

Exchange Rate Volatility and Sectoral Performance in Nigeria: A Comparative Analysis with Implications for Economic Diversification (1981-2024)

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ABSTRACT

The nation's quest for economic diversification has been repeatedly challenged by persistent exchange rate fluctuations, which distort investment decisions, increase production costs, and undermine sectoral growth. This study therefore, investigated how exchange rate volatility (EXRV) impact sectoral performance in Nigeria with implications for economic diversification using annual data from 1981 to 2024 obtained from the CBN Statistical Bulletin and WDI. The GARCH model and ARDL technique was employed and the findings revealed heterogeneous sectoral responses to EXRV. EXRV exerted a negative but insignificant impact on agricultural sector performance, a negative and significant impact on industrial sector performance, and a positive significant impact on services sector performance in the long run. FDI positively influence the performance of the industrial sector, while inflation and interest rates had mixed effect across the sectors. The comparative analysis revealed that services sector was the least affected by exchange rate fluctuations, the industrial sector is the most vulnerable, with minimum effect on the agriculture sector. From the findings, the study concluded that EXRV plays a significant role in the performance of the economy's sectors and serves as a great parameter for Nigeria's economic diversification agenda. The study highlighted the need for policies that fosters exchange rate stability, improve industrial competitiveness and ensure sustainable growth across productive sectors of the economy.

Keywords: Agricultural Sector, Economic Diversification, Exchange Rate Volatility (EXRV), Industrial Sector, Services Sector.

INTRODUCTION

The exchange rate constitutes a significant component of the macroeconomic environment of any open economy, reflecting a nation's currency value in relation to others, and a key indicator in global trade. The structure of the exchange rate system in Nigeria has experienced several policy reforms and structural adjustment especially in 1986 when Nigeria started to embrace the structural adjustment programme which ushered in a more flexible system from the fixed exchange rate system (Oaikhenan & Aigheyisi, 2015). The exchange rate has exhibited varying degrees of volatility over time, which can be largely explained by several factors which include shift in monetary policy framework, market demand and supply dynamics of foreign exchange and global economic uncertainties (CBN, 2023).

Nigeria's economic framework is largely characterized by interdependence among its major sectors such as agriculture, industry and services, with each sector having varying degrees of dependence on imported inputs, technology and external financing and hence differently positioned within the broader macro-economic environment. Over time, policy adjustments and global economic integration have contributed to changes in

sectoral composition with efforts focused on improving non-oil productive activities, as part of long-term developmental strategies (Adejumo, 2020; Falana, 2019). In this context, sectoral performance is shaped not only by domestic production capacity but also by external economic conditions that influence cost structures, investment flows and access to inputs across sectors. Consequently, variations in macroeconomic conditions tend to transmit differently across the sectors thereby affecting their relative contribution to overall economic activity and structural transformation in Nigeria.

The EXRV remained a persistent macroeconomic problem affecting Nigeria, as the value of naira continues to experience frequent fluctuations as a result of external shocks, oil price instability and structural imbalance of the economy (Akanbi, *et al.*, 2017). Though various studies (such as Audi, 2024; Nwakarama and Awogbemi, 2024; Moses, *et al.*, 2020; Ekirano, *et al.*, 2023; Chinyere, *et al.*, 2024; Danladi, 2025; Orisdare and Olofin, 2024) have been carried out on EXRV and macroeconomic outcomes, their focus has been on the overall macroeconomic indicators like the real gross domestic product (RGDP) while some are sector-specific. Existing studies have also paid limited attention to comparative analysis across sectors, thereby masking the diversity of reaction of different sectors in the Nigerian economy, and lastly, the sharp and increasing fluctuations experienced in recent years contributed to the inquisition into how different sectors respond to the movement. In contrast to previous studies that focused on aggregate economic growth, this study undertakes a comparative sectoral evaluation of the effects of EXRV on agriculture, industrial, and services sectors in Nigeria and draws implications for economic diversification.

In reality, exchange rate changes may impact the economy's sectors differently, depending on their level of dependence on imports, export orientation, and exposure to foreign inputs, making the economy more heterogeneous and complex than is often assumed. Failing to account for the heterogeneous reaction explains why general prescriptions of economic policy may be ineffective to directly translate into policy effects at the sectoral level. There is therefore, a need for disaggregated and comparative analysis to provide deeper insight into the differential effects of EXRV on agriculture, industrial and services, to inform more specific and effective policy recommendations for a stable economy and diversification.

LITERATURE REVIEW

Exchange Rate Volatility (EXRV)

Exchange rate measures the relative worth of a nation's currency and serves as the basis for currency conversion in international markets. It represents the value of a domestic currency against another which is important in trade, foreign investment and overall macroeconomic interactions (Adejumo, 2020). In general economic knowledge, exchange rates influences imports and exports prices, shape price competitiveness, and the purchasing power of households and businesses engaged in cross-border transactions. Exchange rate changes in developing economies like Nigeria are prone to being closely monitored because they affect the balance of trade, production expenses and the stability of the external sector (Obadan, 2006; CBN, 2023).

The EXRV indicates extent of fluctuation or movement of a particular currency overtime and it measures how often movement of exchange rates is in response to market forces, policy adjustments and external shocks (Goshit, *et al.*, 2024). EXRV captures the instability or unpredictability associated with currency movements in macroeconomic terms, which may be high or low in the short and long term, depending on domestic and external economic environment (Oyadeyi, 2024). High volatile exchange rates give rise to uncertainty in economic planning in general, as firms and investors struggle to predict their future cash flows and costs in foreign currency terms. This uncertainty may have an impact on production decisions, investment planning, and trade activity of various economic sectors (Nwosu, *et al.*, 2023). An unstable exchange rate in developing economies like Nigeria, whose foreign exchange earnings are largely based on commodity is often viewed as an index of macroeconomic instability and external vulnerability (Ajakaiye & Ojo, 2018; Mordi, 2006; Gayweh, 2025).

Gross Domestic Product (GDP) and Sectoral Performance

Sectoral performance represents the contribution and level of output of each sector to GDP, while the GDP represents the total market value of all final goods and services generated in an economy over a specified period. It is extensively used as a country measure of overall economic performance and level of economic development (Nwakarama & Awogbemi 2024). GDP measures the productive potential of the economy and measures a broad indicator of economic activity in all sectors. In the broad sense, GDP growth is driven by changes in its major expenditure components, and it is generally used to gauge the rate of growth or contraction of an economy over time (Central Bank of Nigeria, 2023; World Bank, 2024).

GDP is broken down into economic activity sectors in most macroeconomic studies to gain insight into the nature of economic activity. This study analyzed GDP by three major sectoral groups: agriculture, industrial and services. Agricultural activities refer to those activities associated with crop production, livestock, and forestry and fishing, and are often linked to the provision of food supply and raw materials. The industrial sector is defined as manufacturing, mining, construction and utilities and closely tied to production, value addition and economy structural transformation. Services sector comprises a broad spectrum of economic activities, including banking, insurance, telecommunications, transportation, education and trade, and are crucial for enabling consumption, distribution, and economic coordination (National Bureau of Statistics, 2022; OECD, 2021).

