PUBLIC DEBT DYNAMICS AND EXCHANGE RATE IN NIGERIA

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Abstract

In light of the persistent exchange rate depreciation and growing public debt in Nigeria over the last years, this study examined the dynamics between public debt and exchange rate in Nigeria. The study objective was to look at how external and domestic debts affect exchange rate in Nigeria. Using secondary data analysed through times series analysis with data for 43 years (1981-2023), the ARDL cointegration test was used because the data were composed of I(0) and I(1) variables. The result showed that there is no long-run relationship between public debts and exchange rate. However, there was evidence of a structural break, which then require running a pre and post-structural break analysis. External debt showed to reduce exchange rate pre-structural break, but it was insignificant. After structural break, external debt became positively significant on increasing the exchange rate. Domestic debt shows a positive relationship with exchange rate pre and post structural break. While it was insignificant pre 1999, it became significant after 1999. Debt servicing positively add to increasing exchange rate pre and post structural break but was only significant pre-structural break. Foreign reserve similar to debt servicing also have a positive relationship with exchange rate pre and post-structural break but only significant after the structural break. Using the granger causality test, there was no causation between public debts and exchange rate. Based on the research findings, the study recommends that external debts should be utilised for capital expenditures rather than recurrent expenditures to enhance future economic returns and the productive capacity of the economy. This recommendation is crucial due to the significant burden on Nigeria's reserves from the country's reliance on imports, which contributes to high exchange rates.

Keywords: Domestic Debts, Exchange Rate, External Debts, Public Debts, Nigeria

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1. Introduction

In recent years, the public debts of Nigeria have been rising and in similar vein, exchange rate has been depreciating. It therefore becomes imperative to examine how these economic variables are related. What are the dynamics between them and how does it play out in the Nigerian economy? The link between public debt and exchange rate fluctuations therefore is a critical area of economic analysis, particularly for developing countries like Nigeria. As Africa's most populous nation and one of its largest economies, Nigeria's fiscal health and foreign exchange stability are key to its economic growth and development. However, the country has experienced significant volatility in its exchange rate over the years, often driven by changes in public debt levels, global oil prices, and broader economic policies.

Public debt involves the accumulation and servicing of domestic and external debt, reflecting the government's borrowing practices and fiscal discipline. Public debts occur when government expenditure exceeds its income and it becomes necessary for the government to borrow to bridge the gap between income and expenditure (Essien et al., 2016; Aigbedion et. al 2020). The management of public debt has profound implications for the exchange rate, influencing inflation, investment flows, and overall economic stability in Nigeria. The interplay between these factors is complex, shaped by both domestic policies and external economic conditions.

The growth of Nigeria's public debt within the last year has brought about public outcry especially as most people claim not to see the outcome of the borrowings by the government (Leadership News, 2024). Similarly, the exchange rate has depreciated drastically from around 460 naira to about 1500 naira to one USD. Hence, it has become a necessary concern to determine and identify how these two macroeconomic variables are related. There has also been constant public disapproval of continuous government borrowings whose opinion was that these borrowings without any tangible utilization would become a big burden for future generations. According to Mojekwu and Ogege (2012), the increasing external debt was affecting economic growth and development in developing countries negatively.

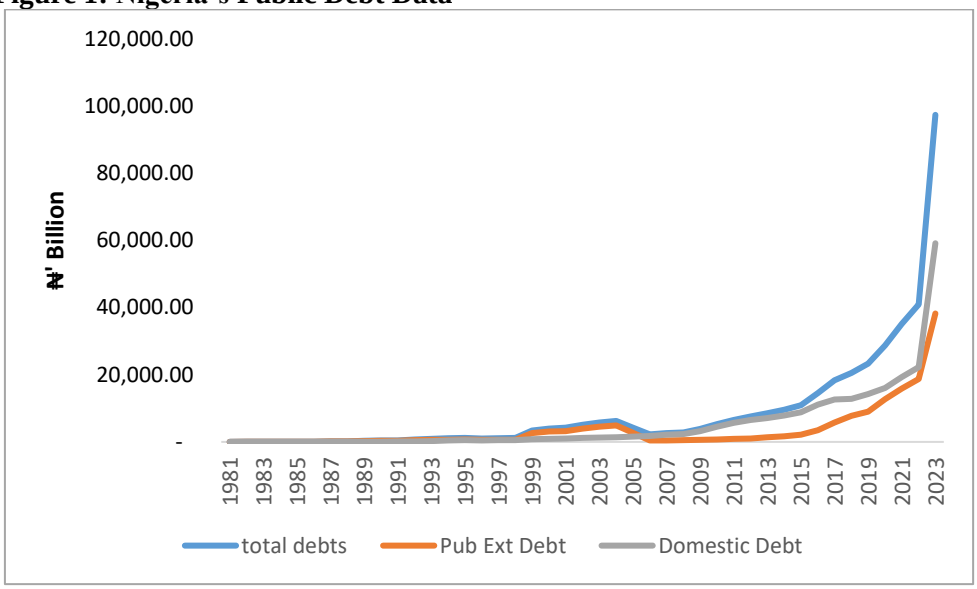
Historical Movement of Public Debt in Nigeria

The history of Nigeria's public debt can be traced back to the colonial period (BudgIT, 2019; Essien et al.,2016). The colonial government on behalf of Nigeria in 1923 took the first loan of £5.7 million. A further loan of £4.89 million was taken by 1936 and by 1952, the total debt burden had increased to about £21.24 million (BudgIT, 2019). Public debts that were incurred before the year 1978 were small and were mostly external debts but as oil prices fell in 1977/78, the country took a major loan of $1 billion to finance medium- and long-term infrastructural projects (Essien et al, 2016).

