IRJEMS International Research Journal of Economics and Management Studies
Published by Eternal Scientific Publications
ISSN: 2583 – 5238 / Volume 4 Issue 3 March 2025 / Pg. No: 254-265
Paper Id: IRJEMS-V4I3P129, Doi: 10.56472/25835238/IRJEMS-V4I3P129

Original Article

Exchange Rate Dynamics and Agricultural Sector Performance in Nigeria: An Empirical Analysis

[1]Agbeyeke Catherine Chukwurimazu, [2]Dr. Chukwugoziem Tom Ezi
[1,2]Department of Economics, Delta State University, Abraka, Delta State, Nigeria.

Received Date: 04 March 2025 Revised Date: 19 March 2025 Accepted Date: 23 March 2025 Published Date: 24 March 2025

Abstract: *The intricate relationship between exchange rate movement and agricultural performance in Nigeria, 1985-2023, is the focus of this study, seeking to fill a fundamental knowledge gap in the interaction between currency fluctuations and agricultural productivity in emerging economies. A rich time series approach that includes Johansen cointegration and Vector Error Correction models is employed to analyze the varied effects of exchange rate fluctuations, monetary policy change, and trade openness on agriculture. Our results provide three important insights: (1) depreciation of the exchange rate has a strong positive correlation (0.866) with agricultural export competitiveness while raising the cost of inputs; (2) monetary policy interest rates reveal a strong negative effect (-0.227) on sector performance via channels of credit availability; and (3) trade openness reveals a doubly sensitive effect, with short-run adverse effects but long-run positive contributions to agricultural growth. These findings contradict the traditional wisdom of exchange rate impacts on farm productivity in developing countries. The research offers empirical support for policymakers to maximize exchange rate management policies, implying that a balanced strategy taking into account both export competitiveness and input cost stability is essential for long-term agricultural development in emerging economies.*

Keywords*: Agricultural Performance, Exchange Rate, Monetary Policy, Nigeria, Trade Openness.*

I. INTRODUCTION

Nigeria's farming industry is an important engine of the economy, accounting for about 25.18% of the nation's GDP. Despite this, volatility in the exchange rate has a great influence on its performance because it sets a nation's currency value and contributes to its international market competitiveness. Stability in the exchange rate is important for agriculture because it impacts the price of imported inputs as well as agricultural commodities' competitiveness. Nigeria's exchange rate strategies have changed drastically since its post-colonial independence in 1960, the Structural Adjustment Program (SAP) in 1986, and the return to civilian leadership by President Olusegun Obasanjo in 1999. Yet the overdependence on oil exports of the Naira and poor performance of non-oil sectors made it susceptible to external shocks. The early 2000s oil boom was a temporary reprieve, but the Naira kept weakening, especially after the 2008 financial crisis. The COVID-19 pandemic in 2020 further revealed the vulnerability of the Nigerian economy, causing further depreciation.

The Nigerian agricultural sector is challenged by macroeconomic issues, such as exchange rate volatility and fluctuations. The Anchor Borrowers' Programme and other interventions have alleviated the plight of farmers but have not adequately mitigated the effects of exchange rate volatility. The vulnerability of the sector is further compounded by the insufficiency of foreign exchange reserves. Recent research has identified the intricate nexus between exchange rate dynamics and agricultural performance. Though other studies have suggested that currency devaluation boosts the competitiveness of exports (Sylvanus et al., 2023), there are others who focus on the adverse effect of currency devaluation on input costs and overall productivity (Adejumo, 2020). This conflict constitutes a policy problem, especially in balancing the requirements of export-based agriculture with food security in the home country.

This research considers three important dimensions of this relationship: the direct effect of exchange rate movements on agricultural performance, the mediating role of monetary policy rates in this relationship, and the impact of trade openness on sector performance. Based on an analysis of data between 1985 and 2023, this study offers a holistic evaluation of how these macroeconomic factors interact to influence agricultural sector performance in Nigeria.

II. LITERATURE REVIEW

A) Conceptual Review

The exchange rate is a critical macroeconomic variable that plays a pivotal role in shaping a country's economic performance. It determines the relative price of domestic goods in foreign markets and foreign goods in domestic markets, influencing trade balances, inflation, investment flows, and overall economic growth (Krugman & Obstfeld, 2017).

It serves as a key price in the foreign exchange market and is essential for determining the cost of international transactions. There are two major types of exchange rates: real and nominal exchange rates. Krugman & Obstfeld, 2017 and Calvo & Reinhar, 2002 have written extensively on the subject of exchange rates, where interest rate differentials, inflation differentials, balance of payments, and political stability are critical factors. According to them, higher interest rates pull in foreign investment, thus appreciating currency, and greater inflation rates devalue currency. Both theories advance the understanding of currency exchange rate dynamics.

Exchange rate volatility has implications for trade, investment, and the economy, especially in developing nations such as Nigeria. It raises uncertainty, risks, and increased business costs. Exchange rate policy is vital to economic stability, but excessive intervention will drain foreign reserves and reduce the effectiveness of monetary policy. Oladipo & Akinbobola (2011) emphasized the mixed findings on the overall effect of exchange rate volatility on economic growth.

Ogundele & Okoruwa emphasize the significance of the agricultural industry to economic development, especially in developing nations such as Nigeria. The industry supports employment, income, and foreign exchange revenues and is central to ensuring food security, poverty reduction, and economic growth. Nevertheless, issues like low productivity, insufficient access to finance, and exposure to climate variability constrain it from achieving its potential. Revamping the industry can curb Nigeria's over-reliance on oil income and foreign exchange earnings, but needs concerted policy initiatives, enhanced access to capital, and higher investments in technology and infrastructure.

The agricultural sector in developing countries is plagued by a number of challenges, including low productivity based on old farm practices, poor infrastructure, lack of access to finance, climate change, and the absence of farm extension services. Crop production in Nigeria is below world levels because of obsolete methods and the unavailability of fertilizers and high-yielding seeds. There is also a lack of infrastructure, which inhibits agricultural production and results in huge post-harvest losses. Climate change and environmental degradation are also threats, with desertification and soil erosion deteriorating land used for agriculture. Notwithstanding government efforts such as the Agricultural Transformation Agenda and the Agriculture Promotion Policy, their effectiveness on farm performance is restricted by irregular implementation, corruption, and poor investment.

Monetary policy is a central bank's function in controlling money supply and interest rates to attain macroeconomic goals, including inflation control, currency stabilization, encouraging employment, and economic growth. In Nigeria, monetary policy is made and implemented by the Central Bank of Nigeria (CBN), and it has far-reaching implications for the different sectors of the economy, including agriculture. Monetary policy is key to setting exchange rates, which influence the movement of foreign exchange and investor attitudes towards the currency of the country. High inflation directly and negatively affects the agricultural sector by raising the cost of production inputs, especially for small farmers. Exchange rates and monetary policy are also closely interrelated with agricultural exports, since they affect the competitiveness of these exports on the world market. Monetary policy choices have direct implications on the availability and price of credit, which plays a significant role in agricultural development. Aside from sustaining inflation and exchange rates, monetary policy can facilitate selective government interventions in agriculture.