A sectoral analysis is significant in economic analysis because each sector has a different reaction characteristic to changes in macro-economic conditions like exchange rate fluctuation, inflation and interest rates. In agriculture, for example, input costs and climate-related issues can affect agriculture; in industry, import costs, foreign exchange and financial system stability can influence industry; in services, financial system stability and consumer demand can affect services. These sectoral components of GDP help to draw an understanding on the structure of the economy as well as understanding how external shocks impact the various sectors of production (Central Bank of Nigeria, 2023; World Bank, 2024).

Theoretical Framework

The Mundell–Fleming Model, developed by Marcus Fleming (1962) and further extended by Robert Mundell (1963), provides a macroeconomic framework for analyzing the relationship between exchange rates, interest rates, and output in an open economy. The model is an extension of the IS-LM framework to an open economy setting and explains how fiscal and monetary policies operate under different exchange rate regimes. It assumes that capital mobility influences macroeconomic stability and that exchange rate movements play a central role in determining aggregate demand and national income. In this context, changes in exchange rates affect net exports, investment flows, and overall economic activity, making the model particularly relevant for economies exposed to external shocks.

For developing economies like Nigeria, where exchange rate fluctuations are frequent, the Mundell–Fleming framework helps to explain how volatility in the exchange rate can transmit to real sector performance through trade and capital flow channels. Thus, it provides a useful theoretical foundation for examining how EXRV influences sectoral output in agriculture, industrial, and services.

Empirical Review

Moses, *et al.* (2020) analysed the effect of EXRV on Nigeria's economic growth between 2003 and 2017, and used GARCH model and VECM for analysis. The findings revealed that volatility of the USD/NGN negatively and significantly impact GDP growth and concluded exchange rate movement was a significant contributor to the dynamics of economic growth rates in Nigeria. Ekirano, *et al.* (2023) using time series data from 1981 to 2021 investigated how EXRV and trade openness influences Nigeria's economic growth while employing the ARDL technique. The results showed that EXRV negatively influence economic growth with significant effect in the short run. The study further stressed the significance of the EXRV to Nigeria's macroeconomic performance.

Nwosu, *et al.* (2023) studied the effect of real EXRV on Nigeria's productive sector for the period from 1999 to 2021. Secondary data from the CBN Statistical Bulletin were used and VAR model was employed to

capture the interrelationship between EXRV, inflation, balance of trade and performance of the productive sector. Findings revealed EXRV significantly affected the productive sector and concluded it remains one of the macroeconomic factors that affect productive activities in Nigeria. Orisdare and Olofin (2024) conducted a time series evaluation of the effects of EXRV on productivity in Nigeria using econometric techniques of Johansen and Bounds cointegration and ARDL for analysis. Empirical results indicated that EXRV had a negative effect on productivity and thus concluded exchange rate stability is critical for improvement of productivity in Nigeria.

Audi (2024) studied the relationship between EXRV and economic growth in Lebanon from 1980 to 2023. Using the ARDL estimation technique for analysis, findings revealed EXRV positively influence economic growth and significantly in the long run but with negative insignificant effect in the short run. The study found that macroeconomic variables like investment volatility and value added in the sectors also had significant effects on the dynamics of growth in Lebanon. A study by Goshit, *et al.* (2024) examined how EXRV impact manufacturing output in Nigeria from 1980 to 2021 using the ARDL model and findings showed that output changes in manufacturing sector had significant negative relationship with EXRV and thus, attributed it to the heavy reliance of the sector on imported machines and raw materials. The study concluded that stability in the exchange rate is necessary for enhancing manufacturing productivity in Nigeria.

Nwakarama and Awogbemi (2024) employed annual data for the period between 1990 and 2023 from the CBN Statistical Bulletin to examine the effect of foreign exchange rate volatilities on Nigeria's economic growth. The relationship between the EXRV, foreign reserves, FDI, trade balance, inflation and GDP growth were investigated using ARDL model. The result showed a negative insignificant effect of EXRV on economic growth in the long run and negative significant effect in the short run. The study, therefore, concluded that the Nigeria economy is not significantly affected in the long run by EXRV. Chinyere, *et al.* (2024) investigated the relationship between EXRV and economic growth in SSA countries using a panel data for the years 2000 to 2022 extracted from the WDI. Real GDP was used to proxy economic growth, EXRV served as the main explanatory variable, and terms of trade and interest rate was used as control variables. The volatility was measured using the GARCH model and the results showed that EXRV negatively and significantly affected the SSA economy, and weakens the ability of the economy to grow in the region.

Gayweh (2025) examined EXRV and Liberia's agriculture, mining and manufacturing activities between 2010 and 2022 using monthly data and ARCH model to estimate volatility. The results indicated that agriculture and manufacturing sectors were most vulnerable to changes in exchange rate because they relied on imported raw materials for their input and output. In contrast, the mining industry had a relationship positive with EXRV, particularly gold production, because of a rise in the demand for gold when the currency is volatile. Danladi (2025) using quarterly data extracted from the CBN Statistical Bulletin from 2010 to 2023 investigated the effect of EXRV on economic growth in Nigeria while employing the ARCH and GARCH model. The results revealed EXRV existed in the Nigerian economy over a period of time with positive effect in the short run and negative effect in the long run.

METHODOLOGY

This study used *Ex Post Facto* research design and extracted data from the CBN Statistical Bulletin and WDI for the period between 1981 to 2024 with main focus on the agricultural, industrial and service sectors as dependent variables, and EXRV as the main explanatory variable. The FDI, inflation rate and interest rate variables were employed as control variables to capture other macroeconomic factors that could affect sectoral performance. The volatility of exchange rates was captured using the Generalized Autoregressive conditional Heteroskedasticity (GARCH) model to explain time-varying volatility and clustering behaviour associated with exchange rate movements, while the agricultural, industrial and services sector performance were measured by their real output contribution to GDP. Time series econometric methods such as descriptive statistics, unit root tests, Autoregressive Distributed Lag (ARDL) model and post-estimation diagnostic test were used to analyze the data.

