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EXCHANGE RATE MANAGEMENT AND AGRICULTURAL EXPORT FINANCING IN NIGERIA

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Abstract

The agricultural sector's role in Nigeria's economic development, employment generation, and food security is pivotal. Despite its importance, the sector encounters persistent challenges, particularly in obtaining sufficient financial resources for sustainable growth. One crucial challenge is the agricultural sector's susceptibility to fluctuations in exchange rates, which can significantly impact the availability and cost of bank credit, ultimately affecting its ability to generate export revenue. In light of these issues, this study aimed to explore the relationship between exchange rate management and agricultural export financing in Nigeria. The study employed time series data covering exchange rates, interest rates, inflation, and agricultural export financing from 2000 to 2022, sourced from the Central Bank of Nigeria Statistical Bulletin. Fully Modified Ordinary Least Squares (FMOLS) methodology was adopted to address endogeneity concerns in the time series data, accounting for simultaneous relationships between variables. The study's findings indicated that exchange rate management plays a significant role in determining agricultural export financing in Nigeria ($\beta1=0.0135$; $P=0.0045$). Therefore, it is recommended that the Central Bank of Nigeria (CBN) adjusts interest rates to stabilize the Naira, as fluctuations in interest rates can impact the cost of borrowing for exporters. A currency depreciation accompanied by higher interest rates may increase the cost of agricultural financing.

Keywords: Exchange Rate, Management, Agriculture, Financing, Interest Rate.

JEL Classification: F31; Q14; O13; O24.

BACKGROUND TO THE STUDY

The agricultural sector is a crucial driver of economic growth, making significant contributions to GDP, employment, and food security (World Bank, 2021). It has accounted for approximately 23% of the gross domestic product. Despite its importance, this sector frequently encounters challenges in obtaining sufficient financial resources for sustainable development. Access to bank credit is pivotal in advancing and modernizing agriculture, enabling farmers to invest in technology, inputs, and infrastructure (Adams, 2017). In the context of the Nigerian economy, agricultural sector financing is particularly susceptible to the impacts of exchange rate fluctuations. The movements in exchange rates can influence the cost of imported inputs, the value of agricultural exports, and overall economic stability (Adewale & Chen, 2020). As Nigerian monetary authorities aim to boost agricultural product exports, exchange rate fluctuations can significantly affect the financial health of the agricultural sector (IFAD, 2017). While numerous studies have explored the impact of exchange rate management on various economic sectors, limited research has specifically delved into its consequences on bank credit to the agricultural sector in Nigeria. Understanding this relationship is crucial for

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policymakers, financial institutions, and agricultural stakeholders to formulate effective strategies that enhance financial resilience amid global economic uncertainties. Theoretical frameworks like the Mundell-Fleming model provide insights into how exchange rate movements can influence investment decisions and capital flows (Mundell, 1963). However, applying and testing these theories within Nigerian agriculture and banking contexts is necessary to offer practical and country-specific insights. Given the scarcity of research in this domain, this study aims to fill the existing gap by scrutinizing the nuanced relationship between exchange rate management and bank credit to the agricultural sector in Nigeria. In doing so, it aspires to contribute to the existing body of knowledge, providing empirical evidence and insights that can guide policymakers, financial institutions, and other stakeholders in supporting the sustainable development of the agricultural sector in Nigeria.

Statement of the Problem

There is no gainsaying that the agricultural sector in Nigeria remains pivotal to economic development, employment generation, and food security (World Bank, 2021). However, despite its significance, the sector faces persistent challenges, particularly in accessing adequate financial resources for sustainable growth through export. One critical aspect of this challenge is the vulnerability of the agricultural sector to exchange rate fluctuations, which can significantly impact the availability and cost of bank credit, ultimately affecting the sector's ability to thrive. Exchange rate fluctuations refer to the unpredictable changes in the value of a country's currency relative to other currencies in the foreign exchange market. African countries, particularly Nigeria, are heavily engaged in international trade. The agricultural sector's dependence on imported inputs, such as fertilizers and machinery, makes it particularly sensitive to currency value changes (Jones & Kim, 2018). Meanwhile, the sector relies on exporting agricultural products, and fluctuations in exchange rates can influence the competitiveness and profitability of these exports (Oluwafemi et al., 2021). The problem at the intersection of exchange rate management, bank credit, and the agricultural sector in Nigeria is multifaceted. Firstly, the volatility in exchange rates can impact the cost of credit for banks. As the cost of funds for banks fluctuates with changes in exchange rates, it may affect the accessibility and affordability of credit for agricultural stakeholders, including smallholder farmers and agribusinesses (Olatunji, 2017). Secondly, Banks, in response to exchange rate uncertainties, may perceive the agricultural sector as riskier, influencing their credit allocation decisions. This can result in reduced lending to the agricultural sector or increased interest rates, hindering the sector's ability to make essential investments (Smith & Wang, 2019). Thirdly, agricultural enterprises engaged in international trade may face foreign exchange exposure. Fluctuations in exchange rates can lead to uncertainties in revenue and profitability, affecting the repayment capacity of borrowers in the agricultural sector (Umar, 2020). Additionally, the complex interplay between exchange rate management, bank credit, and agricultural sector exports has implications for policymakers. Understanding how policies, such as exchange rate management and monetary measures, influence this relationship is crucial for designing effective interventions to support agricultural development (IMF, 2017). Addressing these issues is imperative for fostering Nigeria's resilient and sustainable agricultural sector. By gaining insights into the specific challenges posed by exchange rate