From 1981, Nigeria's external and domestic public debts has constantly been on the increase. The domestic debts has only risen year on year from 1981 up till date. The external debt rose significantly from ₦633.02 billion in 1998 to ₦2577.37 billion in 1999 as contained in CBN (2023) data which might be due to the transition to democratic rule as many multilateral organizations and countries were willing to do business with Nigeria. Public external debt continued to rise until 2004 to ₦4890.27

billion and dropped significantly to ₦451.46 billion in 2006 due to the debt relief granted in 2005 by the paris club. The debt forgiveness reduced Nigeria's total public debt between 2004 and 2006 that by 2007, total public debt continued to rise again till it surpassed the 2004 of ₦6,260.59 to ₦6519.69 billion in 2011. Nigeria's public debt has since been rising and by the end of 2023, it has risen to an unprecedented value of 97,340 billion from 40,912.62 billion in 2022 representing about 137.92% increase (DMO, 2024). The new public debt of Nigeria is at an all time high, driven largely by exchange rate depreciation.

Figure 1: Nigeria's Public Debt Data



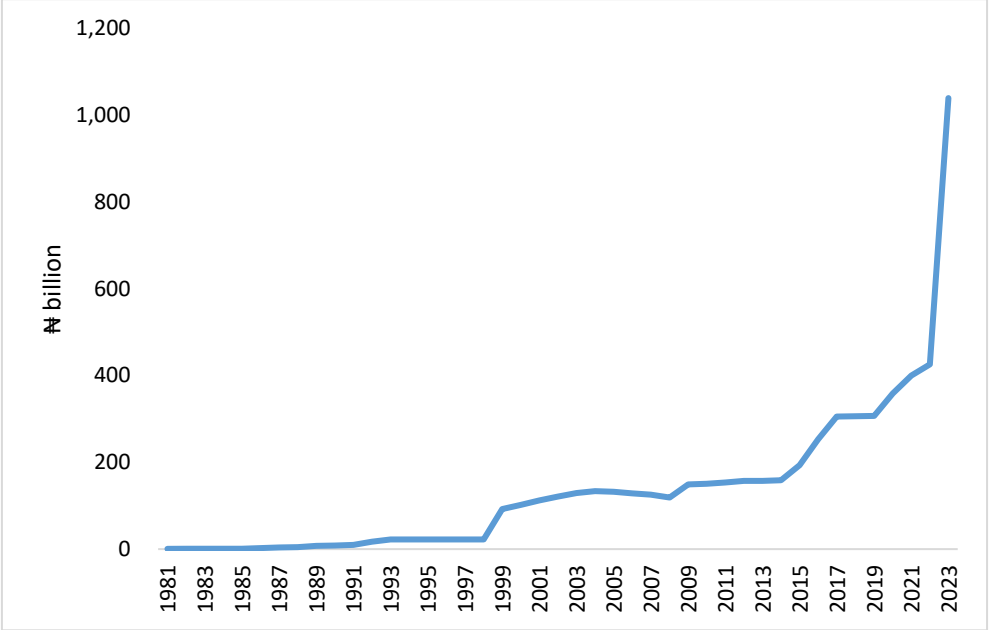
Source: Drawn by the Author using data from CBN Statistical Bulletin, 2023

History of Nigeria's Exchange Rate Volatility

Following the adoption of the market-based exchange rate system in 1986 which was inspired by the structural adjustment programme (SAP), the naira exchange rate has demonstrated persistent instability, characterised by a consistent depreciation in the official, bureau de change, and parallel foreign exchange markets (Obadan, 2006; Akanji, 2006). As noted by Mordi (2006), the exchange rate was fixed prior to 1986 hence naira to dollar was averaged at ₦0.61 to ₦0.89 to a dollar before the introduction of a floating exchange rate regime which caused the rate to go up to ₦2.02 naira to a dollar by 1986. Exchange rate continued to decline and as a result of this persistent decline, the policy was reversed in 1994 to a fixed exchange rate (Mordi, 2006). This fixed regime pegged the exchange rate at ₦21.89 from 1994 until 1998 ensuring a stability in the naira value (CBN, 2024). Naira further depreciated to ₦92.69 in 1999 and has been fluctuating and majorly depreciating since then. The exchange rate depreciated further to ₦102.11 by 2000, ₦111.94 in 2001, ₦120.97 in 2002 and averaged ₦129.90 between 2003 and 2007. Naira appreciated slightly to ₦118.57 in 2008 and depreciated again to ₦148.88 by 2009. The exchange rate decline continued until it was pegged at ₦305 in 2017 and ₦306 in 2018 until 2020

when it depreciated to ₦358 and ₦425 by 2022. A new naira float introduced by the government of Tinubu in June 2023 saw the exchange rate significantly decline to ₦1039 by the end of 2023. Currently, the naira value has depreciated massively by over 250% in exchange to a dollar and is exchange at around ₦1600 to a dollar (CBN, 2024).

Figure 2: Exchange Rate Data



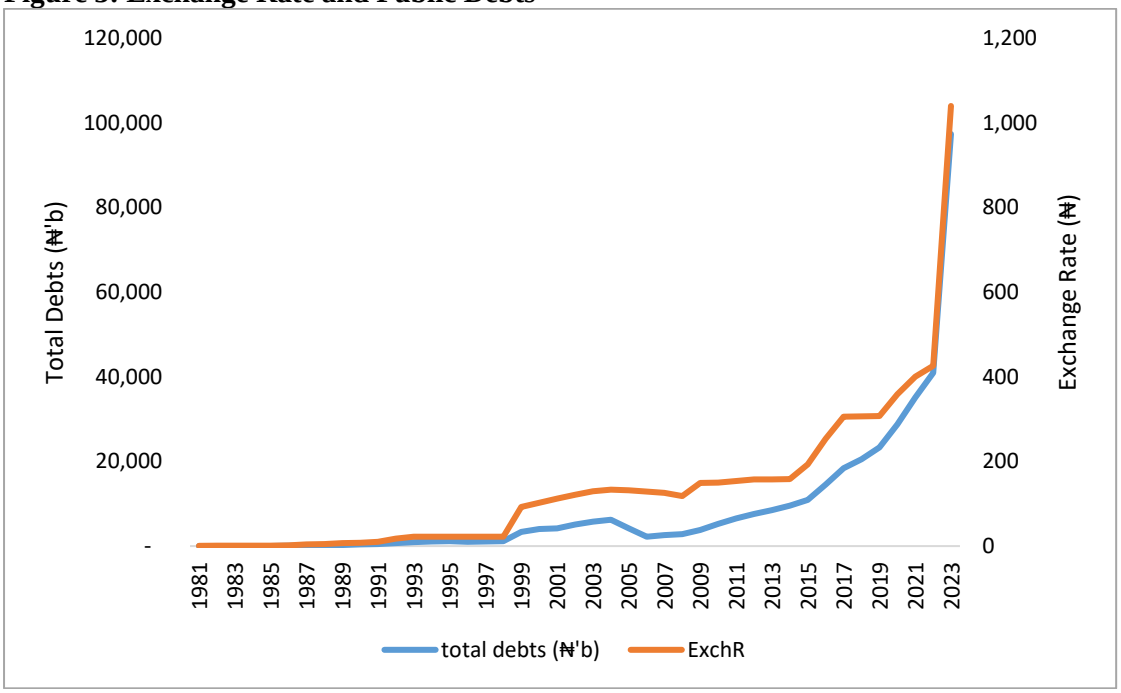
Source: Drawn by the Author using data from CBN Statistical Bulletin, 2023