The model specification was adapted from Oseni, *et al.*, (2019) who studied exchange rate volatility and industrial output growth in Nigeria between 1986-2017 stated as: $INDP = (EXCR, EXP, IMP, TRAOPEN, FDI)$, while the proposed model for this study is stated below:

$$ASP_t = \beta_0 + \beta_1 \ln EXRV_t + \beta_2 FDI_t + \beta_3 INF_t + \beta_4 INT_t + \mu_t \dots \dots \dots (i)$$

$$ISP_t = \beta_0 + \beta_1 \ln EXRV_t + \beta_2 FDI_t + \beta_3 INF_t + \beta_4 INT_t + \mu_t \dots \dots \dots (ii)$$

$$SSP_t = \beta_0 + \beta_1 \ln EXRV_t + \beta_2 FDI_t + \beta_3 INF_t + \beta_4 INT_t + \mu_t \dots \dots \dots (iii)$$

Where ASP_t represents Agricultural sector contribution to GDP at time t , ISP_t represents Industrial sector contribution to GDP at time t , SSP_t represents Services sector contribution to GDP at time t , $\ln EXRV_t$ represents log transformation of Exchange rate volatility, FDI_t is the Foreign Direct Investment, INF_t is the Inflation rate, INT_t represents Interest rate, β_0 is the intercept, $\beta_1, \beta_2, \beta_3, \beta_4$ are coefficients of explanatory variables, μ_t represents error term, and t represents time period between 1981 to 2024. The estimated model results were interpreted to determine the nature of the relationship between exchange rate volatility and sectoral performance in Nigeria, while controlling for FDI, inflation and interest rate dynamics.

RESULTS AND DISCUSSION

Table 4.1: Descriptive Statistics of the Variables

	ASP	ISP	SSP	ln(EXR)	FDI	INF	INT
Mean	23.50776	28.24831	47.24712	3.802091	1.189057	19.40136	17.44346
Median	23.69242	28.27703	48.32567	4.783887	0.961468	13.12650	16.92153
Maximum	36.96508	39.24509	59.78510	7.299098	4.282088	72.83550	31.65000
Minimum	12.24041	18.17313	35.35823	-0.481739	-0.028873	5.388008	8.916667
Std. Dev.	4.743278	6.283428	5.795174	2.087646	0.952675	16.23182	4.905567
Skewness	0.140225	-0.080359	-0.116853	-0.734885	0.968605	1.795631	0.366300
Kurtosis	3.878086	1.840847	2.400477	2.492587	3.729094	5.275433	3.373636
Jarque-Bera	1.557761	2.510687	0.759085	4.432436	7.854667	33.13706	1.239894
Probability	0.458920	0.284978	0.684174	0.109021	0.019696	0.000000	0.537973

Source: E-Views Output (2026).

Table 4.1 revealed the services sector contributed majorly to Nigeria's GDP with an average contribution of 47.25%, with industrial sector of 28.25% and agricultural sector of 23.51%. The mean of EXR indicates that the foreign exchange market is prone to significant volatility, while inflation and interest rates also exhibited substantial variability. The Jarque-Bera statistics indicates normal distribution of most of the variables except the FDI and inflation rate. Overall, the findings revealed significant variation in sectoral performance and macroeconomic conditions in Nigeria between 1981 and 2024.

Augmented Dickey–Fuller Unit Root Tests (ADF)

Table 4.2: ADF test

Variables	t-stat at Level	Critical Value	t-stat at 1st difference	Critical Value	Integrating Order
ASP	-2.6044	-2.9350	-6.7957	-2.9350	I(1)
ISP	-0.6714	-2.9350	-7.7817	-2.9350	I(1)
SSP	-1.2181	-2.9314	-4.2522	-2.9314	I(1)
ln(EXR)	-1.2811	-2.9314	-5.0228	-2.9332	I(1)
FDI	-3.7236	-2.9314	-10.1813	-2.9332	I(0)
INF	-3.7318	-2.9332	-3.0020	-2.9434	I(0)
INT	-2.4684	-2.9314	-5.7940	-2.9332	I(1)

Source: E-Views Output (2026).

The ADF test showed the FDI and inflation rate are stationary at level whereas agricultural sector performance, industrial sector performance, services sector performance, EXR and interest rate were stationary at first differencing. The mixture of I(0) and I(1) variables proves the aptness of using the ARDL model in estimating both the short and long run relationships between the variables.

GARCH Modelling for Volatility and Clustering Behaviours

ARCH Effects Test in Residual

Table 4.3: Heteroskedasticity Test: ARCH

F-statistic	37.14113	Prob. F(5,33)	0.0000
Obs*R-squared	33.11538	Prob. Chi-Square(5)	0.0000

Source: E-Views Output (2026).

The volatility clustering result based on the ARCH effect test reported in Table 4.3 revealed that both F-statistic and chi-square statistic are statistically significant at 5 percent level leading to the rejection of the null hypothesis of no ARCH effect. This confirms evidence of heteroskedasticity and volatility clustering in the exchange rates series, and justifies the application of GARCH model to estimate the volatility of exchange rates.

GARCH Model Estimation

Table 4.4: Estimation Coefficients

Mean Equation				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	4.876394	0.014868	327.9726	0.0000
Variance Equation				
C(ω)	0.228579	0.448579	0.509563	0.6104

RESID(-1) ² (α)	1.498485	1.460112	1.026281	0.3048
GARCH(-1) (β)	-0.412425	1.264244	-0.326223	0.7443
$\alpha + \beta = 1.08006$				

Source: E-Views Output (2026).

Table 4.4 showed estimation of the GARCH model for obtaining EXRV series for the ARDL analysis and the findings revealed the presence of volatility persistence in the exchange rate market, implying that exchange rate fluctuations are influenced by previous shocks and previous volatility. This result validates that exchange rate movements in Nigeria have exhibited unstable pattern over time and justifies inclusion of EXRV as key explanatory variable in evaluating sectoral performance.

ARDL Model for Agricultural Sector Performance

Table 4.5.1: Bound Test Result

ARDL Bound Test (Cointegration)			
Test Statistic	Value	K	N
F-statistic	5.916331	4	44
Critical Value Bounds			
Significance	I(0) Bound	I(1) Bound	Decision
10%	2.427	3.395	Cointegration exists
5%	2.893	4.000	Cointegration exists

Source: E-Views Output (2026).

The ARDL Bounds Test results for the agricultural sector model as shown in Table 4.5.1 showed that the estimated F-statistic is greater than the upper bound critical values at the conventional levels of significance, which indicates that the null hypothesis of no long-run relationship should be rejected. Therefore, the result confirms the existence of long-run equilibrium relationship among the variables, and hence, the estimation of both short-run and long-run ARDL coefficients is justified.

Table 4.5.2: ARDL Short Run Relationships for Agricultural Sector

Error Correction Model				
Variable	Coefficient	Std. Error	t-Statistic	P-value
COINTEQ*	-0.322079	0.065176	-4.941685	0.0000
D(ASP(-1))	0.297817	0.091271	3.263012	0.0030
D(VOL_EXRV)	37.52234	14.05376	2.669914	0.0127
D(VOL_EXRV(-1))	-7.022605	14.89739	-0.471398	0.6411

D(VOL_EXRV(-2))	-113.7517	14.43518	-7.880167	0.0000
D(FDI)	0.343116	0.329339	1.041833	0.3067
D(FDI(-1))	0.515808	0.331717	1.554964	0.1316
D(INF)	0.074890	0.021606	3.466234	0.0018
D(INF(-1))	-0.061472	0.021089	-2.914920	0.0071
D(INF(-2))	0.047761	0.023248	2.054434	0.0497
D(INT)	-0.005485	0.077114	-0.071129	0.9438
D(INT(-1))	-0.206870	0.101872	-2.030690	0.0522
D(INT(-2))	-0.535121	0.101221	-5.286681	0.0000
R-squared	0.842541	F-statistic		12.03947
Adjusted R-squared	0.772560	Prob(F-statistic)		0.00000

Source: E-Views Output (2026).