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management on bank credit to the agricultural sector, policymakers and financial institutions can develop targeted strategies to mitigate risks, enhance credit accessibility, and promote the long-term viability of the agricultural industry in the country. In the subsequent sections of this research, we will explore these problems through empirical analysis, aiming to contribute evidence-based recommendations for stakeholders involved in agricultural financing and economic policy formulation in Nigeria.

Stylized Facts about exchange rate fluctuations in Nigeria

The instability of the Naira vis-à-vis other world currencies such as United States Dollars, British Ponds, and Euro has been of great concern to all participants in the foreign exchange market in Nigeria. The Central Bank of Nigeria (CBN) has taken several measures to stabilize the Naira. Since the deregulation of the Nigerian foreign exchange market in the 1980s, the CBN has formulated and implemented monetary policies such as Nigerian Autonomous Foreign Exchange Market (NAFEX), Wholesale Dutch Auction System, Retail Dutch Auction System (RDAS), Investor and Exporter Window, ostensibly to stimulate the Nigerian economy through the trade finance. The policy thrust of CBN over time is to align the demand and supply sides of foreign exchange to boost foreign exchange liquidity, bearing in mind that the exchange rate responds to the forces of demand and supply. However, whether or not foreign exchange management strategies have stimulated the economy via import and export financing has remained largely unresolved. Figure one below presents the interaction of exchange rate and export loans between 2000 and 2022. Beginning in the year 2000, just at the start of democratic governance, the exchange rate of the Nigerian Naira to the United States dollar was $/N101.7, but the Naira depreciated to $/N111.23 in 2001, representing 8.84% depreciation. In the same period, agriculture export financing increased by 63% from N555, 271bn in 2000 to N903, 284bn in 2001.

