by previous period growth in the light of new information we were not aware of. An Adj R-Squared of 0.986053 means that about 98.6% systematic variation in RGDP can be explained by PPT, CIT, CED and VAT while the remaining 1.4% can be explained by other factors not captured by our model. The F-statistic (345.6713) and a Prob(F-stat.) of 0.000000 confirm that there is a joint statistical significant of a linear relationship between the variables (dependent and independent). With a Durbin-Watson stat value of 2.468113 means that there is no problem of serial correlation.

Particularly, PPT relationship with RGDP is positively significant with a coefficient of 0.017548, a t-Statistic of 2.707348 and a p-value of 0.0109 at the 5% levels of significance.. This suggests that an increase in PPT will increase RGDP. The result shows that a 1 unit change in PPT will increase RGDP by 0.017548% on the short-run all things being equal. The same interpretation is given with respect to lag one of PPT, that is, PPT(-1) which is also positively significant.

While CIT, CED and VAT have insignificant relationship with RGDP, VAT(-1) is positively significant with a coefficient of 0.185384, a t-Statistic of 2.634379 and a p-value of 0.0130 at the 5% levels of significance.. This suggests that an increase in VAT(-1) will increase RGDP. The result shows that a 1 unit change in VAT(-1) will increase RGDP by 0.185384% on the short-run all things being equal. With respect to VAT(-2) results, which has a coefficient of -0.256955, a t-Statistic of -2.640299 and a p-value of 0.0129, a 1 unit increase (decrease) in VAT(-2) will decrease (increase) RGDP by -0.256955% on the short-run all things being equal.

4.3.1.2. Short-Run NARDL Regression Results

From the same Table 4.5 above with a coefficient (0.452876) of RGDP (-1), a t-Statistics of 6.267493, a p-value of 0.0000, an Adjusted R-Squared of 0.997233, a Ward Test F-stat of 685.7557 with a p-value of 0.000000 as well as a Durbin-Watson stat of 2.357805; the

interpretations of the NARDL is very similar to that of ARDL interpreted above.
The summary of the results above show that while there are six negative changes in tax revenue(PPT, CIT, CED, VAT) that are significantly related with RGDP; there are five positive changes in tax revenue(PPT, CIT, CED, VAT) that are significantly related with RGDP in the short-run.

Specifically, Δ(PPT_POS) relationship with RGDP is positively significant with a coefficient of 0.049771 a t-Statistic of 4.274336 and a p-value of 0.0005 at the 1% levels of significance. This suggests that a positive change or increase in PPT will increase RGDP or will lead to a significant change or increase in GDP. The result shows that a 1 unit positive change in PPT will increase RGDP by 0.0497713% in the short-run all things being equal.

Δ(PPT_POS(-1)) relationship with RGDP is negative but it is not significant with a coefficient of -0.014153 a t-Statistic of -1.176219 and a p-value of 0.2548 at the 25% levels of significance which is higher than 5%.

Δ(PPT_POS(-2)) relationship with RGDP is positive but it is not significant with a coefficient of 0.009132, a t-Statistic of 1.081310 and a p-value of 0.2938 at the 29% levels of significance which is higher than 5%.

Δ(PPT_NEG) or negative change in PPT relationship with RGDP is negatively significant with a coefficient of -0.022904, a t-Statistic of -2.381011 and a p-value of 0.0285 at the 5% levels of significance. This suggests that an increase in Δ(PPT_NEG) or negative change in PPT will increase RGDP. The result shows that a 1 unit negative change in PPT or Δ(PPT_NEG) will increase RGDP by -0.022904% in the short-run all things being equal.

Δ(PPT_NEG(-1)) or last year negative change in PPT relationship with RGDP is positively significant with a coefficient of 0.073714 a t-Statistic of 2.938064 and a p-value of 0.0088 at the 1% levels of significance. This suggests that a negative change or decrease in PPT will increase RGDP or will lead to a significant change or increase in RGDP. The result shows that a 1 unit negative change in PPT will increase RGDP by 0.073714% in the short-run all things being equal.