The findings indicated that EXRV exerts mixed effects on the agricultural sector performance in the short run. While the effect of current value is positive and significant, the second lag exerts a negative and significant effect, which implies that changes in exchange rates can be a positive boost to the agricultural sector in the short-term but have negative effects as volatility increases with time.

Table 4.5.3: ARDL Long-Run Result for Agricultural Sector

Variable	Coefficient	Std. Error	t-Statistic	Prob.
VOL_EXRV(-1)	-33.21010	77.26662	-0.429812	0.6700
FDI(-1)	-1.250293	1.484310	-0.842340	0.4053
INF(-1)	-0.019961	0.087964	-0.226917	0.8218
INT(-1)	0.620843	0.333670	1.860648	0.0712
C	18.62397	10.35889	1.797874	0.0808

Source: E-Views Output (2026).

The coefficient of EXRV is negative but not statistically significant in the long-run suggesting that higher volatility of exchange rates decreases the agricultural sector contribution to GDP, though the impact is not significant. The result corroborates the negative and insignificant long-run relationship between EXRV and economic growth in Nigeria reported by Nwakarama and Awogbemi (2024) but however, in contrast to Gayweh (2025), who found a significant negative effect of EXRV on agricultural output in Liberia. FDI also negatively and insignificantly affects the performance of the agricultural sector, which implies that the inflow of FDI has not been significant enough to sustain the growth of the agricultural sector in Nigeria. Likewise, long-run effects of inflation are negative, suggesting that when prices go up, productivity in agriculture decreases. Interest rates, however, have a positive impact though with weak significance on the performance of agricultural sector. This may indicate that agricultural activities are relatively less sensitive to borrowing costs.

The aggregate results revealed that the performance of agricultural sector in this country appears less sensitive to exchange rate movements, which may be attributed to the low level of integration into the international markets and limited reliance on imported production inputs.

ARDL Model for Industrial Sector Performance

Table 4.6.1: Bound Test Result

ARDL Bound Test (Cointegration)			
Test Statistic	Value	K	N
F-statistic	4.675401	4	44
Critical Value Bounds			
Significance	I(0) Bound	I(1) Bound	Decision
10%	2.427	3.395	Cointegration exists
5%	2.893	4.000	Cointegration exists

Source: E-Views Output (2026).

The estimated F-statistic in Table 4.6.1 is higher than the upper bound critical values at 5 percent significance level, suggesting the presence of a long-run relationship among the variables. Therefore, the null hypothesis of no cointegration is rejected, and the long-run model and short run model ARDL can be estimated.

Table 4.6.2: ARDL Short Run Relationships for Industrial Sector

Error Correction Model				
Variable	Coefficient	Std. Error	t-Statistic	P-value
COINTEQ*	-0.535258	0.100834	-5.308302	0.0000
D(VOL_EXRV)	-121.2734	22.08786	-5.490501	0.0000
D(VOL_EXRV(-1))	77.86326	22.98748	3.387204	0.0025
D(VOL_EXRV(-2))	107.9160	23.17946	4.655674	0.0001
D(VOL_EXRV(-3))	52.47675	23.13675	2.268113	0.0330
D(FDI)	-0.702245	0.609490	-1.152186	0.2611
D(FDI(-1))	-3.008580	0.722417	-4.164605	0.0004
D(FDI(-2))	-1.001629	0.489273	-2.047176	0.0522
D(INF)	-0.029376	0.031252	-0.939964	0.3570
D(INF(-1))	-0.172022	0.057545	-2.989324	0.0066
D(INF(-2))	-0.130928	0.048688	-2.689152	0.0131

D(INF(-3))	-0.193778	0.051406	-3.769543	0.0010
D(INT)	-0.399396	0.128607	-3.105560	0.0050
D(INT(-1))	0.503357	0.190062	2.648383	0.0144
D(INT(-2))	0.909407	0.188511	4.824166	0.0001
D(INT(-3))	0.407307	0.164364	2.478080	0.0210
R-squared	0.746078	F-statistic		4.505266
Adjusted R-squared	0.580477	Prob(F-statistic)		0.000640

Source: E-Views Output (2026).

Results of the short-run revealed that, EXRV has a negative and significant impact on the performance of the industrial sector in the current period, which means that the greater the EXRV, the lower the industrial sector's contribution to the GDP in the short run. This implies that exchange rate instability imposes on the industrial firm immediate problems related to price of inputs used in production processes, as well as uncertainty in the procurement of imported inputs. The positive and significant lagged effects however suggest a slow adjustment process to exchange rate shocks over time in the sector. FDI also has a negative short run effect on the performance of the industrial sector, with the first lag being statistically significant which suggests that the immediate benefits of foreign capital inflows may not be fully realized within the period of investment. Inflation also has a negative influence on the performance of the industrial sector, which means that increase in the cost of production will have a negative impact on the output of the industrial sector. Likewise, interest rate has a negative and significant current effect, suggesting that higher borrowing costs discourage industrial investment and production activities. The results generally suggest that EXRV, inflation and high interest rates are important short run constraints to industrial sector growth in Nigeria.

Table 4.6.3: ARDL Long-Run Result for Industrial Sector

Variable	Coefficient	Std. Error	t-Statistic	Prob.
VOL_EXRV(-1)	-344.8981	89.68539	-3.845644	0.0005
FDI(-1)	4.179899	1.297939	3.220414	0.0028
INF(-1)	0.564066	0.091331	6.176057	0.0000
INT(-1)	-1.624849	0.437290	-3.715721	0.0007
C	70.65524	12.90023	5.477052	0.0000

Source: E-Views Output (2026).

Results showed that EXRV has a negative and significant impact on the performance of industrial sector in the long run. That is, the greater the EXRV, the lower the contribution of the industrial sector to GDP. The findings suggest that EXRV raises the cost of production, discourages investment and lowers industrial productivity, especially in an economy where manufacturing activities relies heavily on foreign machinery, equipment and raw materials for operations. The finding corroborates the findings of Moses et al. (2020), Ekirano, *et al.*, (2023), Orisdare and Olofin (2024), Chinyere et al. (2024) and Danladi (2025) who also observed that EXRV has negative impact on economic performance. Specifically, the finding is strongly consistent with studies by Goshit, *et al.*, (2024) which showed that EXRV greatly has a negative impact on

manufacturing sector output in Nigeria, and Gayweh (2025) which reported negative effect of EXRV on manufacturing activities.