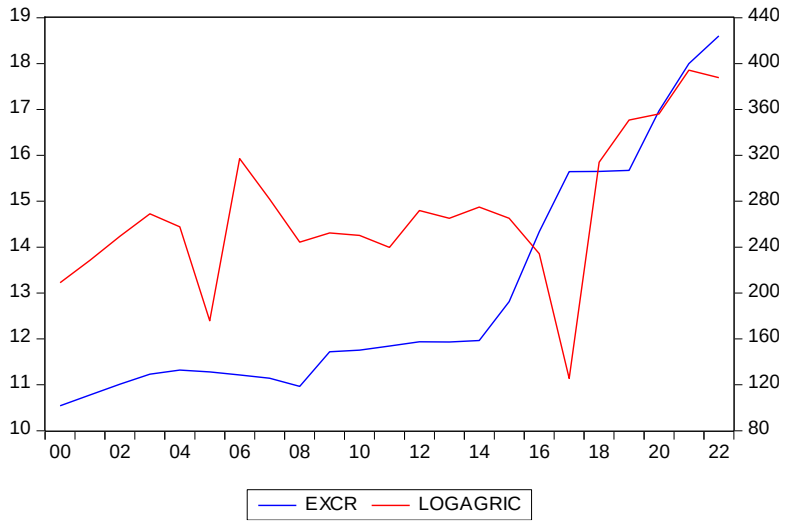

Figure 1: Interaction of exchange rate and export loans between 2000 and 2022

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Between 2001/2002, the Nigerian currency, Naira, depreciated marginally by 8.4% from $/N111.23 in 2001 to $/N120.58 in 2002. Similar to the scenario in 2000/2001, an 8.4% depreciation of the Naira caused a 68.8% rise in agriculture export financing from N903, 284bn in 2001 to N1, 524,392bn in 2002. Between 2002/2003 exchange rate depreciated further from $120.58 in 2002 to $129.22 in 2003, representing 7.16%. Again, agriculture export financing increased by 63% from N1, 524,392bn in 2002 to N2, 487,590 in 2003. Between 2003/2004, Naira depreciated further by 2.84%, from $/N129.22 in 2003 to $/N132.89 in 2004. In the same period, agriculture export financing decreased by 24.7% from N2, 487,590bn in 2003 to N1, 871,968bn in 2004.

Surprisingly, Naira appreciated marginally between 2004/2005 by 1.27%, from $/N132.89 in 2004 to $/N131.27 in 2005. The marginal appreciation of the Naira resulted in an 87% decline in agriculture export financing from N1, 871,968bn in 2004 to N241, 842bn in 2005. There was also a slight Naira appreciation between 2005/2006 by 2.0%. The Dollar to Naira exchange rate stood at $/N131.27 in 2005 as against $/N128.65 in 2006. Interestingly, agriculture export financing increased significantly by 3,318% from N241, 842bn in 2005 to N8, 266,176bn in 2006.

Consistent with the preceding period, Naira appreciated by 2.21% between 2006/2007. The Naira exchange rate stood at $/N128.65 in 2006 but appreciated to $/N125.81 in 2007. 2.21% Naira appreciation caused a 58.6% decline in agriculture export financing from N8, 266,176bn in 2006 to N3, 418,576bn in 2007. The nexus between exchange rate and agriculture export financing appeared interesting during 2007/2008. While exchange rate appreciated by 5.75% from $/N125.81 in 2007 to $/N118.57 in 2008, agriculture export financing declined sharply by 60.7% from N3, 418,576bn in 2007 to N1, 343,7956bn in 2008.

The depreciation of the Naira between 2008/2009 caused a moderate rise in agriculture export financing. For example, the Naira depreciated by 25.57% from $/N118.57 in 2008 to $/N148.88 in 2009, while agriculture export financing increased from N1,343,7956bn in 2008 to N1,638,505bn in 2009, representing 21.9%. In 2009/2010, Naira depreciated by a marginal 0.95% from $/N148.88 in 2009 to $/N150.3 in 2010. The marginal depreciation of Naira caused a slight decline in agriculture export financing by 5.4% from N1, 638,505bn in 2009 to N1, 550,000bn in 2010. The nexus between exchange rate management and agriculture export financing presents an interesting outcome in 2010/2011. For example, 0.02% Naira depreciation resulted in a 22.8% decline in agriculture export financing from N1, 550,000bn in 2010 to N1, 196,272bn in 2011.

Again, the 2011/2012 period presents another exciting relationship between the exchange rate and agriculture export financing. Specifically, Naira depreciated from $/N153.86 in 2011 to $/N157.5 million in 2012, representing 2.36%. In the same period, exchange rate depreciation caused a 123% rise in agriculture export financing from N1, 196,272bn in 2011 to N2, 674,333bn in 2012. The exchange rate effect on agriculture export financing caused mixed outcomes in 2012/2013. For example, a 0.12% appreciation of the Naira from $/N157.5 in 2012 to $/N157.31 in 2013 resulted in a 55% decline in agriculture export financing from N2,674,333bn in 2012 to N2,259,896 in 2013. In the period between 2013/2014, the Naira

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depreciation exerts a similar effect on agriculture export financing. Naira depreciated by 0.78% from $/N157.1 in 2013 to $/N158.55 in 2014. In the same period, agriculture export financing declined by 27.36%. Naira depreciated deeply by 21.37% in 2014/2015 from $/N158.55 in 2014 to as low as $/N192.44 in 2015. The deep Naira depreciation caused a significant decline in agriculture export financing by 118.41% from N2, 878,249.88bn in 2014 to N2, 259,896.02bn in 2015.

A similar scenario played out in 2015/2016, as deep Naira depreciation caused a decline in agriculture export financing. While Naira depreciated by 31.72% from $/N192.44 to $/N253.49, agriculture export financing decreased by 53.98% from N2, 259,896.02bn in 2015 to N1, 040,073.77bn in 2016. In the period between 2018/2019, Naira depreciation increased agriculture export financing by 151% from N7, 635,566bn in 2018 to N19, 159659bn in 2019. Similarly, the 2019/2020 period produced a similar effect of exchange rate management on agriculture export financing. Slight exchange rate depreciation caused a slight increase in agriculture export financing by 14% from N19, 159659bn in 2019 to N21, 880,773 bn in 2020.