Exchange Rate and Public Debts Movements

Exchange rate and public debts seems to have been following same pattern even though the growth of public debts seems to be on steady rise except in the year 2005 when Nigeria was granted a debt pardon by the Paris club. Nonetheless, Nigeria's public debt begin to rise again after 2006. The exchange rate moved in tandem albeit a slow pace due to government intervention.

Looking at data from 2005 when debt forgiveness was granted, it can be seen that the exchange rate improved from ₦133.5 in 2004 to ₦128.65 in 2006 and finally to ₦118.57 in 2008 before depreciating to ₦148 by 2009 (CBN, 2024). This could be attributed to debt forgiveness which led to lower external debt, foreign debt servicing and ultimately resulted to a reduced pressure on foreign exchange. Looking at the tail end of the graph which showed the movement of both the exchange rate and public debt. There was a significant increase in public debt similar to that of foreign exchange in 2023 which brought us to the idea that public debts and foreign exchange have a relationship between them. This study is therefore inspired by the need to understand how these important economic variables are related.

Figure 3: Exchange Rate and Public Debts



Source: Drawn by the Author using data from 2023 CBN Statistical Bulletin

Objectives

Considering the above, this study aims to understand

1. The effect of external debt on exchange rate in Nigeria.
2. The effect of domestic debt on exchange rate in Nigeria.
3. The causality between exchange rate and public debts.

This study will help to inform policy recommendations aimed at achieving a more stable, prosperous economic environment especially in managing exchange rate, and public debt in Nigeria. The study will also add to the growing list of literatures on public debts and exchange rates.

2. Literature Reviews

Empirical Review

There are different empirical research that have been conducted on the connection between exchange rates and public debts. Thus, it is necessary to review these studies in order to understand how pre-existing studies can be used to shape and guide current and future studies.

In a study conducted by Saheed et. al (2015) on the impact of external debt on exchange rate in Nigeria using ordinary least squares with data from 1981-2013. The findings revealed that external debt, debt servicing and foreign reserve were positive and significant in explaining exchange rate fluctuation in Nigeria with the strongest effect displayed by debt servicing. In a similar study in Kenya by Obwogi (2019) which assessed how the growing public debt affects exchange rate. The study

found that foreign public debt is positively related to the foreign exchange rate in the short and long run, but this relationship was not statistically significant.

In another research by Osifalujo et al (2022) which explored the relationship between foreign debt and exchange rate in Nigeria using stepwise regression and var-granger for analysis. With foreign debt as independent variables proxied by multilateral debt, bilateral debt, Paris club and London club debt while exchange rate served as the explained variable. The result of the study showed that all the independent variables except bilateral debt are the major debt positively affecting exchange rate fluctuation. Also, multilateral debt, bilateral debt and London club debt have a significant impact with Paris club debt insignificant. It was also discovered that exchange rates do not influence multilateral debt but multilateral debt influences exchange rate as shown by the granger causality test. The conclusion of the study was that foreign debt relationship with exchange rate is significant. In line with this finding is a study by Ohaegbulem and Iheaka (2024) whose study was to confirm if there is a relationship between the Exchange Rate and External Reserve, Inflation Rate, GDP Growth, Public Debt, Unemployment Rate and Exports. Using multiple linear regression, the study showed that External Reserve, Public Debt and Unemployment significantly influenced the exchange rate fluctuations.

Moazzam (2023) examined the link between debt accumulation and exchange rate fluctuation in South Asian Countries. The study discovered eternal debt is one of the influential factors behind exchange rate volatility. The research confirmed that exchange rate volatility is significantly increased by external debt.

Another study conducted in Nigeria on the impact of public external debt on exchange rate was by Aigbedion et. al (2020). The study was carried out using Ordinary Least Squares (OLS) and Error Correction Model (ECM). The result revealed that public external debt has an impact on exchange rates in the short and long run. External debt and debt servicing proved to be statistically significant in the short run except for foreign reserves while all variables were significant in the long-run.

Olaoye et al. (2022) examined the impact of public debt on macroeconomic indicators in 25 sub-Saharan African (SSA) countries. The research examined the distinct impact of domestic and foreign debts on inflation and exchange rates, employing Driscoll–Kraay standard errors and a dynamic panel threshold model. The findings indicated that foreign debt increases the inflation rate and subjects the economy to unexpected fluctuations in the exchange rate, while domestic debt helps to reduce inflationary pressure. The study identified a nonlinear correlation between public debt and macroeconomic indicators such as inflation and exchange rates, suggesting that increased foreign debt accumulation will elevate the inflation rate and render the region vulnerable to unexpected movements in the exchange rate.

Ayinde and Bankole (2021) investigated how fiscal dominance affects exchange rate stability in Nigeria using data from 1981 to 2018. The Structural Vector Autoregression (SVAR) technique was used to evaluate the fiscal dominance hypothesis and analyse the impact of fiscal deficit components (budget deficit and public debt) on exchange rate movement in Nigeria. The research employed the Granger causality test to determine the causal relationships between the components of the fiscal deficit and exchange rates. The findings indicate a bi-causal relationship

between budget deficit and fluctuations in exchange rates, whereas public debt does not Granger-cause movements in the exchange rate within the country. The SVAR estimates indicate that exchange rate movements in Nigeria respond solely to the shock effects of financial openness, while the ARDL results demonstrate that both public debt and budget deficits exert destabilising effects on exchange rates in Nigeria.