Δ(PPT_NEG(-2)) or two previous years negative change in PPT relationship with RGDP is positively significant with a coefficient of 0.051883 a t-Statistic of 2.348395 and a p-value of 0.0305 at the 5% levels of significance. This suggests that a negative change or decrease in PPT two years ago will increase RGDP or will lead to a significant change or increase in RGDP. The result shows that a 1 unit negative change in PPT two years ago will increase RGDP by 0.051883% in the short-run all things being equal.
The overall PPT results above show that PPT_NEG relationship with RGDP is greater/higher/more than that of PPT_POS. We, therefore, reject the null hypothesis that there is no significant difference between PPT_POS and PPT_NEG with respect to their impact on RGDP and accept the

alternative hypothesis that there is a significant difference on how PPT_POS and PPT_NEG impact RGDP.

Δ(CIT_POS) relationship with RGDP is positive but it is not significant with a coefficient of 8.23E-05, a t-Statistic of 1.243332 and a p-value of 0.2297 at the 22.97% levels of significance which is higher than 5%.
Δ(CIT_NEG) relationship with RGDP is positive but it is not significant with a coefficient of 6.08E-05, a t-Statistic of 0.466828 and a p-value of 0.6462 at the 65% levels of significance which is higher than 5%.
Δ(CIT_NEG(-1)) relationship with RGDP is negative but it is not significant with a coefficient of -0.000305, a t-Statistic of -1.852673 and a p-value of 0.0804 at the 10% levels of significance which is higher than 5%.
Δ(CIT_NEG(-2)) or two previous years negative change in CIT relationship with RGDP is positively significant with a coefficient of 0.000393 a t-Statistic of 3.359466 and a p-value of 0.0035 at the 1% levels of significance. This suggests that a negative change or decrease in CIT two years ago will increase RGDP or will lead to a significant change or increase in RGDP. The result shows that a 1 unit negative change in CIT two years ago will increase RGDP by 0.000393% in the short-run all things being equal.
The overall CIT results above show that CIT_NEG relationship with RGDP is greater/higher/more than that of CIT_POS. We, therefore, reject the null hypothesis that there is no significant difference between CIT_POS and CIT_NEG with respect to their impact on RGDP and accept the alternative hypothesis that there is a significant difference on how CIT_POS and CIT_NEG impact RGDP.

Δ(CED_POS) or positive change in CED relationship with RGDP is positively significant with a coefficient of 0.297880 a t-Statistic of 4.172830 and a p-value of 0.0006 at the 1% levels of significance. This suggests that a positive change or increase in CED will increase RGDP or will lead to a significant change or increase in RGDP. The result shows that a 1 unit positive change in CED will increase RGDP by 0.297880% in the short-run all things being equal.
Δ(CED_POS(-1)) or last year positive change in CED relationship with RGDP is negatively significant with a coefficient of -0.572573 a t-Statistic of -5.896307 and a p-value of 0.0000 at the 1% levels of significance. This suggests that a positive change or an increase in CED last year will increase RGDP or will lead to a significant negative change or decrease in RGDP. The result shows that a 1 unit positive change in CED last year will decrease RGDP by 0.572573% in the short-run all things being equal.
Δ(CED_POS(-2)) or two previous years positive change in CED relationship with RGDP is positively significant with a coefficient of 0.290278 a t-Statistic of 2.478440 and a p-value of 0.0233 at the 5% levels of significance. This suggests that a positive change or increase in CED two years ago will increase RGDP or will lead to a significant change or increase in RGDP. The result shows that a 1 unit positive change in CED two years ago will increase RGDP by 0.290278% in the short-run all things being equal.
Δ(CED_NEG) or negative change in CED relationship with RGDP is negatively significant with a coefficient of -0.377850, a t-Statistic of -3.628279 and a p-value of 0.0019 at the 1% levels of