FDI has a positive and significant impact on industrial performance indicating that the flow of more capital inflows could boost industrial growth and productivity. Inflation also exhibits a positive and significant effect on industrial sector performance, which may reflect periods in which rising prices were accompanied by increased industrial activities and higher nominal output levels. The positive relationship may also reflect periods when industrial output expanded alongside increases in aggregate demand and prices, resulting in higher nominal industrial sector contributions to GDP. On the other hand, interest rate has a negative and significant effect, which means that the increase in interest rates leads to a decrease in investment and activities in industry. The positive effect of the FDI partly offsets the negative impact of EXRV but the level and effects indicate that exchange rate instability is still a major constraint to industrial sector growth in Nigeria.

ARDL Model for Service Sector Performance

Table 4.7.1: Bound Test Result

ARDL Bound Test (Cointegration)			
Test Statistic	Value	K	N
F-statistic	9.481361	4	44
Critical Value Bounds			
Significance	I(0) Bound	I(1) Bound	Decision
10%	2.427	3.395	Cointegration exists
5%	2.893	4.000	Cointegration exists

Source: E-Views Output (2026).

The findings in Table 4.7.1 revealed that the estimated F-statistic is greater than the critical upper bound in all the significance levels, which confirmed the presence of a long-run cointegrating relationship among the variables. This result supports the estimation of both the long-run coefficients and the associated error correction model.

Table 4.7.2: ARDL Short Run Relationships for Services Sector

Error Correction Model				
Variable	Coefficient	Std. Error	t-Statistic	P-value
COINTEQ*	-0.614136	0.073499	-8.355674	0.0000
D(SSP(-1))	0.303985	0.085455	3.557255	0.0014
D(VOL_EXRV)	57.56149	13.18988	4.364063	0.0002
D(VOL_EXRV(-1))	-110.2429	14.41311	-7.648791	0.0000
D(FDI)	-0.280418	0.309447	-0.906192	0.3729
D(FDI(-1))	0.398517	0.327956	1.215151	0.2348

D(FDI(-2))	-0.940354	0.310419	-3.029307	0.0053
D(FDI(-3))	-0.775022	0.258232	-3.001262	0.0057
D(INF)	-0.082397	0.016524	-4.986428	0.0000
D(INF(-1))	0.227733	0.034891	6.527063	0.0000
D(INF(-2))	0.139673	0.030659	4.555655	0.0001
D(INF(-3))	0.161168	0.025392	6.347148	0.0000
D(INT)	0.296631	0.075436	3.932208	0.0005
R-squared	0.855730	F-statistic		13.34572
Adjusted R-squared	0.791609	Prob(F-statistic)		0.000000

Source: E-Views Output (2026).

The short-run findings indicate that there is a strong link between EXRV and performance of services sector. The current value of EXRV has a positive and significant impact on the services sector, implying that exchange rates movements immediately provide opportunities for service-related activities, but the negative and significant effect of the first lag suggests that the initial positive effects in the sector diminish over the long term. The current value of FDI has a negative and insignificant impact on the performance of services sector, but the second and third lagged values are negative and significant, which implies that the past FDI inflows have not led to sustained growth in the services sector. Current effect of inflation is negative and significant on the services sector, suggesting that in the short run an increase in prices decreases the activity of the services sector, however, the positive and significant lagged effects indicate that the sector takes time to adjust to inflationary conditions over time. The results show that interest rate has positive and significant impact on services sector performance, thus it can be inferred that the expansion of activity in financial and other services-related activities could be associated with increase in lending and investment activities. Overall, the results indicate that the services sector adapts more flexibly in the short-run to macroeconomic shocks than do the agricultural and industrial sectors.

Table 4.7.3: ARDL Long-Run Result for Services Sector

Variable	Coefficient	Std. Error	t-Statistic	Prob.
VOL_EXRV(-1)	282.2791	42.82278	6.591797	0.0000
FDI(-1)	-2.042120	0.679647	-3.004678	0.0049
INF(-1)	-0.510866	0.044809	-11.40090	0.0000
INT(-1)	0.610213	0.166164	3.672361	0.0008
C	23.47526	5.600964	4.191290	0.0002

Source: E-Views Output (2026).

The findings show that EXRV is positively and significantly affecting services sector performance in the long run, meaning that the higher the EXRV the better the performance of the services sector and its contribution to GDP in the long run. The finding suggests that service-related activities such as finance, telecommunications, trade, and other business services are more adaptable to exchange rate movements than sectors that depend

heavily on imported physical inputs. This result contrasts with the findings of Moses, *et al.*, (2020), Orisdare and Olofin (2024), Chinyere, *et al.*, (2024), and Danladi (2025), who reported negative effects of EXRV on economic growth and productivity. However, the finding supports Audi (2024), who found that EXRV positively and significantly influenced long-run economic growth.

FDI exerts a negative and significant effect on services sector performance, suggesting that FDI inflows may not have been directed toward productive service activities during the study period. Inflation also has a negative and significant effect, indicating that rising prices reduce the performance and competitiveness of the services sector. Interest rate, however, exerts a positive and significant effect on services sector performance, suggesting that growth in service-related activities may be associated with increased financial intermediation and credit market activities. The findings imply that the services sector demonstrates greater resilience to exchange rate shocks than the agricultural and industrial sectors. This resilience may explain why the sector recorded the highest average contribution to GDP throughout the study period.

Diagnostics Tests

Breusch-Godfrey Serial Correlation LM Test

Agricultural Sector Performance			
F-statistic	0.218129	Prob. F(4,18)	0.9249
Industry Sector Performance			
F-statistic	1.444335	Prob. F(4,14)	0.2712
Services Sector Performance			
F-statistic	1.999064	Prob. F(4,18)	0.1378

Source: Author's computation (2026).

The results of the Breusch-Godfrey Serial Correlation LM Test indicate that the F-statistic p-values for all the sectors are greater than 0.05 suggesting all the estimated ARDL models are free from serial correlation problems, hence the residuals are independently distributed and the models are reliable for inference.

Table 4.8.2: Heteroskedasticity Test: Breusch-Pagan-Godfrey

Agricultural Sector Performance			
F-statistic	0.495236	Prob. F(17,22)	0.9283
Obs*R-squared	11.07072	Prob. Chi-Square(17)	0.8529
Scaled explained SS	4.058397	Prob. Chi-Square(17)	0.9994
Industry Sector Performance			
F-statistic	0.354755	Prob. F(20,18)	0.9863
Obs*R-squared	11.02642	Prob. Chi-Square(20)	0.9455
Scaled explained SS	3.726343	Prob. Chi-Square(20)	1.0000
Services Sector Performance			

F-statistic	0.968496	Prob. F(17,22)	0.5197
Obs*R-squared	17.12172	Prob. Chi-Square(17)	0.4461
Scaled explained SS	5.356486	Prob. Chi-Square(17)	0.9966

Source: Author's computation (2026).