In trying to understand the determinants of the euro exchange rate volatility during the European sovereign debt crisis Ehrmann et'al (2014) discovers that the euro exchange rate exhibited significant independence, showing low explanatory power from macroeconomic fundamentals. The findings of the paper indicate that financial markets are less responsive to public debates conducted by policymakers. Exchange rate volatility, at times, fluctuates in reaction to negative statements from policymakers.

Despite the extensive research in this line, there is need to conduct recent studies using recent data especially at it pertain to Nigeria owing to the high increase in the public debts and exchange rate of Nigeria. This work will also add to the growing list of literature on public debt and exchange rates. This study is there looking at the dynamics that exist between public debts and exchange rate considering the recent happenings.

Theoretical Review

One of the theories that explains the connection between public debts and exchange rate is the Ricardian equivalence theory. The Ricardian equivalence theory was put forward by David Ricardo in 1821 (Osifalujo, Najeem, & Taiwo, 2022). The main idea behind this theory was that when the government increases debt to finance its expenditure, individuals anticipate future taxes needed to repay this debt and as a result, they increase their savings to pay for these future taxes instead of increasing their spending which limits the effect of the borrowing on aggregate demand in the economy (Ikiz, 2020). How does this affect the exchange rate? The increase in government borrowing tends to increase interest rate and an increased interest rate affects investment negatively. When we look at this relationship, it piles up pressure on the ability of the government to make more revenue from tax due to reduced business investment or investment remaining the same. Not forgetting that the borrowing of the government needs to be repaid and serviced. The repayment of debt, especially the debt in foreign currency, puts pressure on the foreign exchange of the country thereby causing the exchange rate to rise since demand for forex is more than the supply. Too much domestic debt also have its own limitation. As highlighted by Àkos and Istvàn (2019) using too much of domestic debt can take a higher part of government revenue as a result of high interest rate usually higher than that of foreign debts and a higher interest rate discourages local investment. It is therefore not surprising that in recent years, Nigeria is among the heavily indebted African country with paltry GDP growth rate and increasing level of poverty (Yusuf & Mohd, 2021). Another theory that can be used to show the dynamics between public debts and exchange rate is the debt overhangs theory. Debt overhang occurs when a country's debt service costs are so high that they slow down growth (Olusegun et al, 2020). An increase in government spending which results in borrowing is expected to improve

economic growth. However, when debt servicing from the borrowings is too high, growth is affected, and this is the idea behind debt overhang. When economic growth is stifled, it means production is affected in such an economy. Considering a country like Nigeria whose growth in recent year has been fluctuating and declining, the debts overhang theory gives an economic underpinning for the happening in the country. A dwindling economy will invariably affect major economic variables like interest rate, inflation and exchange rate considering that the bulk of government borrowings comes from external debt. When public debt is very high, it tends to put pressure on funds for investment leading to crowding out of private investment. If the government imposes policies that attempt to reduce its debt burden through increasing taxes leading, this leads to unexpected inflation, or different types of financial repression, causing the discouragement of investment (Reinhart et al., 2012). An important example is the introduction of different tax and levy policy by the Tinubu administration e.g a 50% tax imposed on banks forex profit (KPMG, 2024). A policy that might discourage investment in the banking sector, which is one of the most important sectors of the Nigerian economy.

3. Methodology

Data and Source

This study utilized secondary data collected from different economic databases. The collected data were for a period of 43 years from 1981 to 2023. The sources of the data and description of the variables are provided in table 1 below:

Table 1: Definition and Data Source

S/N	Variable Name	Symbol	Definition	Unit	Data Source
1	Exchange Rate	EXR	The relative value of naira to dollar	₦	CBN Statistical Bulletin
2	Public External Debt	EXTDBT	Public Debts owed to foreign lenders.	₦	CBN and DMO
3	Domestic Debt	DOMDBT	Debts owed to domestic borrowers	₦	CBN
4	Debt Servicing	DBTSERV	Repayment of principal and interest on public debts	₦	CBN and WDI
5	Foreign Reserve	FORRES	Assets held by the CBN in foreign currency	$	CBN
6	FDI	FDI	FDI as a percentage of GDP	%	World Bank Development Indicator
7	Inflation	INFL	Rate at which the general level of prices for goods and services rises over time	%	CBN Statistical Bulletin
8	Lending Rate	LENDR	The cost of borrowing money, or the return on investment for lending money, expressed as a percentage	%	CBN Statistical Bulletin

Source: Authors computation 2024

Empirical Model

In accounting for the dynamics between public debt and exchange rate in Nigeria, the model utilized the specification highlighted below

Exchange rate = $f(public\ debts)$

…….. (1)

Public Debt = $f(ExtDbt, DomDbt, ForRes, FDI, INF, LendR)$

……(2)

Equation 1 can therefore be respecified as

ExchR = $f(ExtDbtt, DomDbtt, LDBTServVt, ForRest, FDIt, INFLt, LendRt)$

……...… (3)

$ExchR_t = \beta_0 + \beta_1 ExtDbtt + \beta_2 DomDbtt + \beta_3 DBTServV + \beta_4 ForRes + \beta_5 FDI + \beta_6 INFL + \beta_7 LendR + \mu_t$

…….....….. (4)

Changing the functional form of equation 4 to a log-log model considering some of the variables are in different and large values such as exchange rate, domestic debts, external debts, debt servicing and foreign reserve. Logging these variables helps to normalize the distribution, which allows for better model fit and more valid inference (Gujarati & Porter, 2009).

$LExchR_t = \beta_0 + \beta_1 LExtDbtt + \beta_2 LDomDbtt + \beta_3 LDBTServV + \beta_4 LForRes + \beta_5 FDI + \beta_6 INFL + \beta_7 LendR + \mu_t$

…….. (5)

ARDL Model Specification

The ARDL model was used in analyzing the data and this is due to the fact that the variables were a combination of both I(0) and I(1) variables from the result of the unit root test. This is in compliance to the argument of Pesaran et al (2001) and Pesaran and Pesaran (1997) that the ARDL model is the best technique of analysis when the variables in a model are combination of data that are stationary at level and first difference. The ARDL model is specified as follows.