significance. This suggests that an increase in Δ(CED_NEG) or negative change in CED will increase RGDP. The result shows that a 1 unit negative change in CED or Δ(PPT_NEG) will increase RGDP by 0.377850% in the short-run all things being equal.
Δ(CED_NEG(-1)) relationship with RGDP is positive but it is not significant with a coefficient of 0.284001, a t-Statistic of 1.762917 and a p-value of 0.0949 at the 10% levels of significance which is higher than 5%.
Δ(CED_NEG(-2)) relationship with RGDP is negative but it is not significant with a coefficient of -0.269330, a t-Statistic of -1.558074 and a p-value of 0.1366 at the 14% levels of significance which is higher than 5%.
The overall CED results above show that CED_POS relationship with RGDP is greater/higher/more than that of CED_NEG. We, therefore, reject the null hypothesis that there is no significant difference between CED_POS and CED_NEG with respect to their impact on RGDP and accept the alternative hypothesis that there is a significant difference on how CED_POS and CED_NEG impact RGDP.

Δ(VAT_POS) relationship with RGDP is negative but it is not significant with a coefficient of -0.161721, a t-Statistic of -1.998885 and a p-value of 0.0610 at the 6% levels of significance which is higher than 5%.
Δ(CED_NEG(-1)) relationship with RGDP is positive but it is not significant with a coefficient of 0.284001, a t-Statistic of 1.762917 and a p-value of 0.0949 at the 10% levels of significance which is higher than 5%.
Δ(VAT_POS(-1)) or last year positive change in VAT relationship with RGDP is positively significant with a coefficient of 0.303083 a t-Statistic of 3.146169 and a p-value of 0.0056 at the 1% levels of significance. This suggests that a positive change or increase in VAT will increase RGDP or will lead to a significant change or increase in RGDP. The result shows that a 1 unit positive change in VAT will increase RGDP by 0.303083% in the short-run all things being equal.
Δ(VAT_NEG) or negative change in VAT relationship with RGDP is positively significant with a coefficient of 0.131590 a t-Statistic of 3.129395 and a p-value of 0.0058 at the 1% levels of significance. This suggests that a negative change or decrease in VAT will increase RGDP or will lead to a significant change or increase in RGDP. The result shows that a 1 unit negative change in VAT will increase RGDP by 0.131590% in the short-run all things being equal.
The overall VAT results above show that VAT_POS relationship with RGDP is greater/higher/more than that of VAT_NEG. We, therefore, reject the null hypothesis that there is no significant difference between VAT_POS and VAT_NEG with respect to their impact on RGDP and accept the alternative hypothesis that there is a significant difference on how VAT_POS and VAT_NEG impact RGDP.

Table 4.6 Long-Run ARDL and NARDL Estimation Results							
Symmetry(Linear ARDL) Model				Asymmetry(Non-Linear ARDL or NARDL) Model			
Variables	Coefficients	t-Statistic	P-values	Variables	Coefficients	t-Statistic	P-values
PPT(-1)	0.292754	5.884415	0.0000	PPT_POS(-1)	0.081791	4.058167	0.0003
CED(-1)	0.132760	2.852496	0.0074	PPT_NEG(-1)	0.187696	2.976136	0.0057

CIT(-1)	-7.89E-05	-0.490671	0.6269	CIT_POS	0.000150	1.265794	0.2153
VAT(-1)	-0.181208	-1.078478	0.2886	CIT_NEG(-1)	0.000273	1.671781	0.1050
C	33.49528	5.174051	0.0000	CED_POS(-1)	0.028486	0.146772	0.8843
				CED_NEG(-1)	-0.663796	-1.305135	0.2018
				VAT_POS(-1)	0.258372	1.460667	0.1545
				VAT_NEG	0.240513	2.875382	0.0074
				C	52.31809	9.122439	0.0000

Source: Researcher's Computations (2023) Using EViews13 Software.