The p-values of the F-statistic, Obs R^2 and Scaled explained sum of squares are all greater than 0.05. This depicts that the null hypothesis of homoskedasticity cannot be rejected, signifying the absence of heteroskedasticity in the model. Therefore, the heteroskedasticity test results show that all the estimated ARDL models satisfy the assumption of constant variance of residuals, confirming that the models are stable and reliable for statistical inference.

Normality Test

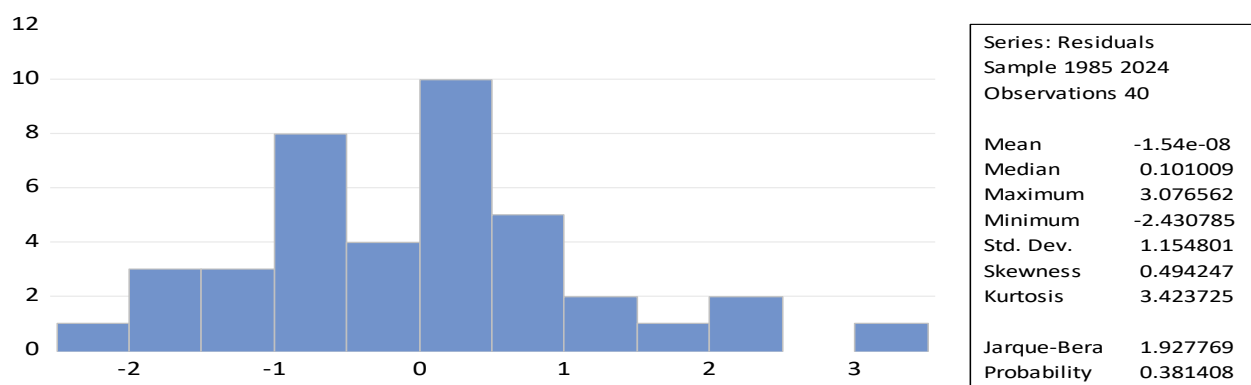


Figure 1: Histogram and Normality Statistics for Agricultural Sector Performance

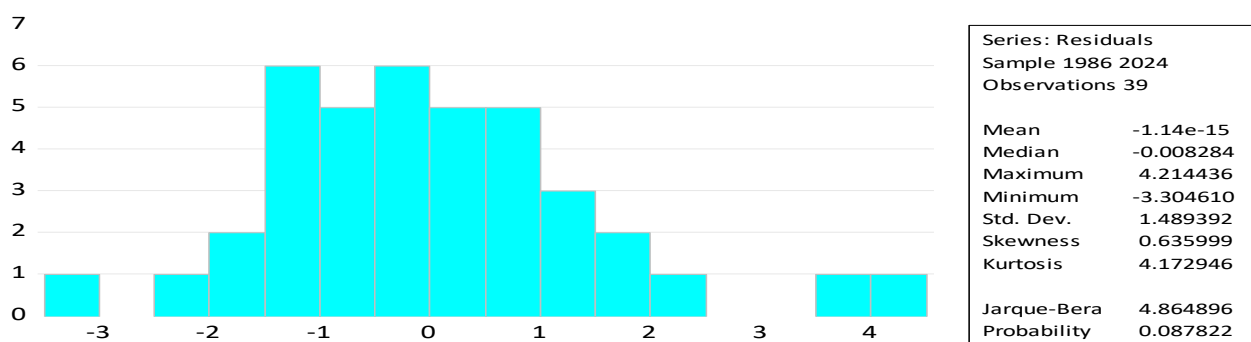


Figure 2: Histogram and Normality Statistics for Industrial Sector Performance

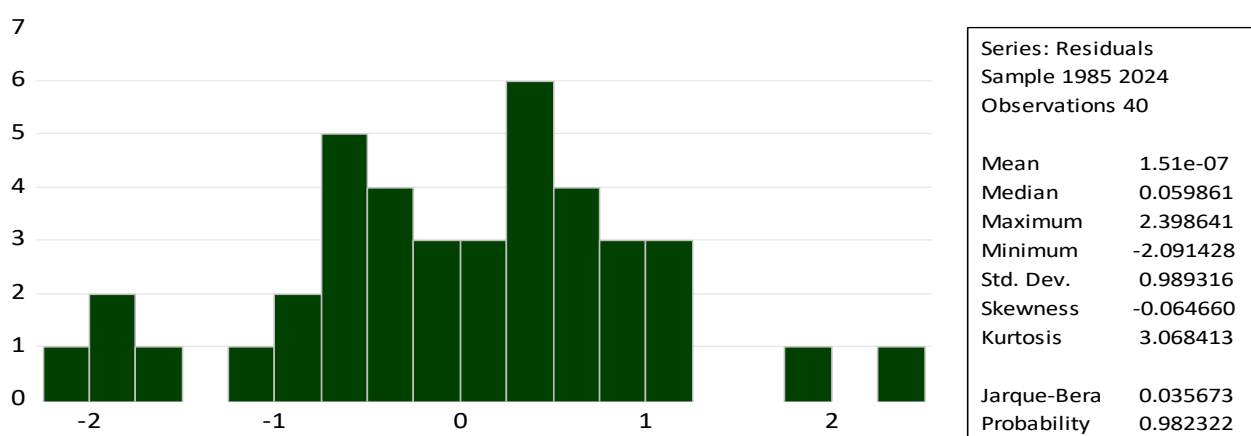


Figure 3: Histogram and Normality Statistics for Services Sector Performance

The histogram normality test indicates that the residuals are normally distributed since the p-value for agricultural (p-value = 0.3814), industrial (p-value = 0.0878) and services sectors (p-value = 0.9823) are all greater than 0.05, the null hypothesis of normal distribution is rejected at the 5% significance level, suggesting evidence of normality in the residuals of the services sector model.