$\Delta LExchR_t = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta LExtDbt_{t-1} + \sum_{i=1}^{n} \beta_2 \Delta LDomDbt_{t-1} + \sum_{i=1}^{n} \beta_3 \Delta LDbtServ_{t-1} + \sum_{i=1}^{n} \beta_4 \Delta LForRes_{t-1} + \sum_{i=1}^{n} \beta_5 \Delta FDI_{t-1} + \sum_{i=1}^{n} \beta_6 \Delta INFL_{t-1} + \sum_{i=1}^{n} \beta_7 \Delta LendR_{t-1} + \mu_i$

……. (6)

$LExchR_t$ = log of Exchange Rate

LExtDbt = Log of External Debt

LDomDbt = Log of Domestic Debt

LDBTSerV = Log of Debt Servicing

LForRes = Log of foreign reserve

FDI = Foreign Direct Investment

INFL = Inflation Rate

LendR = Lending Rate

$\beta_1 - \beta_7$ = Coefficients of the Variables

μ = stochastic error terms

t = time period from 1981 – 2023

Table 2: A priori Expectation

Variable Name	Meaning	Expected Sign
EXTDBT	External Debts	(-)
DOMDBT	Domestic Debts	(+)
DBTSERV	Debt Servicing	(+)
FORRES	Foreign Reserve	(-)
FDI	Foreign Direct Investment	(-)
INFL	Inflation Rate	(+/-)
LENDR	Lending Rate	(+)

Source: Authors compilation 2024

Table 2 above shows the a priori expectation of the coefficients of the variables.

4. Analysis and Presentation of Data

Descriptive Statistics

Table 3: Descriptive statistics of the Data

	EXCHR (₦)	EXTDBT (₦'B)	DOMDBT (₦"B)	DBTSERV (₦'B)	FORRES ($'M)	FDI (%)	INFL (%)	LENDR (%)
Mean	137.2268	3528.224	5319.029	840.3658	19509.84	1.238177	19.26953	22.56969
Median	118.5669	689.8375	1166.001	163.8113	8592.007	1.087951	13.01000	22.50886
Maximum	1039.630	38220.00	59120.00	7800.000	58472.88	4.282088	72.84000	36.09000
Minimum	0.610025	2.331200	11.19260	0.045108	456.6417	-0.039522	5.380000	10.00000
Std. Dev.	183.5950	6872.602	10197.59	1628.878	17556.31	0.939394	16.35473	6.035763
Skewness	2.985482	3.513932	3.707005	2.766890	0.452251	0.921882	1.811454	-0.270597
Kurtosis	14.69061	16.77736	19.24863	10.63275	1.662943	3.787938	5.293969	2.703799
Jarque-Bera	308.7450	428.5783	571.5155	159.2463	4.668807	7.203055	32.94471	0.681955
Probability	0.000000	0.000000	0.000000	0.000000	0.096868	0.027282	0.000000	0.711075
Sum	5900.754	151713.6	228718.3	36135.73	838923.3	53.24160	828.5900	970.4966
Observations	43	43	43	43	43	43	43	43

Source: Authors computation using Eviews9 2024

Table 3 presents the descriptive statistics of the dataset. Over the period under study, the average exchange rate over the period is about ₦137.23 to a dollar reaching a peak of ₦1039 to one USD with minimum exchange rate at ₦0.61. Nigeria's external debt averaged is ₦3,528 billion while the domestic debt is about ₦5319 billion showing that the domestic debt is above the external debt. The external debt reached the maximum of ₦38,220 billion and the domestic debt reached the highest at ₦59120 billion. Debt servicing averaged ₦840 billion and the average foreign

reserve was $19,509 million. The foreign direct investment coming into Nigeria is averaged at 1.23% of the country's GDP. The average Nigeria's inflation rate is about 19.3% which is seen as double digit and high with the lending rate also high at 22.6%.

Correlation

Table 4: Correlation Matrix Table

	EXCHR	EXTDBT	DOMDBT	DBTSERV	FORRES	FDI	INFL	LENDR
EXCHR	1							
EXTDBT	0.94748	1						
DOMDBT	0.97779	0.954087	1					
DBTSERV	0.94271	0.962476	0.954998	1				
FORRES	0.57251	0.351834	0.481492	0.488325	1			
FDI	-0.09073	-0.162580	-0.173208	-0.235760	0.125627	1		
INFL	-0.10239	0.009568	-0.030079	-0.028264	-0.332644	0.18111	1	
LENDR	0.42904	0.371122	0.376745	0.403587	0.330001	0.16591	0.14164	1

Source: Authors computation using Eviews9 2024

Correlation between the variables is shown in table 4 above. The table shows a moderate correlation among most of the independent variables. However, domestic and external debt which shows very strong correlation with coefficient of 0.95. Also, debt servicing has strong relationship with both external debt and domestic debt with correlation coefficient of 0.96 and 0.95 respectively. This is not surprising, as debt servicing is a function of both external and domestic debt. This could signal the presence of multicollinearity among the variables. To check for the presence of multicollinearity, there is need to conduct the variance inflation Factor (VIF).

Variance inflation Factor (VIF)

Table 5: Variance Inflation Factor test result

Variables	VIF
EXTDBT	34.04570
DOMDBT	16.35892
DBTSERV	32.43090
FORRES	3.449078
FDI	1.838270
INFL	1.416709
LENDR	1.375479

Source: Authors computation using Eviews9 2024

The VIF is used to test for the presence of multicollinearity and the result is shown in table 5 above. The result show that External debt, domestic debt and debt servicing show sign of multicollinearity with a VIF value of over 10. Greene (2002) suggested

that one solution to solve the issue of multicollinearity is to drop the related variables, he also cautions that doing so can lead to omitted variable bias if these variables are theoretically essential in the model. In our case, external debt, domestic debt, and debt servicing are all important to the research question and carry distinct policy implications. As a result, rather than removing any of the variables, we acknowledge the issue of multicollinearity but retain the variables in the model due to their relevance. These could result to inflated standard errors but will give an unbiased result.