4.3.2 Discussion of the Long-Run Regression Results.

4.3.2.1. Long-Run ARDL Regression Results

PPT(-1) or one year lag of PPT or previous year PPT relationship with RGDP is positively significant with a coefficient of 0.292754, a t-Statistic of 5.884415 and a p-value of 0.0000 at the 1% levels of significance.. This suggests that an increase in PPT(-1) will increase RGDP. The result shows that a 1 unit increase in PPT(-1) will increase RGDP by 0.292754% in the long-run all things being equal.

CED(-1) or one year lag of CED or previous year CED relationship with RGDP is positively significant with a coefficient of 0.132760, a t-Statistic of 2.852496 and a p-value of 0.0074 at the 1% levels of significance.. This suggests that an increase in CED(-1) will increase RGDP. The result shows that a 1 unit increase in CED(-1) will increase RGDP by 0.132760% in the long-run all things being equal.
Both CIT(-1) and VAT(-1) are negative but not significantly related with RGDP in the long-run.

4.3.2.2. Long-Run NARDL Regression Results

PPT_POS(-1) or one year lag of PPT_POS or previous year PPT_POS relationship with RGDP is positively significant with a coefficient of 0.081791, a t-Statistic of 4.058167 and a p-value of 0.0003 at the 1% levels of significance.. This suggests that an increase in PPT_POS(-1) will increase RGDP. The result shows that a 1 unit increase in PPT_POS(-1) will increase RGDP by 0.081791% in the long-run all things being equal.
PPT_NEG(-1) or negative change in PPT last year relationship with RGDP is positively significant with a coefficient of 0.187696, a t-Statistic of 2.976136 and a p-value of 0.0057 at the 1% levels of significance. This suggests that an increase in PPT_NEG(-1) will increase RGDP. The result shows that a 1 unit negative change in PPT last year will increase RGDP by 0.187696% in the long-run all things being equal.

The overall PPT results above show that PPT_POS(-1) and PPT_NEG(-1) are both positively and statistically related with RGDP. We, therefore, accept the null hypothesis that there is no significant difference between PPT_POS(-1) and PPT_NEG(-1) with respect to their impact on RGDP.

CIT_POS and CIT_NEG(-1) are both insignificantly related with RGDP. We, therefore, accept the null hypothesis that there is no significant difference between CIT_POS and CIT_NEG(-1) with respect to their impact on RGDP.

CED_POS(-1) and CED_NEG(-1) are both insignificantly related with RGDP. We, therefore, accept the null hypothesis that there is no significant difference between CED_POS(-1) and CED_NEG(-1) with respect to their impact on RGDP.

VAT_POS(-1) relationship with RGDP is positive but it is not significant with a coefficient of -0.258372, a t-Statistic of 1.460667 and a p-value of 0.1545 at the 15% levels of significance which is higher than 5%.
VAT_NEG or negative change in VAT relationship with RGDP is positively significant with a coefficient of 0.240513 a t-Statistic of 2.875382 and a p-value of 0.0074 at the 1% levels of significance. This suggests that a negative change or decrease in VAT will increase RGDP or will lead to a significant change or increase in RGDP. The result shows that a 1 unit negative change in VAT will increase RGDP by 0.240513% in the long-run all things being equal.
The overall VAT results above show that VAT_NEG relationship with RGDP is greater/higher/more than that of VAT_POS. We, therefore, reject the null hypothesis that there is no significant difference between VAT_POS and VAT_NEG with respect to their impact on RGDP and accept the alternative hypothesis that there is a significant difference on how VAT_POS and VAT_NEG impact RGDP.