Openness to trade means a nation's capacity for the free flow of goods, services, and capital across boundaries. It is important to develop nations such as Nigeria, which is highly dependent on oil exportation. Trade openness complements exchange rate dynamics, which have both favorable and unfavorable effects on the agricultural sector. While there has been trade openness in Nigeria, this has resulted in enhanced agricultural exports when exchange rates favor the country. It has exposed the sector, however, to import competition, which can discredit local production. The decline of trade barriers resulted in higher importation of foods, which undermined domestic food output and the existence of small-scale farmers. Overall, trade openness significantly influences the most important economic sectors, such as agriculture.

Trade openness affects the agricultural sector by reducing the price of imported inputs, making it simple for farmers to enhance productivity. Nevertheless, exchange rate instability can disapprove of these advantages. In Nigeria, the Naira lost value between the 2014-2016 oil price plunge, which increased import costs and diminished agricultural productivity. Trade openness has the ability to enhance agricultural exports through market access to the outside world, but its competitiveness depends on the volatility of exchange rates. Policies promoting trade openness have been introduced by the Nigerian government, but their effects have been negated by exchange rate volatility and structural issues.

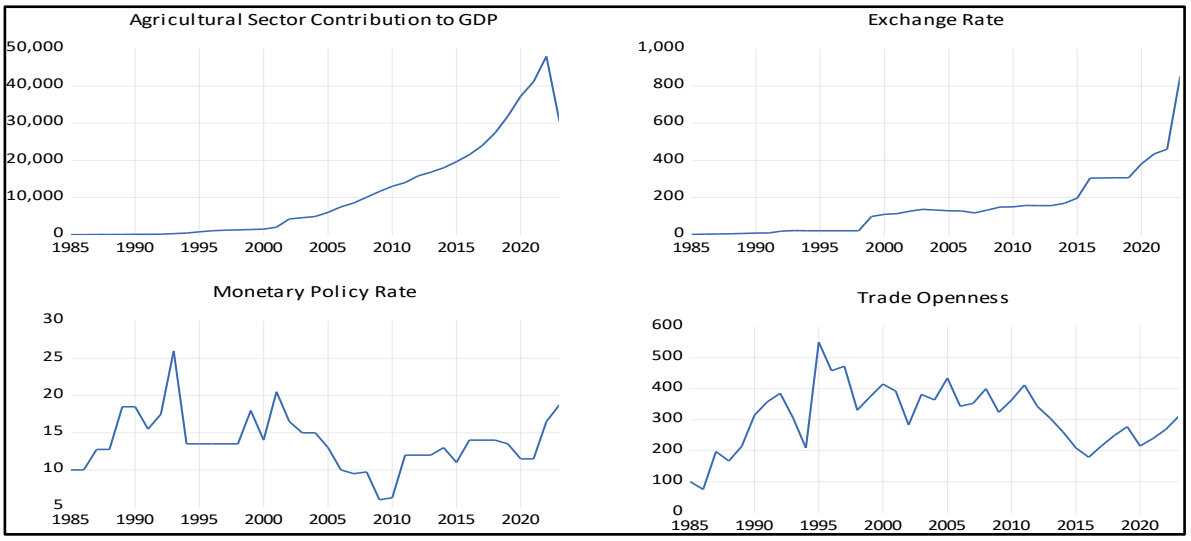

Fig. 1 Trend Lines of agricultural sector performance (AGRIC), exchange rate (EXR), oil exports (OILEXP), monetary policy rate (MPR), and trade openness (OPN) from 1985 to 2023

B) Theoretical Review

This research applies the Purchasing Power Parity (PPP) and Agricultural Growth Linkage Theory to examine the nexus between exchange rates and agricultural sector performance in the economy of Nigeria. PPP describes how exchange rate fluctuations impact the competitiveness of Nigerian agriculture in overseas markets, while the Agricultural Growth Linkage Theory focuses on agriculture as the driver of economic growth and development.

Purchasing Power Parity (PPP) theory, proposed by Gustav Cassel in 1918, stipulates that exchange rates be changed such that goods of the same type in two nations would have the same value when translated to a standard unit of currency. It exists either in an absolute or relative guise. PPP possesses conflicting empirical data and short-run mixed findings. It has constraints like transport costs and barriers to trade, non-tradable commodities, and market imperfections. The Interest Rate Parity (IRP) theory, however, posits that the gap between interest rates in two nations ought to be equal to the anticipated change in exchange rates. It is vital for developing nations like Nigeria, which is greatly dependent on oil exports. Trade openness, where the free movement of goods, services, and capital across borders is facilitated, affects the major economic sectors, such as agriculture.

C. Empirical Review

An empirical review of the literature on exchange rate dynamics and agricultural sector performance in Nigeria has established a complex relationship between the variables. Researchers have employed different methodologies and time periods to investigate the effect of exchange rate movements on Nigeria's agricultural economy. Falana (2019) established a negative relationship between exchange rate regimes and real sector output, particularly in regulated regimes, but a positive relationship in deregulated regimes. Sylvanus et al. (2023) discovered that exchange rate movements had adverse effects on the volumes of agricultural exports but had significant influences on capacity utilization. Ogunjimi (2019) discovered that exchange rate depreciation had a positive impact on agricultural and services sector production but a reverse impact on industrial production. Adejumo (2020) concluded that exchange rate stability is vital to improving agricultural productivity. Iliyasu (2019) identified a positive association between depreciation in the exchange rate and a boost in agricultural activity, indicating that Nigeria ought to invest heavily in agriculture in order to leverage this advantage. Isibor et al. (2018) discovered that exchange rate management has a significant and positive influence on the performance of the agricultural sector, and Adekunle and Ndukwe (2018) indicated that agricultural sector performance would be optimized using stable exchange rate policies. Loto (2011) established that exchange rate movements adversely affected agricultural exports, and better access to agricultural markets was required. Ehinomen (2012) established that exchange rate depreciation during the Structural Adjustment Program did not favor the manufacturing sector, but appreciation positively affected manufacturing. Adejumo and Ikhide (2017) discovered that remittance inflows and appreciation of the exchange rate positively impacted agriculture but also led to the Dutch disease through a decline in agricultural competitiveness.