Lag Length Selection

Table 6: lag Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	9.708607	NA	0.053956	-0.087621	0.253623	0.034814
1	15.35758	8.690732*	0.042620*	-0.326030*	0.057869*	-0.188290*
2	15.46297	0.156728	0.044765	-0.280152	0.146402	-0.127108
3	15.53309	0.100679	0.047140	-0.232466	0.236744	-0.064118
4	16.00732	0.656628	0.048666	-0.205503	0.306362	-0.021851

Source: Authors computation using Eviews9 2024

Table 6 shows the lag selection criteria. Based on the result, LR, FPE, AIC, SC and HQ selects lag 1 as the optimal lag. Hence, lag 1 is the true lag length of our model. According to Braun and Mittnik (1993), choosing a lag length different from the true lag length gives an inconsistent result.

ADF Unit Root Test Result

Table 7: Unit root of the variables

Variable	T-stat	Critical Value	Prob	Order
LEXCHR	-1.819390	-3.520787	0.6775	I(1)
	-5.245691	-3.523623	0.0006***	
LEXTDBT	-1.859057	-3.523623	0.6572	I(1)
	-4.751261	-3.523623	0.0023***	
LDOMDBT	-0.505928	-2.933158	0.8799	I(1)
	-3.720451	-2.935001	0.0073***	
LDBTSERV	-1.901700	-3.520787	0.6359	I(1)
	-5.286568	-3.523623	0.0005***	
LFORRES	-3.178787	-3.520787	0.1025	I(1)
	-6.142304	-3.526609	0.0000***	
FDI	-3.980990	-2.933158	0.0036***	I(0)
	-10.05832	-2.935001	0.0000***	
INFL	-3.718055	-2.935001	0.0074***	I(0)
	-6.641954	-2.936942	0.0000***	
LENDR	-3.398531	-3.520787	0.0652*	I(1)
	-7.177413	-3.526609	0.0000***	

Source: Authors computation using Eviews9 2024

*Significance: * - 10%, ** - 5%, *** - 1%*

The unit root test was done using the Augmented Dickey Fuller Test (ADF) and it showed that the variables are combination of both I(0) and I(1) as shown in Table 7 with the dependent variable being an I(1) variable which suggests the need to use the ARDL bounds test in our analysis.

Bounds Test

Table 8: Result of the Bounds Test

Variable Name	**Critical Bound**		**F-Stat**
Significant	I(0)	I(1)	
10%	2.03	3.13	
5%	2.32	3.5	**1.926979**
2.5%	2.6	3.84	
1%	2.96	4.26	

Source: *Authors computation using Eviews9 2024*

The bounds tests value of 1.93 as shown in table 8 is below the lower critical bounds of 2.32 at 5%, which suggests that there is no relationship between exchange rate and public debts in the long-run. This suggests that there is only a short run relationship between public debts and exchange rate.

ARDL Short Run Result

Table 9: ARDL Short Run Coefficients

Variable	**Coefficient**	**Std. Error**	**T-statistics**	**Prob**
LEXCHR(-1)	0.635817	0.113435	5.605130	0.0000***
LEXTDBT	0.172516	0.059012	2.923389	0.0065***
LDOMDBT	0.490477	0.132350	3.705913	0.0009***
LDOMDBT(-1)	-0.344417	0.148528	-2.318870	0.0274**
LDBTSERV	0.329957	0.101088	3.264054	0.0027***
LDBTSERV(-1)	-0.297695	0.096973	-3.069884	0.0045***
LFORRES	0.014102	0.069885	0.201789	0.8414
FDI	0.111937	0.036065	3.103756	0.0041***
INFL	-0.001247	0.001734	-0.719301	0.4775
LENDR	0.006681	0.006715	0.995036	0.3277
LENDR(-1)	-0.022831	0.007014	-3.255148	0.0028***
C	-0.841486	0.933252	-0.901671	0.3744

Source: Authors computation using Eviews9 2024
*Significance: * - 10%, ** - 5%, *** - 1%*

Table 9 showed the outcome of the ARDL. As can be seen from the table, External debt has a positive relationship with the exchange rate. A percentage increase in external debt increases the exchange rate by 0.17%. External debt showed to be statistically significant in determining the value of the exchange rate in Nigeria. The result showed that a percentage increase in domestic debt increases the exchange

rate by 0.49%. This indicates that domestic debt has a positive relationship with exchange rate and also showed to be statistically significant. Similar to the result of both the external and domestic debt relationship with the exchange rate is debt servicing. Debt servicing showed to be significant and have a positive effect on exchange rate. A percentage increase in debt servicing increases the exchange rate by 0.33%. Foreign Reserve also showed a positive relationship with the exchange rate. A percentage increase in the foreign reserve increases the exchange rate by 0.01%. However, foreign reserve was statistically insignificant in determining the exchange rate in Nigeria.

The relationship between Foreign Direct investment and exchange rate according to the result is positive. Exchange rate will increase by 0.11% if FDI increases by one percentage. FDI showed to be statistically significant. Inflation has an insignificant negative relationship with exchange rate. The higher the inflation rate, the lower the exchange rate. The exchange rate will reduce by 0.001% if inflation increases by a percent. The lending rate have a positive but insignificant relationship with exchange rate. A percentage increase in the lending rate increases the exchange rate by 0.0067%.