Table 5	**Diagnostics Tests**	
	Symmetry(Linear ARDL) Model	Asymmetry(Non-Linear ARDL or NARDL) Model
Bound Test (F-stat.)	F-stat = 13.41. From 10% 1(0) to 1% 1(1) = 2.20 to 5.53	F-stat = 16.84; From 10% 1(0) to 1% 1(1) = 1.85 to 3.77
Stability Diagnostics Test	CUSUM and CUSUMSQ. See Table 6a	CUSUM and CUSUMSQ. See Table 6a
Breusch-Godfrey Serial Correlation LM Test	0.0946	0.4530
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.0452	0.8835
Model Specification Test-Ramsey RESET Test	Prob F-stat(0.4805); Likelihood Ratio (0.4114)	F-stat(0.8850); Likelihood Ratio (0.8241)

Error Correction Test-CointEq(-1)*(Prob)	-0.275012 (0.0000)	-0.547124 (0.0000)
Normality Test-Jacque Bera Stat (Prob)	0.070188 (0.965514)	1.896100 (0.387496)

Source: Researcher's Computations (2023) Using EViews13 Software.

4.3.3 Discussion of the Regression Diagnostics Tests Results.

Bounds Tests: From Table 5 above, the F-stat value of 13.41 for the ARDL model exceeds the lower bounds-1(0)- at 10%, 5% and 1% critical values as well as upper bounds-1(1)- at 10%, 5% and 1% critical values which range from 2.20 to 5.53. Also, the F-stat value of 16.84 for the NARDL model exceeds the lower bounds-1(0)- at 10%, 5% and 1% critical values as well as upper bounds-1(1)- at 10%, 5% and 1% critical values which range from 1.85 to 3.77. The study, therefore, reject the null hypothesis of no cointegration. This means that RGDP, PPT, CIT, CED and VAT in Nigeria are cointegrated for the period under study.

Error Correction Test: The ECM specification is a combination of the short run equation and the long run representation. It is expected to have a negative sign and must be significant. As we can see from Table 5 above with respect to the ARDL model, CointEq(-0.275012) is negative and is significant at the 1% level(p = 0.0000). CointEq(-0.275012) is called the Speed of Adjustment. This shows that the reversion to equilibrium is at an adjustment speed of -0.275012%. That is, the previous period deviation from equilibrium is corrected in the correct period by an adjustment speed of -0.275012%. Again, it tells us that about -0.275012%.of departure from long-run equilibrium is corrected each period. The same explanation is valid for the NARDL model with a coefficient of -0.547124 and a p-value of 0.0000.

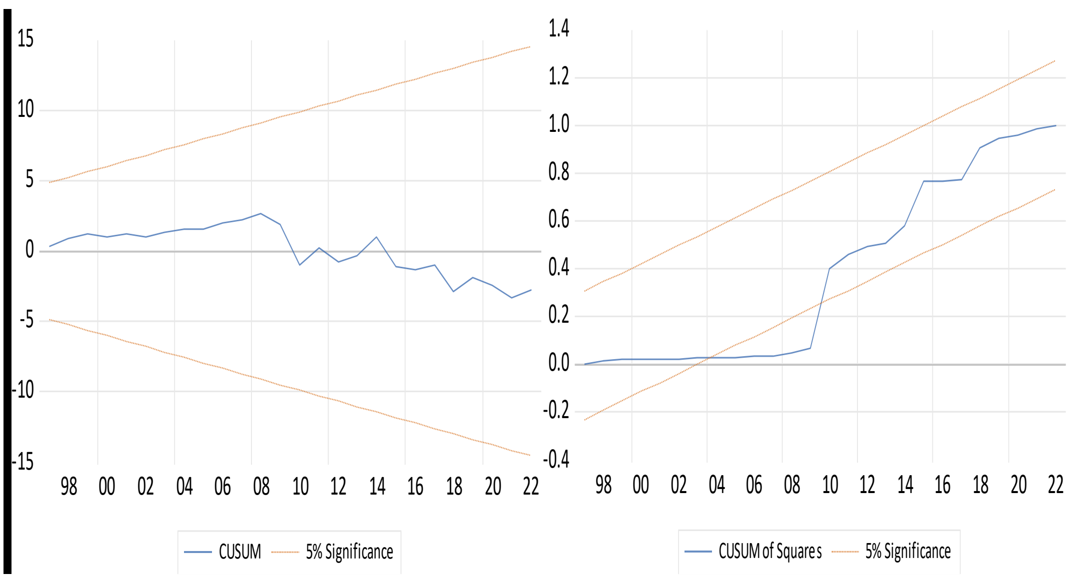
Normality Test: In data analysis, normalcy assumptions are used by descriptive statistics, correlation, regression, ANOVA, t tests, etc. This normality assumption should be upheld despite the sample size because choosing the incorrect data set representation will result in an incorrect interpretation (Mishra et al., 2019). Alejo et al.,(2015) also hinted that it is essential to check for non-normal errors in regression models since the assumption of normality is crucial for the validation of inference techniques, forecasting, and model specification tests, both conceptually and methodologically. For the ARDL model, the value of the Jarque-Bera statistic(1.896100) and its probability value(0.387496) in Table 5 above shows that the data used in analyzing the regression model are normally distributed since the p-value is greater than 0.05, that is, 5%. That of the NARDL is also normally distributed with Jarque-Bera statistic of 1.896100 and a p-Value of 0.387496.