This chapter investigates the exchange rate-agricultural sector performance relationship in Nigeria using theoretical and empirical literature. Exchange rate movements and agricultural performance are influenced by major macroeconomic determinants like inflation, interest rates, and political stability. The empirical literature has analyzed how volatility in the exchange rate affects the agricultural sector in Nigeria, revealing that a depreciation in the Nigerian Naira can increase the price of foreign

agricultural inputs, leading to a decline in agricultural productivity. However, it can also improve export competitiveness by reducing the cost of Nigerian agricultural products to foreign markets. The nation's reliance on oil exports largely determines exchange rate stability, and the occurrence of "Dutch Disease" has been partly responsible for the fall of Nigeria's agriculture exports. The review points to the imperative necessity of exchange rate stability, agricultural infrastructure investment, and holistic policy measures towards ensuring sustainable growth in Nigeria's agriculture. The monetary and trade policies of the government, such as the Agricultural Transformation Agenda and Agriculture Promotion Policy, are intended to counteract these impacts by enhancing agricultural productivity.

In spite of tremendous empirical work on the exchange rate-agricultural sector performance nexus, there are some lacunae in the literature. To begin with, most of the studies have emphasized the short-term impacts of exchange rate volatility, with little or no explicit consideration of the long-term implications of persistent exchange rate volatility on agricultural productivity as well as competitiveness. Second, there is relatively limited empirical work on the asymmetric impacts of exchange rate fluctuations across various parts of the agricultural economy, including smallholder farmers and exporters. Third, there is not enough investigation of the interaction between exchange rate policy and government intervention in agriculture, including subsidies, credit programs, and market access programs. Finally, more detailed studies are needed on the contribution of external shocks, e.g., global commodity prices or remittances, to the exchange rate-agriculture nexus. The Nigerian economy is externally dominated by factors like oil prices and world demand for agricultural exports, and more detailed analysis is needed to know how these external shocks interact with exchange rate volatility to impact agricultural performance.

Table 1: Summary of Reviewed Empirical Studies

Author	Period covered	Methodology	Variables	Outcome
Falana (2019)	1961-2017	Autoregressive Distributed Lag (ARDL), Mundell-Fleming IS-LM framework	Exchange rate regimes, Real sector output	An inverse relationship between exchange rate regimes and real sector performance in regulated regimes, positive in deregulated ones
Sylvanus et al. (2023)	1986-2021	ARDL, ECM	Exchange rate, Agricultural export volumes	Negative but insignificant impacts of exchange rate fluctuations on agricultural export volumes, significant on capacity utilization
Ogunjimi (2019)	1981-2016	ARDL, NARDL	Exchange rate, Agricultural, Industrial, and Services sector output	Positive effect of exchange rate depreciation on agriculture and services output, inverse effect on industrial output
Adejumo (2020)	1980-2016	Time-series analysis	Exchange rate fluctuations, Sectoral performance	The agricultural sector is highly sensitive to exchange rate volatility, affecting production costs.
Iliyasu (2019)	1999-2016	Time-series analysis	Exchange rate changes, Agricultural activity	The positive relationship between exchange rate depreciation and increased agricultural activity
Isibor et al. (2018)	1981-2015	Ordinary Least Square (OLS) regression	Exchange rate management, Agricultural, and manufacturing output	The exchange rate positively and significantly affects agricultural sector performance
Adekunle & Ndukwe (2018)	1981-2016	ARDL, Co-integration	Exchange rate fluctuations, Agricultural output	Both exchange rate appreciation and depreciation significantly influence agricultural output, with appreciation having a larger effect.
Loto (2011)	2005-2008	Pooled data	Exchange rate fluctuations, Economic downturns, Agricultural exports	Exchange rate fluctuations negatively impact agricultural exports during economic downturns
Ehinomen (2012)	1986-2010	OLS regression	Exchange rate management, Manufacturing, and Agriculture	Exchange rate appreciation had a significant positive effect on manufacturing and indirectly benefited agriculture
Adejumo & Ikhide (2017)	1981-2013	Dynamic Ordinary Least Squares (DOLS)	Remittances, Exchange rate movements, Agricultural sector	Remittance inflows and exchange rate appreciation positively affect agriculture but contribute to Dutch disease, reducing agricultural competitiveness

III. RESEARCH METHODOLOGY

A) Research Design

The very essence of a research design lies in being able to clearly define and analyze the interactions among the variables under study, bearing in mind the theoretical premise on which the study is grounded (Panneerselvam, 2010). In this study, attention is centered on the effects of exchange rate changes on Nigeria's agricultural sector performance and designs a model through which the causality relationships existing among these variables are critically explored. It considers the most important information, like agricultural production, exchange rates, monetary policy rates, and trade openness.

This study employs the ex post facto quantitative research design with secondary data analysis. This backward-looking strategy is well-suited to probe cause-and-effect relationships where experimentation may not be possible. Data drawn from the CBN and World Bank will be subjected to econometric analysis in an effort to measure the exchange rate performance and the performance of Nigeria's agricultural sector.

B) Model Specification

We have earlier stated that the theoretical framework of this study is based on two key theories: Purchasing Power Parity (PPP) **and the** Agricultural Growth Linkage Theory. We go further to adapt the works of Adejumo (2020), Iliyasu (2019), and Isibor et al. (2018) to specify our model, first in its functional form as follows:

$$AGRP = f(EXR, MPR, TOP) \quad 3.1$$

Where:

AGRP represents the Agricultural Sector's performance

EXR represents the Exchange Rate

MPR represents the Monetary Policy Rate

TOP Trade Openness

We transform equation 3.1 into an econometric expression as follows:

$$AGRP = \beta_0 + \beta_1 EXR + \beta_2 MPR + \beta_3 TOP + m_t \quad 3.2$$

Where:

$\beta_0 - \beta_4$ are the parameters of the independent variables, while i_t is the stochastic error term.

IV. RESULTS AND DISCUSSION

A) Descriptive Statistics

The descriptive statistics of all the variables employed in this study are shown in Table 2.

Table 2: Descriptive Statistics

	AGRP	EXR	MPR	OPEN
Mean	10957.47	151.5900	13.75000	308.9118
Median	4935.264	128.2700	13.50000	314.5780
Maximum	47944.06	853.0000	26.00000	550.2128
Minimum	34.23709	0.999600	6.000000	75.22695
Std. Dev.	13098.79	169.7578	3.777966	102.2313
Skewness	1.211975	2.107294	0.700402	-0.114345
Kurtosis	3.525002	8.708996	4.637091	2.851835
Jarque-Bera	9.995632	81.82751	7.543766	0.120659
Probability	0.006753	0.000000	0.023009	0.941454
Sum	427341.5	5912.011	536.2500	12047.56
Sum Sq. Dev.	6.52E+09	1095073.	542.3750	397147.1
Observations	39	39	39	39

The study examines the Agricultural Sector Performance (AGRP), Exchange Rate (EXR), Monetary Policy Rate (MPR), and Trade Openness (TOP) variables in Nigeria. The AGRP has a mean value of 10,957.47, indicating high performance indicating the importance of agriculture in the Nigerian economy. The exchange rate has a mean of 151.59, characterized by significant volatility, indicating fluctuations due to global oil prices, economic policies, and external shocks. The MPR, the central bank's interest rate, has a mean value of 13.75, with a moderate standard deviation of 3.78. The trade openness has a mean of 308.91, indicating the average degree of openness in Nigeria's trade. The median value of 314.58 suggests a relatively centered distribution, with a moderate variation in trade openness. The skewness for trade openness is -0.11, indicating a nearly symmetrical distribution. The distribution of trade openness is normal, indicating no significant outliers or extreme fluctuations in the degree of openness during the period. The study highlights the importance of understanding the relationships between exchange rate dynamics, trade openness and their effects on the agricultural sector in Nigeria.