Table 10: Autocorrelation and Heteroscedasticity Test

Autocorrelation and Heteroscedasticity Test			
Breusch-Godfrey Serial Correlation LM Test			
F-statistic	0.211425	Prob. F(2,23)	0.6491
Obs*R-squared	0.303985	Prob. Chi-Square(2)	0.5814
Breusch-Pagan Godfrey Heteroscedasticity Test			
F-statistic	0.526988	Prob. F(15,25)	0.8695
Obs*R-squared	6.801392	Prob. Chi-Square(15)	0.8149
Scaled explained SS	5.318106	Prob. Chi-Square (15)	0.9148

Source: Authors computation using Eviews9 2024

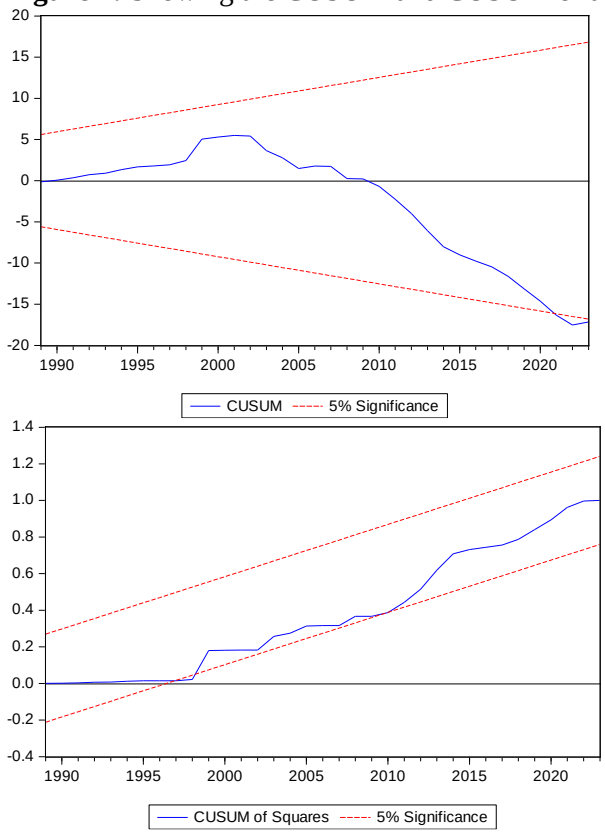
Table 10 displays the result of the autocorrelation and heteroscedasticity. The Breusch-Pagan Serial correlation LM test value of 0.6491 is higher than the significant level of 5% hence there is no sufficient evidence to reject the null hypothesis and we can conclude that the model is free from serial correlation. The result also showed that there is no heteroscedasticity among the variables considering the result of the Breusch-Pagan Godfrey heteroscedasticity test.

Cumulative Sum (CUSUM) and CUSUM of Square Test

The result of the CUSUM and CUSUM of Square test indicate that the coefficient of the model is not stable over time as the blue line came outside of the stability

level indicated by the red lines at some point. We can as a result conclude that there is evidence of structural break in the model.

Figure 4: Showing the CUSUM and CUSUM of the Square Test



Source: *Authors computation using Eviews9 2024*

Chow test for Structural Break

Table 11: Result for Test for Structural Break (1999)

F-statistic	8.065432	Prob. F (12,18)	0.0001
Log likelihood ratio	77.81301	Prob. Chi-Square (12)	0.0000
Wald Statistic	96.78518	Prob. Chi-Square (12)	0.0000

Source: Authors computation using Eviews9 2024

Table 11 shows the result of the structural break with 1999 chosen as the structural break year. The choice of 1999 is because this was a significant year in Nigerian history considering that the country returned to civilian rule from military rule in this year.

Looking at the result and using the probability value of 0.0001, it can be seen that the F statistic is significant. This provides us with significant evidence to suggest that there is structural break in the model.

ARDL Result Pre 1999

Table 12: ARDL Short Run Coefficients Pre- 1999

Variable	Coefficient	Std. Error	T-statistics	Prob
LEXCHR(-1)	-0.335123	0.225421	-1.486656	0.3770
LEXTDBT	-0.111954	0.091016	-1.230053	0.4346
LEXTDBT (-1)	0.170738	0.040907	4.173787	0.1497
LDOMDBT	0.593782	0.121468	4.888381	0.1285
LDOMDBT (-1)	-0.209988	0.083312	-2.520497	0.2405
LDBTSERV	0.647154	0.049701	13.02095	0.0488**
LDBTSERV (-1)	-0.162849	0.102297	-1.591923	0.3571
LFORRES	0.049393	0.018599	2.655670	0.2293
LFORRES (-1)	0.167650	0.026058	6.433681	0.0982*
FDI	0.004358	0.015042	0.289758	0.8205
FDI (-1)	-0.071664	0.019141	-3.744018	0.1662
INFL	-0.001411	0.000233	-6.066200	0.1040*
INFL (-1)	0.004245	0.001169	3.629940	0.1711
LENDR	0.019016	0.001908	9.966083	0.0637*
LENDR(-1)	-0.001332	0.002138	-0.623083	0.6453
C	-2.262427	0.652213	-3.468847	0.1787

Source: Authors computation using Eviews9 2024
Significance: * - 10%, ** - 5%, *** - 1%

The table 12 above shows the result of the short run ARDL model before 1999.The result show that external debt has negative relationship with the exchange rate while domestic debts have positive relationship. However, both variable was statistically insignificant in explaining the relationship between public debts and exchange rate. Debt servicing shows a positive relationship with exchange rate pre-1999 and statistically significant. The result showed that a percentage increase in debt servicing would increase the exchange rate by 0.64%. Foreign reserve and FDI display a positive relationship with exchange rate but both was statistically insignificant to explain the relationship between exchange rate and public debts in the period before the structural break. Inflation has a negative but insignificant relationship with exchange rate while lending rate have a positive yet insignificant relationship with exchange rate before 1999.

ARDL Result Post 1999

Table 13: ARDL Short Run Coefficients post 1999

Variable	Coefficient	Std. Error	T-statistics	Prob
LEXCHR(-1)	0.171974	0.083446	2.060889	0.0571*
LEXTDBT	0.173656	0.058550	2.965959	0.0096***
LDOMDBT	0.981390	0.137629	7.130710	0.0000***
LDOMDBT(-1)	-0.979563	0.246206	-3.978626	0.0012***
LDBTSERV	0.108376	0.133041	0.814603	0.4280
LFORRES	0.191155	0.081779	2.337448	0.0337**
FDI	-0.042418	0.052877	-0.802205	0.4350
INFL	-0.001381	0.005850	-0.236086	0.8166
LENDR	0.008783	0.010461	0.839656	0.4143

C	-0.006486	0.812849	-0.007979	0.9937

Source: Authors computation using Eviews9 2024
Significance: * - 10%, ** - 5%, *** - 1%

Table 13 shows the result of the short run ARDL after structural break in 1999. The result showed that both external debt and domestic debt contribute to high exchange rate after the structural break with both being statistically significant. A percentage increase in external debt increases the exchange rate by 0.17% and a percentage increase in domestic debt increases the exchange rate by 0.98%. Debt servicing also show to have a positive relationship with exchange rate but it becomes insignificant after structural break was accounted for. After the structural break in 1999, foreign reserve shows a positive and significant relationship with exchange rate. A percentage increase in foreign reserve increases exchange rate by 0.19%. FDI and inflation rate showed a negative effect on exchange rate while the lending rate showed a positive relation after the structural break. Similar to the significance of the model before the structural break, FDI, inflation and lending rate are all statistically insignificant.