Ramsey RESET Test: This test is carried out to make sure that the model used is correctly specified, that is, there is no misspecification in the model used. For the ARDL model, the Prob value of both the F-statistic (0.4805) and that of the Likelihood Ratio(0.4114) are greater than 0.05.This means that the model correctly specified. Also, that of the NARDL model is correctly specified since the Prob value of both the F-statistic (0.8850) and that of the Likelihood Ratio(0.8241) are greater than 0.05

Breusch-Godfrey Serial Correlation LM Test: With a p-value of 0.0946 for the ARDL model and a p-value of 0.4530 for the NARDL model indicate that there is no serial correlation in the two models since their p-values are greater than the critical values at 5% level of significance.
Heteroskedasticity Test: Breusch-Pagan-Godfrey: With a p-value of 0.0452 for the ARDL model indicate that there is a problem of heteroscedasticity since the p-value is less than the critical values at 5% level of significance. However, the p-value of 0.8835 for the NARDL model indicate that there is no problem of heteroscedasticity with a p-value greater than the critical values at 5% level of significance.

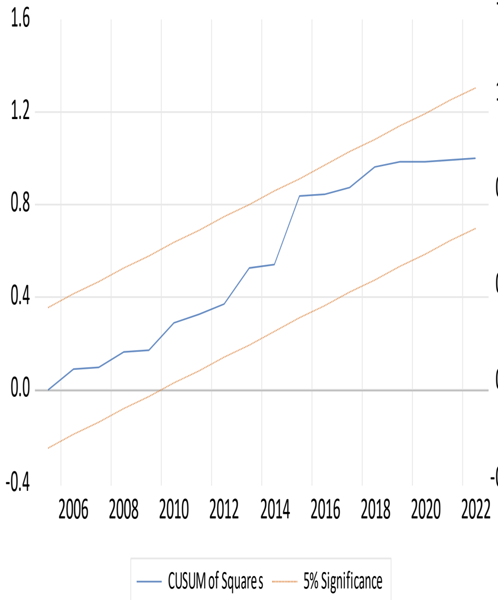
Stability Diagnostics Test: Table 6a and Table 6b below show the results of stability diagnostics tests for the CUSUM and CUSUMSQ. While the models (ARDL and NARDL) are very stable with respect to the CUSUM test since the results from these tables are within the 5% boundary, that of CUSUMSQ are not stable because there is a little deviation for both the ARDL and NARDL models.