In 2020/2021, the Naira depreciated by 0.11.45% from $/N358.81 in 2020 to $/N399.91 in 2021. This marginal Naira depreciation resulted in a 160% rise in agriculture export financing from N21, 880,773 bn in 2020 to N56, 948,630bn in 2021. The Naira continued depreciation into the period 2021 and exerted a strong effect on agriculture export financing. For example, Naira depreciated by 6.04% from $/N399.91 in 2021 to $/N424.08 in 2022. Agriculture export financing declined from N56, 948,630bn in 2021 to N48, 948,630 bn in 2022. In conclusion, a close look at the trend showed that exchange rate movements caused significant changes in agricultural export loans due to the following:

a. Export Competitiveness: Exchange rate fluctuations can affect the competitiveness of Nigerian agricultural exports. A weaker Naira can make Nigerian exports more attractive in international markets as they become relatively cheaper. This can boost demand for Nigerian agricultural products. Conversely, a stronger Naira can make agricultural exports more expensive for foreign buyers, potentially reducing demand for Nigerian agricultural exports.

b. Export Earnings: Agricultural Export loans are often denominated in foreign currency. When the Naira depreciates, the value of export earnings in local currency terms may increase, potentially benefiting exporters by enhancing their ability to service export loans. However, a depreciating Naira can also lead to increased inflation and higher operating costs for exporters of agricultural products.

c. Cost of Imports: When the local currency (Naira) depreciates against foreign currencies, it becomes more expensive for Nigerian farmers to import goods and raw materials. Farmers must exchange more Naira to obtain the same amount of foreign currency, increasing farm input costs. This can strain the financial resources of importers of farm inputs.

d. Risk Management: Exchange rate fluctuations introduce uncertainty for importers. When the Naira is volatile, importers face greater currency risk. To mitigate this risk, they may need to enter into hedging agreements or pay higher premiums on import finance, such as letters of credit or trade loans, to protect against unfavourable exchange rate movements.

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LITERATURE REVIEW

Empirical Literature

Scholars have debated and argued about the effect of exchange rate management and agricultural export financing in Nigeria. While some found positive effects, other scholars found negative effects, and others found no effect, thereby leaving academia in a quandary.

Olatunji (2017) explored the relationship between exchange rate risk management and export performance, focusing on non-oil exporters in Nigeria. The author noted that his study is critical, given the vulnerability of export-oriented businesses to fluctuations in exchange rates. The author used data and statistical techniques to explore how adopting risk management practices correlates with export success, measured in terms of export volume, revenue, and market competitiveness. Findings from the study suggest that non-oil exporters who actively engage in exchange rate risk management are better positioned to maintain competitive pricing in international markets. This is crucial for sustaining and expanding market shares. The author also noted that exchange rate risk management enables exporters to explore and enter new markets. The ability to manage currency risk enhances exporters' confidence in diversifying their customer base, reducing dependence on specific markets. Hwang & Im (2017) found that declines in trade loans and documentary bills negatively affect Korean exports, especially small and medium-sized enterprises. These studies highlight the importance of adequate finance in promoting export growth and reducing constraints. Internal financing is a crucial trade finance source, particularly among multinational corporations and overseas subsidiaries. Sanati (2018) examined export financing in the form of subsidised export packaging credit as a significant determinant of India's export growth, finding that pre-shipment credit facilitates exports, with medium exporters being the most sensitive to pre-shipment credit. Gezici et al. (2018) found that limited capital on exports affects Turkish manufacturing firms, making firms more productive, profitable, and expansive with fewer constraints. St-Pierre et al. (2018) found that local collaboration among SMBs positively influences export growth and external financing availability.

Ojo's (2018) study investigated the impact of exchange rate volatility on agricultural exports in Nigeria. The author emphasized that understanding this relationship is essential, given the significance of agricultural exports to the country's economy. Ojo utilized empirical analysis to investigate the relationship between exchange rate volatility and agricultural exports in Nigeria. Through econometric models and statistical techniques, the study examines how changes in exchange rate volatility correlate with fluctuations in the value and volume of agricultural exports over time. Ojo's findings suggest that high exchange rate volatility contributes to uncertainty in export prices. This uncertainty affects the profitability of agricultural exports, making it challenging for exporters to plan and execute their trade activities effectively. Exchange rate volatility influences the cost of inputs for agricultural production. Fluctuations in currency values impact the prices of imported inputs, affecting the overall cost structure for farmers and exporters.