Granger Causality

Table 14: Granger Causality Test

Null Hypothesis	F-Statistic	Probability
LEXTDBT does not Cause LEXCHR	3.22894	0.0939
LEXCHR does not Cause LEXTDBT	1.09611	0.3129
LDOMDBT does not Cause LEXCHR	0.63434	0.4391
LEXCHR does not Cause LDOMDBT	10.0153	0.0069
LFORRES does not Cause LEXCHR	0.01016	0.9212
LEXCHR does not Cause LFORRES	7.75925	0.0146
LDBTSERV does not Cause LEXCHR	11.4494	0.0045
LEXCHR does not Cause LDBTSERV	6.51630	0.0230
LDOMDBT does not Cause LEXTDBT	0.46623	0.5059
LEXTDBT does not Cause LDOMDBT	4.31256	0.0567
LFORRES does not Cause LEXTDBT	7.15442	0.0181
LEXTDBT does not Cause LFORRES	9.27294	0.0087
LDBTSERV does not Cause LEXTDBT	4.08477	0.0628
LEXTDBT does not Cause LDBTSERV	1.45537	0.2477
LFORRES does not Cause LDOMDBT	1.36258	0.2626
LDOMDBT does not Cause LFORRES	3.85448	0.0698
LDBTSERV does not Cause LDOMDBT	6.03979	0.0276
LDOMDBT does not Cause LDBTSERV	1.74652	0.2075
LDBTSERV does not Cause LFORRES	8.68100	0.0106
LFORRES does not Cause LDBTSERV	0.00662	0.9363

Source: Authors computation using Eviews9 2024
Does not cause → Does not Granger Cause

From the Granger causality test result shown in table 14, the following was discovered that Exchange rate granger cause domestic debt and Foreign Reserve. Debt servicing granger cause exchange rate and foreign reserve. External debt

granger causes domestic debt. Foreign reserve granger causes external debt and external debt granger cause foreign reserve. Debt servicing also causes domestic debt.

Discussion

The CUSUM test showed that there was stability in the data due to structural break. The year 1999 was identified as the structural break year due to change from military rule to a democratic rule. In the pre-1999 period, external debt reduces the exchange rate while domestic debt contribute to the increase in the exchange rate but both were statistically insignificant. Only debt servicing is statistically significant in the pre-1999 to explain the relationship between public debt and exchange rate, all the other variables where insignificant. When Nigeria's debt servicing increases, the exchange rate also increase (naira depreciates) in the pre-1999 period.

After the structural break, both external debt and domestic debts became significant. Both showed to have direct relationship with exchange rate. An increase in Nigeria's external and domestic debt increases the value of the exchange rate. While domestic debt is expected to increase the exchange rate, external debt is expected to reduce the exchange rate (appreciation). The finding is in line with the result of the research by Olaoye et al. (2022) and Saheed et. al (2015) that indicate that external debt is significant and positively related with exchange rate. The reason for the positive relationship between external debt might be because most of the loans are used to finance importation of consumption production rather than being used for longer term investment that is capable of boosting the productive base of the country. The result showed that debt service is positively related to exchange rate, which is in line with the study, by Saheed et. al (2015) but becomes insignificant after adjusting for structural break. The positive relationship is expected considering that debt servicing is the repayment of the principal and interest rate on public debts hence, the repayment of debts particularly the external debts put a strain on forex availability in Nigeria, which subsequently cause exchange rate to rise.

In the same vein with external and domestic debt, foreign reserves have a positive and significant effect on the exchange rate. As foreign reserves grow, the exchange rate also grows. This is not in line with the a priori expectation. What could be the reason for this? Foreign reserve signifies the availability of forex in the economy and availability should mean that there is less pressure on exchange rate, which makes exchange rate to appreciate as the reserve increases but this study shows otherwise. However, this result was in line with the result of the study by Saheed et. al (2015). One possible explanation is that Nigeria's increase in foreign reserves is not sustainable for foreign exchange policy intervention as it largely depends on oil revenue, which is susceptible to oil price volatility.

5. Conclusion and Recommendation

The study showed that there is no long run relationship between public debts and exchange rates. The observation from the study was that the impact of public debt could be divided into two components – external and domestic debts. After conducting the necessary test, the model showed the presence of a structural break, with the structural break period being 1999. Only debt servicing was significant in explaining the relationship between public debt and external debt before the structural

break. While external debt has a negative impact on the exchange rate, domestic debt has a positive impact on the exchange rate, but both were insignificant pre-1999. After structural break occurred post 1999, these relationship changed. After the structural, both external debt and domestic debt exhibited a positive and significant relationship with the exchange rate. While debt servicing maintained it positive relationship with exchange rate, it became insignificant due to structural break. Foreign reserve became significant post 1999, but the effect on the exchange rate was positive, meaning that with growing foreign reserve, the exchange rate (depreciates) grows in response. Exploring the causality between public debt and exchange, the granger causality test showed that debt servicing granger cause exchange rate and foreign reserve while External debt granger causes domestic debt. The model was free of serial correlation. Based on the observed result, the study is recommending that external borrowings of the government should not be used to fund recurrent expenditure but instead be used for capital expenditure, which have the ability to bring future returns and improve the productive capacity of the economy, which can be useful in ensuring foreign exchange management. There is also the need for good debt management like pegging the level of overall public debt to a certain percentage of the GDP. The country's over-reliance on importation also puts pressure on the country's reserve resulting in a high exchange rate.

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