B) Unit Root Test

Testing for unit roots is important in time series data-based studies because the use of non-stationary data can result in spurious regression. Table 3 presents the results of the Augmented Dickey-Fuller test in levels and the first difference of the variables.

Table 3: Results of the Augmented Dickey-Fuller Unit Root Test

Unit Root Test at Levels				
Variable	**ADF Test Statistic**	**ADF Critical Value**	**P-Value**	**Remark**
AGRP	1.447757	-2.948404	0.99886	Not Stationary
EXR	3.561957	-2.941145	0.9999	Not Stationary
MPR	-3.312116	-3.533083	0.0796	Not Stationary
OPN	-3.229137	-3.533083	0.0941	Not Stationary
Unit Root Test at 1st Difference				
Variable	**ADF Test Statistic**	**ADF Critical Value**	**P-Value**	**Remark**
AGRP	-4.518766	-3.557759	0.0055	Stationary At I(1)
EXR	-3.199024	-2.960411	0.0296	Stationary At I(1)
MPR	-8.002163	-3.536601	0.0000	Stationary At I(1)
OPN	-8.381377	-3.536601	0.0000	Stationary At I(1)

The Augmented Dickey-Fuller (ADF) test conclusions show that the variables used in this study, such as Agricultural Sector Performance (AGRP), Exchange Rate (EXR), Monetary Policy Rate (MPR), and Trade Openness (TOP), are non-stationary at their levels. This non-stationarity is observed from the p-values' high values, which are all above the conventional significance level of 0.05, and the ADF test statistics being greater than their respective critical values. This indicates that these variables display time-varying statistical properties, rendering them inappropriate for robust regression analysis in their present form since they may result in spurious outcomes. The economic variables, such as exchange rates and agricultural performance are prone to changes resulting from numerous external influences, which make them non-stationary.

At the first difference, however, all five variables are made stationary. The ADF test statistics are below the critical values, and the p-values fall well below 0.05, which means that the null hypothesis of a unit root is rejected. This implies that once the data are differenced, the variables are made stationary, with constant means and variances over time. Stationarity of these variables at the first difference means that they are integrated of order one, or I(1). This ensures that such time series can now be properly analyzed using methods like cointegration or vector autoregression (VAR), where more precise and meaningful results can be obtained.

C) Co-Integration Test

The Johansen co-integration test results, presented in the two tables, provide insights into the long-run relationships among the variables under study: Agricultural Sector Performance (AGRP), Exchange Rate (EXR), Monetary Policy Rate (MPR), and Trade Openness (OPN). Co-integration suggests that even though the variables are non-stationary at their levels, they move together in the long run, implying a stable equilibrium relationship over time. The results are presented in Tables 4 and 5.

Table 4*:* Johansen Co-integration

No. of co-integrating equation	**Trace Statistic**		**Maximum Eigen Value**	
	Trace Statistic	P-Value**	Max-EigenStatistic	P-Value**
None*	98.70417	0.0001	49.21505	0.0004
At most 1*	49.48913	0.0348	24.93119	0.1053
At most 2	24.55793	0.1779	11.29968	0.6174

At most 3	13.25825	0.1057	6.956072	0.4943
At most 4	6.302183	0.0121	6.302183	0.0121

** denotes rejection of the hypothesis at the 0.05 level*
***MacKinnon-Haug-Michelis (1999) p-values*

The Johansen test, based on Trace and Maximum Eigenvalue statistics, assesses the number of co-integrating equations among variables. The test rejects the null hypothesis of no co-integrating equations, confirming at least one. For the hypothesis of at most 1, the trace statistic is 49.48913, indicating a second co-integrating equation. Beyond this, the p-values increase significantly, indicating no further co-integrating relationships. The Max-Eigen statistic supports only one co-integrating equation, indicating a stable long-term relationship between variables.

In light of the foregoing, the results suggest that there is at least one, and possibly two, co-integrating relationships among the variables. This means that the variables move together in the long run, maintaining a stable equilibrium despite short-term fluctuations. The particular long-run relationships are seen in Table 5.

Table 5: Normalized Long-Run Co-integrating Coefficients

Variables	**AGRP**	**EXR**	**MPR**	**OPN**
Coefficients	1.000000	55.37823	-850.9695	22.35446
Standard Error		(13.8878)	(164.625)	(4.85807)
t-statistics		-3.988	5.169	4. 602

The coefficients in Table 5 provide information about the long-run equilibrium relationships between the variables, with AGRP serving as the dependent variable. The coefficient for the exchange rate is 55.37823, with a standard error of 13.8878. The t-statistic of -3.988 is statistically significant, indicating a strong long-term relationship between the exchange rate and agricultural performance. The positive coefficient suggests that a depreciation (increase in the exchange rate) is associated with an increase in agricultural sector performance in the long run. This aligns with the idea that a weaker currency may boost agricultural exports by making them more competitive internationally.

The coefficient for the monetary policy rate is -850.9695, with a standard error of 164.625 and a t-statistic of 5.169, indicating a significant relationship. The large negative coefficient suggests that an increase in the monetary policy rate (i.e., higher interest rates) has a substantial negative impact on agricultural sector performance. This is likely because higher interest rates increase borrowing costs, which could hinder investment in agriculture and reduce overall productivity. The coefficient for trade openness is 22.35446, with a standard error of 4.85807 and a significant t-statistic of 4.602. This positive coefficient implies that greater trade openness is associated with improved agricultural sector performance in the long run. Openness to trade may provide access to international markets, technology, and inputs that can enhance agricultural productivity and growth.

D) Pearson Correlation Technique

The Pearson correlation is used to examine the relationship between variables. The result is presented in Table 6.