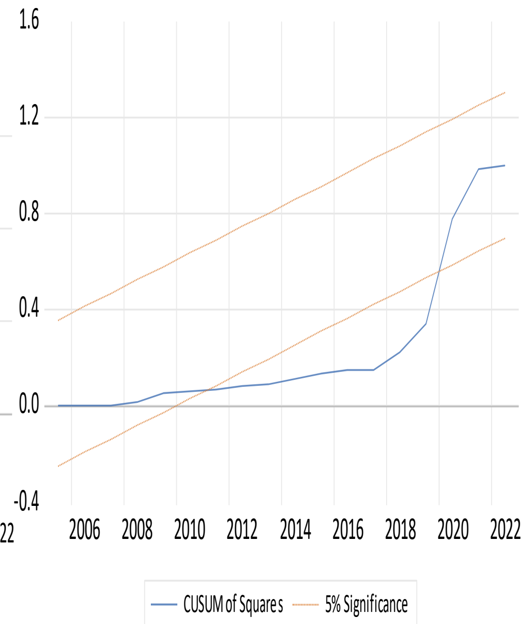
Table 6a CUSUM and CUSUMSQ Tests for the ARDL



Source: Author’s Computation Using Eviews 13 Software

Table 6b CUSUM and CUSUMSQ Tests for the NARDL





Source: Author's Computation Using Eviews 13 Software

5.0 Conclusion and Recommendation.

This study examines the impact of tax revenue on economic growth in Nigeria. Annual time series data from 1985 to 2022 collected from various sources were used. The results of the short-run ARDL Bounds Test showed that PPT, PPT(-1) and VAT(-1) are positively and statistically significant with economic growth proxied by RGDP; VAT(-2) is negatively and statistically significant with it while CIT, CED and VAT are insignificant. The results of the long-run ARDL Bounds Test showed that while PPT(-1) and CED(-1) are positively and statistically significant with RGDP; CIT(-1) and VAT(-1) are insignificant.

The results of the short-run NARDL model where the variables are divided into positive(POS) and negative(NEG) changes show that Δ(PPT_POS), Δ(PPT_NEG(-1)), Δ(PPT_NEG(-2)), Δ(CIT_NEG(-2)), Δ(CED_POS), Δ(CED_POS(-2)), Δ(VAT_POS(-1)) and Δ(VAT_NEG) are positively and statistically significant with economic growth proxied by RGDP; Δ(PPT_NEG), Δ(CED_POS(-1)) and Δ(CED_NEG) are negatively and statistically significant with it while Δ(PPT_POS(-1)), Δ(PPT_POS(-2)), Δ(CIT_POS), Δ(CIT_NEG), Δ(CIT_NEG(-1)), Δ(CED_NEG(-1)), Δ(CED_NEG(-2)) and Δ(VAT_POS) are insignificant with RGDP. The results of the long-run NARDL model reveal that PPT_POS(-1), PPT_NEG(-1) and VAT_NEG are positively and statistically significant with RGDP while CIT_POS, CIT_NEG(-1), CED_POS(-1), CED_NEG(-1) and VAT_POS(-1) are insignificant with it.

The overall results support the general hypothesis that there is a strong link between tax revenue on economic growth in Nigeria.

The study recommends that the Nigerian government should as a matter of urgency develop a strong will to:

1) stabilize the economic and political environments of the country that would attract more foreign capital inflows.
2) provide basic infrastructure that would help create more businesses and also reduce costs of production.
3) discourage monopoly power and ensure fair competition among market players and thereby lowering prices of goods and services with higher quality delivery.
4) ensure that costs of collecting taxes are insignificant when compared with the amount realized.
5) deal with the hydra headache problem of tax multiplicity which has been a discouraging factor to tax payers.
6) reform the tax system to discourage tax evasion by bringing more tax payers to the tax brackets and also increase the tax base more than the tax rate.
7) prevent leakages by guaranteeing good corporate accountability and transparency.

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