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Cho et al. (2019) found that existing bank debtors experience lower interest rates during real exchange rate appreciation, allowing them to export more profitably or increase their export volume. Small Colombian exporters prefer settlement in a currency with an established financial market and use vehicle currency during extreme exchange rate volatility periods. Bruno & Shin (2019) found that an appreciation of the U.S. dollar led banks to rely on wholesale Dollar funding to reduce their credit supply to firms. Fosu and Abass (2019) found that domestic credit improves export diversification in Africa but has a negligible effect on other economies. Silva and Pinto (2019) found that export intensity has an inverse relationship with the leverage ratio, with firms with a greater propensity for expansion being more leveraged.

Ajayi (2019) employed empirical analysis to investigate the relationship between exchange rate policies and economic growth in Nigeria. The study uses econometric models and time-series data to explore the impact of exchange rate stability, volatility, and flexibility on key economic indicators such as GDP growth. Ajayi's findings suggest that a stable exchange rate is positively associated with economic growth. A consistent and predictable exchange rate environment fosters investor confidence, attracts foreign direct investment (FDI), and promotes overall economic stability.

Efanga et al. (2020) examined the nexus between exchange rate and banks' credit to the agricultural sector in Nigeria using ARDL analytical framework. The authors obtained secondary data from the Nigerian Bureau of Statistics (NBS), the Central Bank of Nigeria (CBN), and World Development Indicators (WDI) for the period 1981 to 2018. Inferential statistics showed that the exchange rate has a negative and significant effect on bank credit to the agricultural sector.

Adewole and Olaniyan's (2020) study explored the challenges and prospects of financing cocoa exports in Nigeria. The authors noted that Cocoa is a vital component of Nigeria's agricultural sector and a significant contributor to its economy. The authors identified limited access to credit as a major challenge faced by cocoa exporters in Nigeria. The study delves into the reasons behind this limited access, including stringent lending requirements, high-interest rates, and the perceived risk associated with agricultural ventures. Adewole and Olaniyan's (2020) study provides valuable insights into Nigeria's financing challenges and prospects of cocoa exports. The research sheds light on the multifaceted issues cocoa exporters face and suggests potential pathways, including government interventions and collaborative efforts, to enhance the financial sustainability of the cocoa industry.

Umar (2020) examined the repercussions of exchange rate fluctuations on the accessibility of agricultural credit in Nigeria. The author noted that understanding how exchange rate movements affect credit availability is crucial, given the centrality of credit for the agricultural sector. Findings from the study showed that higher volatility could lead to increased interest rates, potentially impacting the affordability of credit for farmers. Heightened exchange rate volatility results in an increased perception of credit risk by financial institutions. This led to more stringent lending criteria, making it challenging for farmers to qualify for loans. Exchange rate fluctuations were associated with challenges in accessing credit for agricultural purposes.

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THEORETICAL FRAMEWORK

The Mundell-Fleming model

The Mundell-Fleming model, also known as the IS-LM-BP model, is an economic framework that combines elements of the Keynesian IS-LM model with an open economy perspective, considering the foreign exchange market. This model was developed independently by economists Robert Mundell and Marcus Fleming in the early 1960s. The Mundell-Fleming model seeks to explain how changes in fiscal and monetary policy and shocks to the economy impact output, interest rates, and the exchange rate in an open economy. The key components of the model are the IS curve, the LM curve, and the BP (balance of payments) curve.

IS Curve (Investment and Savings):

Similar to the standard IS-LM model, the IS curve represents the equilibrium in the goods and services market. It shows combinations of output and interest rates where total spending equals total output. In an open economy, net exports (exports minus imports) are included in the IS curve.

LM Curve (Liquidity and Money):

The LM curve represents the equilibrium in the money market. It shows combinations of output and interest rates where the demand for money equals the supply of money. Changes in the money supply, which may result from central bank actions, can shift the LM curve.

BP Curve (Balance of Payments):

The BP curve represents the equilibrium in the balance of payments, which includes the trade balance (exports minus imports) and the capital flow. The balance of payments is affected by changes in the exchange rate. An increase in the exchange rate (appreciation) may lead to a decrease in net exports and vice versa.