Table 6: Pearson Correlation Matrix

Correlation				
Probability	AGRP	EXR	MPR	OPN
AGRP	1.000000			

EXR	0.866139	1.000000		
	0.0000	-----		
MPR	-0.372566	-0.360923	1.000000	
	0.0195	0.0240	-----	
OPN	0.634647	0.890854	-0.359168	1.000000
	0.0000	0.0000	0.0247	-----

The correlation matrix presents the relationships between five key variables: Agricultural Sector Performance (AGRP), Exchange Rate (EXR), Monetary Policy Rate (MPR), and Trade Openness (OPN). The correlation between AGRP and EXR is 0.866, indicating a strong positive relationship. This implies that as the exchange rate rises (currency depreciation), the performance of the agricultural sector increases. The reason for the positive relationship could be that a depreciating currency could increase agricultural exports, rendering Nigerian agricultural goods more competitive abroad. The AGRP and MPR correlation

coefficient is -0.373, indicating a weak to moderate negative relationship. This suggests that increased interest rates are linked to decreased agricultural sector performance, probably because of higher borrowing costs, which may deter investment in the agricultural sector.

AGRP and OPN share a correlation of 0.635, a strong positive one. This means that increased openness to trade favors agricultural sector performance, possibly because it provides entry into foreign markets and improved technology, leading to increased productivity within the agricultural sector. EXR and MPR have a correlation of -0.361, a weak to moderate negative correlation. This negative relationship implies that when exchange rates fall (rise in EXR), the central bank could react by increasing interest rates (MPR) to stabilize the currency and combat inflation. However, the relationship is not that strong, as indicated by the intricate factors that determine exchange rates and monetary policy.

EXR and OPN exhibit a high positive correlation of 0.891, which is strong evidence that increased openness to trade is linked with the appreciation of the exchange rate. This may be explained by the flow of foreign money from international trade, especially exports, which is likely to strengthen the currency. This tight correlation between EXR and OPN captures the interdependence of exchange rate management and trade. The MPR and OPN have a weak negative correlation of -0.359, meaning that an increase in trade openness is accompanied by a decrease in interest rates. This would be an indicator that the central bank reduces interest rates to foster growth in international trade. Yet the weak negative relationship indicates other factors affecting monetary policy decisions rather than trade openness.

E) Ordinary Least Squares Regression Technique

The result of the regression estimation is presented in Table 7.

Table 7: OLS Regression Estimate

Dependent Variable: AGRP Method: Least Squares				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
Log (EXR)	0.184002	0.083362	2.207257	0.0341
Log (MPR)	-0.227410	0.142450	-15.96414	0.0000
Log (OPN)	-0.967922	0.104108	-9.297260	0.0000
C	-0.495647	0.666056	-0.744152	0.4619
R-squared	0.993595	Durbin-Watson stat		1.247327
Adjusted R-squared	0.992842			
F-statistic	1318.624	Prob(F-statistic)		0.000000

The Ordinary Least Squares (OLS) regression analysis of Agricultural Sector Performance (AGRP) reveals that a 1% increase in the Exchange Rate (EXR), Monetary Policy Rate (MPR), and Trade Openness (OPN) is associated with a 0.18% increase in agricultural performance. This suggests that currency depreciation enhances agricultural performance, making agricultural exports more competitive. Conversely, a 1% increase in MPR leads to a 0.23% decrease in agricultural performance, suggesting that higher interest rates increase borrowing costs, dampening agricultural investment and productivity. Trade openness also has a negative effect on agricultural performance, with a 0.97% decrease for every 1% increase in trade openness. The constant term (-0.495647) is not statistically significant, suggesting that the overall level of agricultural performance is not significantly different from zero. The R-squared value of 0.9936 indicates that approximately 99.36% of the variation in AGP is explained by the independent variables, indicating a good fit for the model. The F-statistic of 1318.624 and p-value of 0.000000 indicate that the combination of EXR, MPR, and OPN significantly explains variations in AGP. Further tests for autocorrelation are warranted.

F) Diagnostic Tests

The diagnostic tests show the serial correlation, heteroskedasticity, multicollinearity, and normality of the residuals and/or coefficients of the regression model. This is presented in Table 8.

Table 8: Test for Normality, Heteroskedasticity and Autocorrelation

Test	**F-Statistics**	**P-value**
Normality Test (Jarque-Bera)	4.200570	0.122422
Serial correlation LM Test (Breusch-Godfrey)	1.980001	0.0971
Heteroskedasticity (Breusch-Godfrey)	0.265692	0.8979

The OLS regression model is tested for its validity and robustness through diagnostic tests such as normality, serial correlation, and heteroskedasticity. The Jarque-Bera test ensures that residuals are normally distributed, satisfying the assumption of normality in the model. The Breusch-Godfrey LM test for serial correlation examines whether there is autocorrelation in the residuals, with a p-value of 0.0971 greater than 0.05. This shows no strong evidence of serial correlation in the residuals of the model, which might reflect missing key variables or correlated errors over time, perhaps skewing the results.

The Breusch-Pagan-Godfrey test for heteroskedasticity is used to test whether the variance of the residuals is constant for all levels of the independent variables. The p-value of 0.8979 is significantly higher than 0.05, and hence, there is no evidence of heteroskedasticity, and the residuals have a constant variance, which is a crucial assumption of the OLS model. When the variance is homoscedastic (constant), the model estimates are unbiased, and valid statistical inferences can be made. These tests ensure that the OLS model assumptions are fulfilled, thereby making the regression outcome more accurate.

G) Multicollinearity Test

The Variance Inflation Factor (VIF) test measures multicollinearity, which occurs when two or more independent variables in a regression model are highly correlated. Multicollinearity can inflate the standard errors of the coefficients, making it difficult to assess the independent effect of each variable on the dependent variable. The result is presented in Table 9.

Table 9: Variance Inflation Factor Test

Variance Inflation Factors Sample: 1985 2023 Included observations: 39			
Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.443631	473.6090	NA
LOG(EXR)	0.069499	149.3946	8.516252
LOG(MPR)	0.020292	146.2849	1.704101
LOG(OPN)	0.010839	373.2579	1.834193

A VIF value above 10 is considered a sign of significant multicollinearity, though values between 5 and 10 can also indicate moderate multicollinearity concerns. Overall, while the Exchange Rate (EXR**)** shows a relatively high VIF (8.52), indicating moderate multicollinearity, it is not severe enough to raise significant concerns. The other independent variables, Monetary Policy Rate (MPR) and Trade Openness (OPN), all have VIF values well below 5, suggesting minimal multicollinearity. Therefore, apart from EXR, multicollinearity does not appear to be a major issue in this model, meaning the coefficients can be interpreted with reasonable confidence.

H) Stability Tests

The CUSUM test and the CUSUM of squares are used to test for the model's stability. These tests are graphical methods that help detect any significant shifts in the parameters of a regression model. Both plots feature a cumulative test statistic along with 5% significance boundaries. If the test statistic remains within these boundaries, the model is considered stable.