Stability Tests

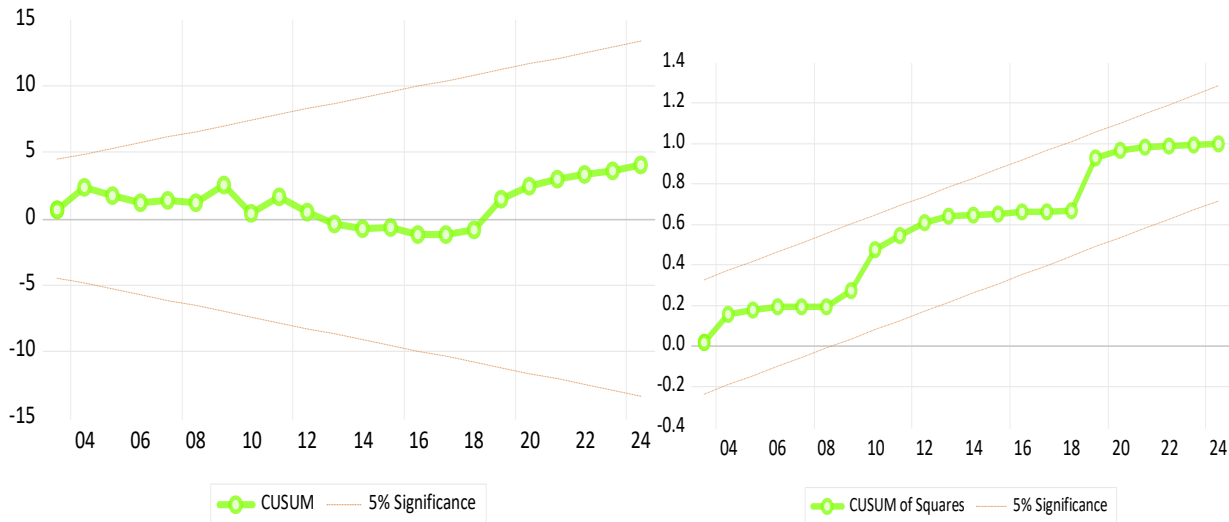


Figure 4: CUSUM and CUSUMSQ for Agricultural Sector Performance

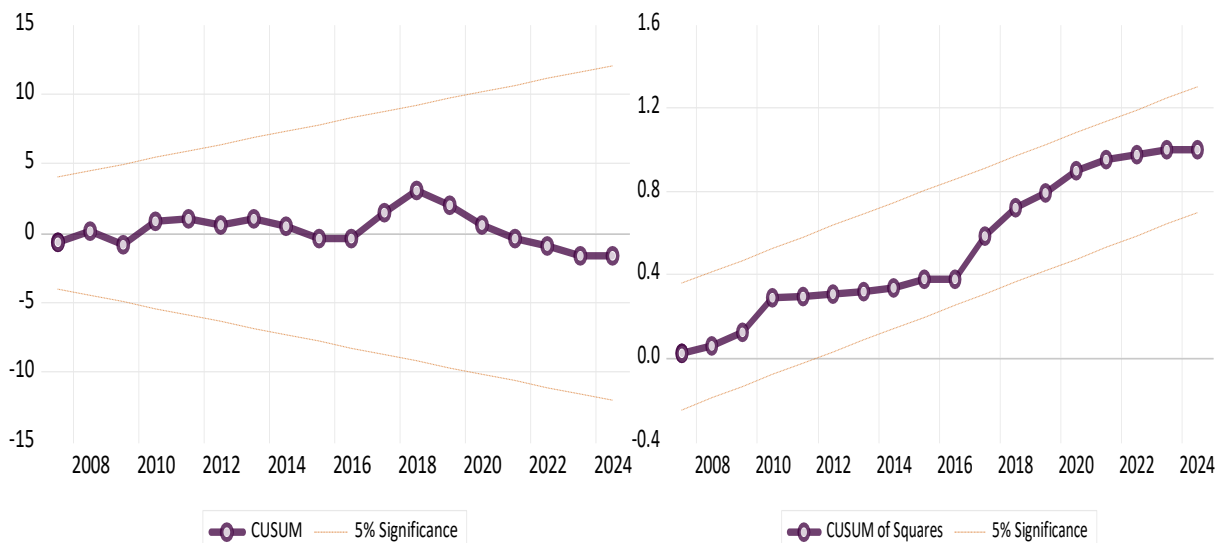


Figure 5: CUSUM and CUSUMSQ for Industrial Sector Performance

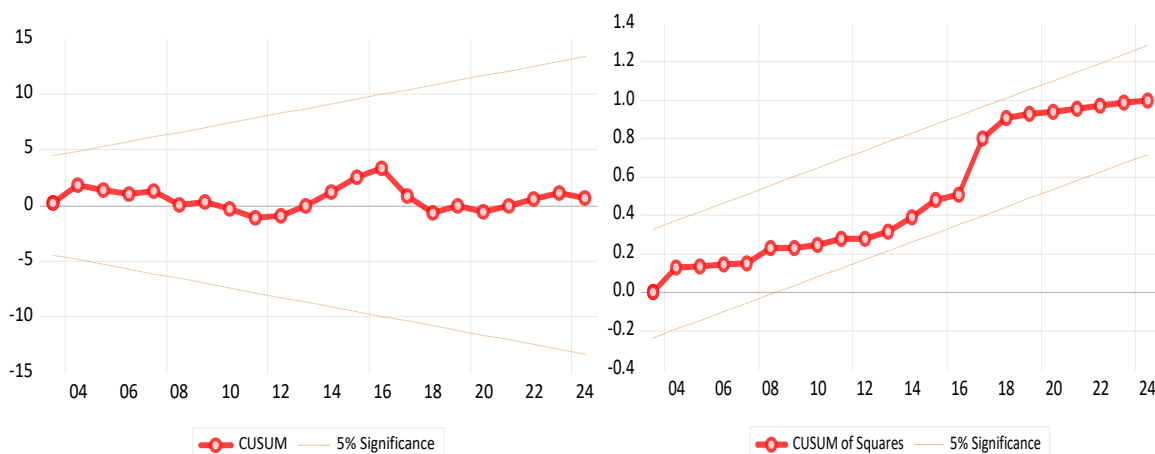


Figure 6: CUSUM and CUSUMSQ for Services Sector Performance

The CUSUM plot shows the cumulative sum of recursive residuals together with the 5% significance boundaries (dotted red lines). The CUSUM line remains entirely within the 5% significance bounds throughout the study period. This means that there is no evidence of structural instability in the estimated models for all the sectors performances. The regression coefficients are stable at the 5% significance level, implying that the relationship between agricultural, industrial, services sectors and the predictors does not experience a statistically significant structural break. The long-run and short-run estimates can be considered reliable and consistent over time.

In the plotted results, the CUSUM of Squares line for the sectors remains within the 5% significance (critical) bounds for the entire period. This implies that there is no statistically significant evidence of structural breaks in the models and the variance of the residuals remains stable over time. Also, the estimated coefficients of the models are stable and reliable across the study period. Therefore, at the 5% level of significance, the null hypothesis of parameter stability cannot be rejected, indicating that the model does not suffer from structural instability over the period under study.