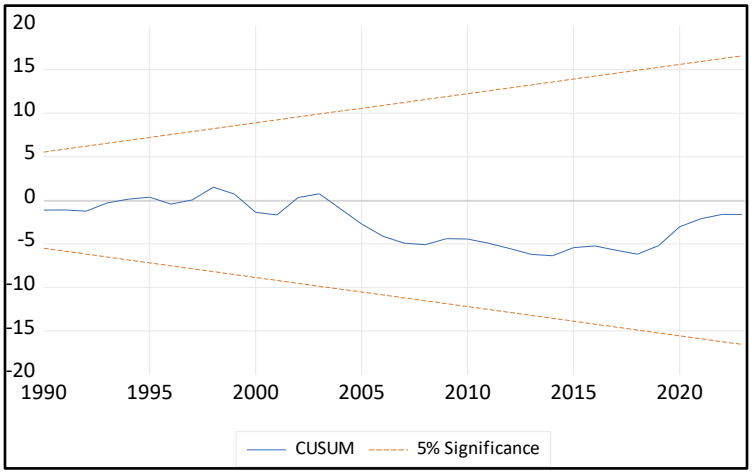

Fig. 2 CUSUM Test

The CUSUM test ensures there is no structural break or parameter instability for the regression model over time. The CUSUM statistic (blue line) in this plot varies around the zero line but within the 5% significance limits (dashed red lines) for the entire period. Since the CUSUM statistic is below both the upper and lower critical limits, it is possible to state that the regression model remains stable over the time span of the investigation. No evidence of any major structural break or parameter instability can be inferred.

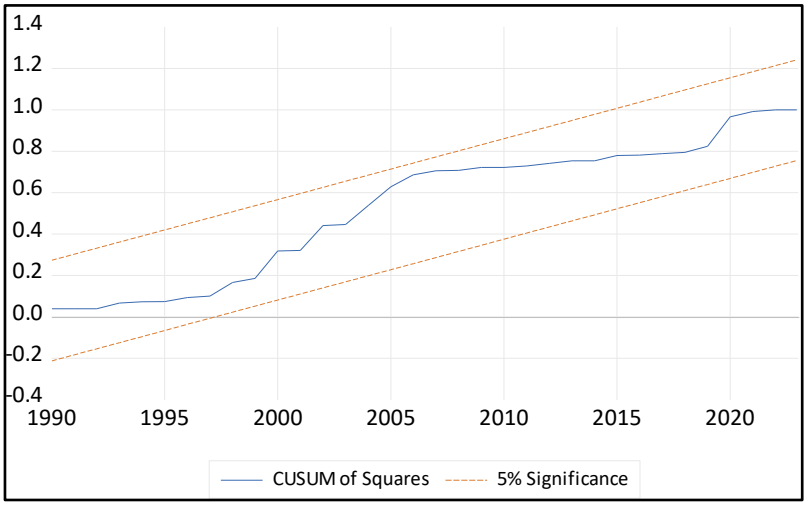

Fig. 3 CUSUM of Squares Test

The CUSUM of Squares test is more responsive to slow changes in the variance of the residuals and tests for cumulative changes in the variance pattern. The blue line (CUSUM of Squares statistic) begins at zero and slowly increases over time, staying within the 5% significance limits throughout the period. Just like in the CUSUM test, as the CUSUM of Squares statistic remains within the critical limits, we can confidently conclude that there is no parameter instability or heteroskedasticity of residuals in the model over time.

I) Discussion of Findings

The explanation of the determinants of Nigeria's agricultural sector performance, using the OLS regression results, is a source of understanding the dynamics behind agricultural outcomes in Nigeria. Among the main findings is that exchange rate depreciation is positively correlated with agricultural sector performance. Depreciation, which reduces the prices of domestic goods to foreign buyers, tends to increase agricultural exports and consequently sustain sector growth. This is in line with existing research that established a positive relationship between export performance and currency depreciation, especially in developing economies that use agricultural exports as a source of foreign exchange (Oduh, 2012; Aye et al., 2014). The statistical importance of this link indicates that the policies of the exchange rate play a significant function in determining agriculture results, notably by increasing Nigeria's agricultural competitiveness in global markets.

Monetary policy, that is, monetary policy rate (MPR), has a negative correlation with farm performance, such that an increase in interest rates suppresses the growth of this sector. This is in accordance with the literature, which implies that high borrowing prices limit farmers' capacity to invest in productivity-enhancing inputs like technology, fertilizers, and equipment (Adeniyi et al., 2012). The statistical significance of this association highlights the relevance of low interest rates in encouraging agricultural development since the availability of cheap credit is commonly a key driver of investment in agriculture. The converse, i.e., high interest rates, would dampen agricultural productivity through increasing the cost of loans and the decline in capital for sector growth.

Trade openness presents a more differentiated finding. In the short run, trade openness negatively affects agricultural performance, potentially due to increased competition from imported agricultural goods, which can undercut domestic producers. This observation is consistent with studies that have shown how liberalization of trade can expose vulnerable sectors, like agriculture in developing countries, to foreign competition (Rodrik, 2001). In addition, the importation of cheaper farm products can discourage domestic production, resulting in worsening agricultural performance. Yet, in the long term, trade openness positively relating to agricultural sector performance indicates that the sector gains from increased access to international markets, better agricultural technologies, and international agricultural supply chains. Openness to trade can raise productivity by enabling domestic producers to utilize superior-quality inputs and export markets (Anderson & Martin, 2005). Consequently, the initial adverse effect of trade openness may only be temporary while domestic producers adjust to international competition and realize new opportunities.

V. CONCLUSION AND RECOMMENDATION

The relationship between exchange rate and agricultural sector performance in Nigeria is crucial for economic prosperity. A competitive exchange rate makes Nigerian agricultural products more attractive on the international market, incentivizing farmers to scale production and improve efficiency. However, exchange rate dynamics cannot be viewed in isolation; structural improvements, such as investments in infrastructure, technological adoption, and policy support, are necessary for the agricultural sector to capitalize on favorable exchange rates.

To ensure stable, sustainable agricultural growth, Nigeria must maintain a flexible exchange rate that supports agricultural exports while addressing domestic challenges such as access to finance, infrastructure development, and market diversification. Integrating exchange rate policies with broader agricultural reforms can enhance the resilience and productivity of the agricultural sector, ensuring it remains a key driver of economic diversification and sustainable development.

Recommendations include promoting exchange rate stability, enhancing export competitiveness, supporting agricultural input costs, encouraging value addition in agriculture, strengthening foreign exchange access for exporters, introducing low-interest credit facilities for farmers, developing agricultural export processing zones, and strengthening agricultural value chains to maximize export gains. These measures will help Nigeria diversify its agricultural export basket, increase revenue, and reduce post-harvest losses.

VI. REFRENCES

[1] Adebayo, B. (2018). The impact of monetary policy on the agricultural sector in Nigeria. *Journal of Economics and Development*, 9(4), 112-126.
[2] Adejumo, A. O. (2017). Exchange rate trends and export performance in Nigeria: A descriptive approach. *International Trade eJournal*.
[3] Adejumo, A. O. (2020). Exchange rate fluctuations and sectoral performance of the Nigerian economy (1980-2016). *European Journal of Marketing and Economics*, 1(2), 45-58.
[4] Adejumo, A. O., & Ikhide, S. (2017). Remittance inflows, real exchange rate movements, and sectoral performance in Nigeria. *European Journal of Economics and Business Studies*, 7, 78–88.
[5] Adekunle, W., & Ndukwe, C. I. (2018). The impact of exchange rate dynamics on agricultural output performance in Nigeria. *ERN: Africa (Development) (Topic)*. https://consensus.app/papers/impact-exchange-rate-dynamics-agricultural-output-adekunle/bbd1bb8486fb5ba39665fb8500efb8e8/?utm
[6] Adeniyi, O., Omisakin, O., Yaqub, J., & Oyinlola, A. (2012). Exchange rate and agricultural sector performance: The case of Nigeria. *Journal of Agricultural Economics*, 48(2), 93-112.
[7] Adeoye, B. (2019). Agricultural development and trade policy in Nigeria: Implications for food security. *Journal of Agriculture and Environmental Studies*, 4(2), 56-78.
[8] Adeoye, B. (2019). Exchange rate volatility and economic growth in Nigeria. *Journal of Economic Studies*, 46(3), 1-14.
[9] Adeoye, B. (2019). Testing the Purchasing Power Parity Hypothesis in Nigeria. *Journal of Economic Policy and Development*, 10(2), 45-59.
[10] Ajani, E. (2013). Agricultural extension services and their impact on agricultural productivity in Nigeria. *Journal of Agricultural Science*, 5(4), 50-66.
[11] Ajibola, A. O. (2016). The effects of inflation on the agricultural sector in Nigeria. *African Journal of Economic Policy*, 23(2), 29-46.
[12] Akeh, M. U., Asukwo, J. I., Bekom, O., Emefiele, C., & Nkamare, S. (2022). Foreign exchange on the performance of Nigeria's economy: An econometric approach. *IIARD International Journal of Banking and Finance Research*.
[13] Akinleye, S. O. (2010). Agricultural sector and economic diversification in Nigeria. *Journal of Agricultural Economics*, 3(2), 60-75.
[14] Akinleye, S. O. (2010). Trade openness, exchange rates, and agricultural export performance in Nigeria. *Journal of Agricultural Economics*, 3(2), 30-45.
[15] Anderson, K., & Martin, W. (2005). Agricultural trade reform and the Doha Development Agenda. *The World Economy*, 28(9), 1305-1327.
[16] Auty, R. M. (2001). *Resource abundance and economic development*. Oxford University Press.
[17] Balassa, B. (1964). The purchasing-power parity doctrine: A reappraisal. *Journal of Political Economy*, 72(6), 584-596.
[18] Branson, W. H. (1977). Asset markets and relative prices in exchange rate determination. *Svenska Handelsbanken Quarterly Review*, 57(1), 25-32.
[19] Calvo, G. A., & Reinhart, C. M. (2002). Fear of floating. *Quarterly Journal of Economics*, 117(2), 379-408.
[20] Cassel, G. (1916). The present situation of the foreign exchanges. *The Economic Journal*, 26(101), 62-65.
[21] Cassel, G. (1918). Abnormal deviations in international exchanges. *The Economic Journal*, 28(112), 413-415.
[22] Central Bank of Nigeria. (2016). *Annual Report 2016*. Central Bank of Nigeria.
[23] Central Bank of Nigeria. (2021). *Anchor Borrowers' Programme: Agricultural credit and lending policies*. Central Bank of Nigeria.
[24] Central Bank of Nigeria. (2021). *Statistical Bulletin: Foreign Exchange and Oil Sector Data*. Central Bank of Nigeria.
[25] Dornbusch, R. (1976). Expectations and exchange rate dynamics. *Journal of Political Economy*, 84(6), 1161-1176.
[26] Dorosh, P., & Mellor, J. (2013). Agriculture and economic transformation: Pathways and policies for development. *Journal of Development Studies*, 49(4), 503-515.
[27] Ehinomen, C. (2012). Exchange rate management and the manufacturing sector performance in Nigeria. *IOSR Journal of Humanities and Social Science*, 5(1), 1–12.
[28] Eyo, E. O. (2008). Macroeconomic environment and agricultural sector growth in Nigeria. *World Journal of Agricultural Sciences*, 4(6), 781-786.
[29] Ezeabasili, V. N., Mojekwu, J. N., & Herbert, W. E. (2012). Oil price volatility and exchange rate volatility in Nigeria. *Journal of Economics and Sustainable Development*, 3(11), 67-71.
[30] Falana, O. (2019). Exchange rate regimes and real sector performance in Nigeria. *Canadian Social Science*, 15(6), 117-128.
[31] Falana, O. (2019). Exchange rate regimes and real sector performance in Nigeria. *Canadian Social Science*, 15(6), 117-128.
[32] Falana, O. E. (2019). Exchange rate fluctuation and real sector performance in Nigeria: A disaggregated analysis. *European Scientific Journal*, 15(25), 358–358.
[33] Fan, S., & Zhang, X. (2008). Public expenditure, growth, and poverty reduction in rural Uganda. *African Development Review*, 20(3), 466-496.
[34] FAO. (2019). *State of food and agriculture*. Food and Agriculture Organization of the United Nations.
[35] Frankel, J. A., & Rose, A. K. (1996). A panel project on purchasing power parity: Mean reversion within and between countries. *Journal of International Economics*, 40(1-2), 209-224.