Table 4.9: Comparison of Sectoral Performances

Variable	Agricultural Sector	Industrial Sector	Services Sector	Contribution to GDP
Mean Contribution to GDP (%)	23.51	28.25	47.25	Services sector is the largest contributor to GDP, followed by industry and agriculture.
Exchange Rate Volatility (Long Run)	Negative, insignificant (-33.21; p-value = 0.6700)	Negative, significant (-344.90; p-value = 0.0005)	Positive, significant (282.28; p-value = 0.0000)	Industry is most adversely affected by EXRV, while services benefit from it.
FDI (Long Run)	Negative, insignificant (-1.25; p-value = 0.4053)	Positive, significant (4.18; p-value = 0.0028)	Negative, significant (-2.04; p-value = 0.0049)	FDI mainly supports industrial growth, with limited benefits to agriculture and services.
Inflation (Long Run)	Negative, insignificant (-0.02; p-value = 0.8218)	Positive, significant (0.56; p-value = 0.0000)	Negative, significant (-0.51; p-value = 0.0000)	Inflation adversely affects services and agriculture but is associated with increased industrial output.
Interest Rate (Long Run)	Positive, weakly significant (0.62; p-value = 0.0712)	Negative, significant (-1.62; p-value = 0.0007)	Positive, significant (0.61; p-value = 0.0008)	Higher interest rates constrain industry but are associated with improved agriculture and services performance.
Exchange Rate Volatility (Short Run)	Mixed effects; positive current effect but negative second lag	Negative current effect but positive lagged effects	Positive current effect but negative first lag	EXRV affects all sectors differently in the short run.

Speed of Adjustment (ECM)	32.21%	53.53%	61.41%	Services sector adjusts fastest to shocks, followed by industry and agriculture.
Model Explanatory Power (R^2)	84.25%	74.61%	85.57%	Services model has the highest explanatory power, followed closely by agriculture.

Source: Author's computation (2026).

The comparative analysis reveals that EXRV affects Nigeria's major sectors differently, suggesting that sectoral responses to macroeconomic shocks are not uniform. The results show that the industrial sector is the most vulnerable to EXRV, the services sector is the most resilient, while the agricultural sector appears relatively insulated from exchange rate fluctuations. These differences provide important insights into the prospects and challenges of economic diversification in Nigeria.

The industrial sector emerges as the most adversely affected sector, as EXRV exerts a negative and significant effect on its performance. This finding suggests that fluctuations in the exchange rate reduce the contribution of the industrial sector to GDP by increasing production costs and creating uncertainty for investors and manufacturers. The high sensitivity of the industrial sector to exchange rate movements can be attributed to its heavy dependence on imported machinery, equipment, spare parts, and intermediate inputs. Consequently, exchange rate instability weakens industrial competitiveness, discourages long-term investment, and constrains the expansion of domestic productive capacity. This finding is consistent with Goshit, *et al.*, (2024) and Gayweh (2025), who reported that manufacturing activities are particularly vulnerable to exchange rate fluctuations due to their reliance on imported production inputs.

In contrast, the services sector demonstrates the highest level of resilience to EXRV. The positive and significant effect of EXRV on services sector performance suggests that fluctuations in exchange rates may create opportunities for activities within the financial, telecommunications, trade, and digital service industries. Unlike the industrial sector, most service-based activities rely less on imported physical inputs and are therefore better positioned to adjust to changing macroeconomic conditions. The ability of the services sector to maintain growth despite exchange rate instability partly explains why it recorded the highest average contribution to GDP during the study period. This finding supports the argument that service-oriented activities are generally more flexible and adaptable to economic shocks than production-based sectors.

The agricultural sector exhibits a different pattern. Although EXRV exerts a negative effect on agricultural performance, the relationship is statistically insignificant in the long run. This suggests that agricultural sector performance is relatively insulated from exchange rate movements compared to the industrial sector. A possible explanation is that a large proportion of agricultural production in Nigeria remains domestically oriented and less integrated into international markets. Furthermore, many agricultural activities rely more on local resources and labour than on imported capital-intensive inputs. While exchange rate instability may affect certain export-oriented agricultural activities, its overall influence on agricultural sector performance appears limited.

The findings have important implications for Nigeria's economic diversification strategy. Economic diversification aims to reduce excessive dependence on crude oil by strengthening the productive capacities of non-oil sectors. However, the results suggest that exchange rate instability poses a significant challenge to this objective, particularly through its adverse effect on industrial development. Since industrialization remains a critical pathway for employment generation, technological advancement, export expansion, and structural transformation, persistent EXRV may undermine efforts to achieve broad-based economic diversification. At the same time, the resilience of the services sector highlights its growing importance as a driver of economic growth in Nigeria. Nevertheless, reliance on services alone may not be sufficient to achieve sustainable diversification because service-led growth often lacks the strong production linkages associated with industrial development. Therefore, while the services sector should continue to receive policy support, greater attention

should be directed toward creating a stable macroeconomic environment capable of supporting industrial expansion and enhancing agricultural productivity.

Overall, the findings suggest that successful economic diversification in Nigeria requires a balanced strategy that promotes exchange rate stability, strengthens industrial competitiveness, encourages productive investment, and enhances the capacity of agricultural services to contribute to long-term economic development. Such an approach would reduce the economy's vulnerability to external shocks and support a more diversified and resilient growth structure.

CONCLUSION AND RECOMMENDATION

Using GARCH and ARDL techniques, this study investigated the effect of EXRV on sectoral performance in Nigeria between 1981 and 2024. The findings revealed that EXRV exerts heterogeneous effects across sectors, with a negative but insignificant effect on agricultural sector performance, a negative and significant effect on industrial sector performance, and a positive significant effect on services sector performance. These findings are consistent with the Mundell-Fleming framework, which posits that exchange rate movements affect sectors differently depending on their degree of openness and reliance in international trade. The insignificant effect on agriculture may reflect the sector's relatively lower integration into international markets and greater dependence on domestic production, making it less responsive to EXRV. In contrast, the significant negative effect on the industrial sector suggests its heavy dependence on imported raw materials, machinery and intermediate inputs, which raises production costs when EXRV increases. Conversely, the positive effect on the services sector may be explained by the relatively lower dependence of many service activities on imported raw materials and their greater responsiveness to changes in domestic demand and international capital flows.

The findings also indicated that FDI has a positive effect on the industrial sector while inflation and interest rates have varying effects across the sectors. The comparative analysis revealed that the industrial sector is the most vulnerable to exchange rate instability while the services sector is the most resilient and the agricultural sector is relatively protected from exchange rate instability. The study therefore concluded that EXRV is a key determinant of sectoral performance and has significant implications for economic diversification, if not kept under control, can affect the development of industrial sectors and weaken the efforts of developing a diversified and resilient non-oil economy in Nigeria.

Based on the results, policy makers should focus on ensuring exchange rate stability by maintaining foreign exchange management policies which are consistent in order to eliminate uncertainty and enhance the performance of productive sectors, especially the industrial sector. Government should also encourage industrial competitiveness through support of local production, facilitation of productive FDI in manufacturing, agro-processing, and improving the business environment. Furthermore, efforts should be intensified to modernize agriculture and boost high-value service sectors like information and communication technology, financial services and digital innovations. These will drive up productivity in the sectors, decrease reliance on oil revenue and enhance Nigeria's long-term economic diversification and sustainable growth objectives.

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