[36] Frenkel, J. A. (1976). A monetary approach to the exchange rate: Doctrinal aspects and empirical evidence. *Scandinavian Journal of Economics*, 78(2), 200-224.
[37] Froot, K. A., & Rogoff, K. (1995). Perspectives on PPP and long-run real exchange rates. In *Handbook of International Economics* (Vol. 3, pp. 1647-1688). Elsevier.
[38] Froot, K. A., & Thaler, R. H. (1990). Anomalies: Foreign exchange. *Journal of Economic Perspectives*, 4(3), 179-192.
[39] Gujarati, D.N. (2003). Basic Econometrics. 4Th Ed. New York: McGraw–Hill Inc.
[40] Haggblade, S., Hazell, P., & Dorosh, P. (2007). Sectoral growth linkages between agriculture and the rural non-farm economy. In S. Haggblade, P. Hazell, & T. Reardon (Eds.), *Transforming the rural nonfarm economy: Opportunities and threats in the developing world* (pp. 141-182). Johns Hopkins University Press.
[41] Iheanacho, E. (2020). Inflation and its impact on agriculture in Nigeria. *Journal of Agricultural Economics and Development*, 45(2), 112-130.
[42] Iliyasu, A. (2019). An empirical analysis of the impact of exchange rate on agriculture in Nigeria. *Journal of Environment and Earth Science*, 9(11), 54-69.
[43] IPCC. (2014). *Climate Change 2014: Impacts, Adaptation, and Vulnerability*. Intergovernmental Panel on Climate Change.
[44] Isibor, A., Felicia, O., Arogundade, M., & Osuma, G. (2018). Exchange rate management and sectoral output performance. *International Journal of Supply Chain Management*, 7(3), 129-134.
[45] Jaiyesimi, O. (2022). *Revisiting the structural adjustment program of 1986*. Punchng.com. https://punchng.com/revisiting-structural-adjustment-programme-of-1986/
[46] Johnston, B. F., & Mellor, J. W. (1961). The role of agriculture in economic development. *The American Economic Review*, 51(4), 566-593.
[47] Krugman, P., & Obstfeld, M. (2017). *International Economics: Theory and Policy* (11th ed.). Pearson.
[48] Loto, M. A. (2011). The impact of the economic downturn on the performance of agricultural export in the Nigerian economy: A quarterly empirical analysis. *Journal of Emerging Trends in Economics and Management Sciences*, 2(6), 504–510.
[49] Mishkin, F. S. (2016). *The economics of money, banking, and financial markets*. Pearson.
[50] Mordi, N. O. (2014). Exchange rate determination in developing countries: Evidence from Nigeria. *International Journal of Economics and Finance*, 6(4), 23-32.
[51] Mundell, R. A. (1961). A theory of optimum currency areas. *The American Economic Review*, 51(4), 657-665.
[52] National Bureau of Statistics. (2021). *Agriculture data: Employment and GDP contributions*. National Bureau of Statistics.
[53] National Bureau of Statistics. (2024). *Agriculture data: Employment and GDP contributions*. National Bureau of Statistics.
[54] Obi, C. (2020). Trade openness, exchange rate volatility, and agricultural productivity in Nigeria. *Nigerian Journal of Economic and Social Studies*, 62(3), 99-112.
[55] Obstfeld, M., & Rogoff, K. (1995). Exchange rate dynamics redux. *Journal of Political Economy*, 103(3), 624-660.
[56] Obstfeld, M., & Rogoff, K. (1995). The intertemporal approach to the current account. In G. Grossman & K. Rogoff (Eds.), *Handbook of International Economics* (Vol. 3, pp. 1731-1799). Elsevier.
[57] Oduh, M. O. (2012). Oil price, exchange rate, and agriculture in Nigeria: A vector error correction model (VECM) approach. *International Journal of Economics and Finance*, 4(7), 121-133.
[58] Ogundele, O., & Okoruwa, V. (2006). Efficiency differentials in smallholder agricultural production in Nigeria: A stochastic frontier approach. *Journal of Agricultural Economics*, 34(1), 49-65.
[59] Ogunjimi, J. (2019). Exchange rate dynamics and sectoral output in Nigeria: A symmetric and asymmetric approach. *International Finance eJournal*, 51(1), 178-193.
[60] Ogunjobi, J. O., Oladipo, O., Eseyin, O., Opaola, O., & Aransiola, I. J. (2022). Exchange rate and agricultural exports: Evidence from Nigeria (1981-2019). *International Journal of Research and Scientific Innovation*, 3(2), 45-67.
[61] Ogunleye, A. J. (2011). Exchange rate volatility and foreign direct investment in sub-Saharan Africa: Evidence from Nigeria and South Africa. *The Journal of Developing Areas*, 45(3), 243-255.
[62] Ojeaga, P. (2014). Oil revenue and agricultural sector performance in Nigeria. *Journal of Sustainable Development in Africa*, 16(7), 1520-5509.
[63] Oladipo, O. S., & Akinbobola, T. O. (2011). Oil price shocks and stock market behaviour in Nigeria. *Journal of Economic and Social Studies*, 3(1), 22-35.
[64] Olajide, O. T., Akinlabi, B. H., & Tijani, A. A. (2012). Agriculture resource and economic growth in Nigeria. *European Scientific Journal*, 8(22), 103-115.
[65] Olaniyi, A. (2020). The Agricultural Transformation Agenda and its impact on Nigeria's agricultural sector. *Nigerian Journal of Agricultural Economics*, 5(1), 45-62.
[66] OPEC. (2020). *Annual Statistical Bulletin 2020*. Organization of the Petroleum Exporting Countries.
[67] Panneerselvam, R. (2010). *Research methodology*. PHI Learning Pvt. Ltd.
[68] Rodrik, D. (1997). *Has globalization gone too far?* Institute for International Economics.
[69] Rodrik, D. (2001). *The globalization paradox: Democracy and the future of the world economy*. W.W. Norton & Company.
[70] Rodrik, D. (2008). One economics, many recipes: Globalization, institutions, and economic growth. *Princeton University Press*.
[71] Rodrik, D. (2008). The real exchange rate and economic growth. *Brookings Papers on Economic Activity*, 2008(2), 365-412.
[72] Rogoff, K. (1996). The purchasing power parity puzzle. *Journal of Economic Literature*, 34(2), 647-668.
[73] Sachs, J., & Warner, A. (1995). Economic reform and the process of global integration. *Brookings Papers on Economic Activity*, 1995(1), 1-118.
[74] Sala-i-Martin, X., & Subramanian, A. (2003). Addressing the natural resource curse: An illustration from Nigeria. *NBER Working Paper Series*, 9804.
[75] Sala-i-Martin, X., & Subramanian, A. (2013). Addressing the natural resource curse: An illustration from Nigeria. *Journal of African Economies*, 22(4), 570-615.
[76] Sarno, L., & Taylor, M. P. (2002). *The Economics of Exchange Rates*. Cambridge University Press.
[77] Sylvanus, U., Inim, V. E., & Ityav, D. L. (2023). Foreign exchange fluctuations on the performance of agricultural export in Nigeria. *Economy*, 4(1), 50-72.
[78] Taylor, M. P., & Taylor, A. M. (2004). The purchasing power parity debate. *Journal of Economic Perspectives*, 18(4), 135-158.
[79] Todaro, M. P., & Smith, S. C. (2015). *Economic development*. Pearson.
[80] World Bank. (2020). *World development indicators*. World Bank Group.
[81] World Bank (2021). World Bank Reports. The Nigerian Structural Adjustment Program: Policies, Impact, and Prospects.