The interaction of these three curves helps to analyze the impact of various economic policies and external shocks on the key macroeconomic variables:

Fiscal Policy: Changes in government spending and taxation can shift the IS curve.

Monetary Policy: Changes in the money supply or interest rates can shift the LM curve.

Exchange Rate Policy: Changes in the exchange rate, often influenced by central bank interventions, affect the position on the BP curve. The Mundell-Fleming model has important implications for policy analysis, particularly in the trade-off between exchange rate stability and domestic policy autonomy. According to the model, in an open economy, a country cannot simultaneously have fixed exchange rates, free capital movement, and an independent monetary policy. This idea is encapsulated in the Mundell-Fleming trilemma, which posits that a country must choose at most two of these three policy goals. The model has been influential in shaping discussions on international monetary policy and exchange rate regimes, providing insights into how different policy combinations can impact economic variables in an open economy setting.

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METHODOLOGY

Model Specifications

The functional form of the model is specified as;

$InAGRICF_t = f(EXCR, INTR, INF)$……(1)

While the econometric model is stated as follows;

$Y= \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \varepsilon$……(2)

Where:

Y is the endogenous variable,

X_1, X_2, X_3 are exogenous variables,

β_0 is the intercept,

β_1, β_1, and β_1 are the slope coefficients,

ε is the error term.

Equation 2 can be transformed as;

$InAGRICF_t = \beta_0 + \beta_1EXCR_t + \beta_2INTR_t + \beta_3INF_t + \varepsilon_t$……..(3)

Where;

InAGRICF= Natural logarithm of agricultural export financing (response variable)

EXCR = exchange rate (explanatory variable)

INTR = interest rate (control variable)

INF = inflation rate (control variable)

Equation 3 is estimated using Fully Modified Ordinary Least Squares (FMOLS) to address endogeneity issues by considering the simultaneous relationship between variables. This is particularly important when dealing with time series data where variables may be interrelated.

Data Sources

Secondary data for this study is obtained from various editions of Central Bank of Nigeria (CBN) Statistical Bulletin and Nigerian Export and Import Bank (NEXIM) of 23 years (2000 -2022). Meanwhile, agricultural export financing is transformed into a logarithm from its monetary values.

Pre-estimation tests

Descriptive Statistics

According to Seddighi et al. (2000), descriptive statistics summarize a dataset's main aspects, including measures of central tendency, dispersion, and shape. Testing for normality is a common step in descriptive statistics, and it helps to understand the distribution of a variable.

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Many statistical tests, such as t-tests, ANOVA, and regression analysis, assume that the underlying distribution of the data is approximately normal. Checking for normality is crucial to ensure the validity of these statistical methods.

Table 1: Descriptive Statistics

	EXCR	INF	INTR	InAGRICF
Mean	198.8626	12.57565	24.47913	14.75574
Median	153.8600	12.13000	23.79000	14.63083
Maximum	424.0800	18.87000	30.60000	17.85766
Minimum	101.7000	6.330000	18.36000	11.14032
Std. Dev.	100.0078	3.546610	4.062014	1.570888
Skewness	1.055953	-0.058997	0.052722	0.110683
Kurtosis	2.677907	2.127944	1.695651	3.260468
Jarque-Bera	4.373732	0.742137	1.641093	0.111978
Probability	0.112268	0.689997	0.440191	0.945550
Sum	4573.840	289.2400	563.0200	339.3821
Sum Sq. Dev.	220034.2	276.7258	362.9990	54.28916
Observations	23	23	23	23

Source: Authors Computation from E-Views, 2023

Table 1 above presents the descriptive statistics of variables, and our discussion will be based on three parameters (skewness, Kurtosis, Jarque-Bera). For EXCR (Exchange Rate), the skewness is positive (1.06), suggesting a right-skewed distribution. The kurtosis (2.68) indicates that the distribution has relatively heavy tails. The Jarque-Bera statistic (4.37) tests for normality, and the p-value (0.11) suggests that the exchange rate data may not be perfectly normally distributed.

For INF (Inflation), the skewness is close to zero (-0.06), suggesting a relatively symmetric distribution. The kurtosis (2.13) indicates that the inflation rate distribution has somewhat heavy tails. The Jarque-Bera statistic (0.74) and the p-value (0.69) suggest that the inflation rate data is consistent with a normal distribution.

For INTR (Interest Rate), the skewness is close to zero (0.05), suggesting a relatively symmetric distribution. The kurtosis (1.70) indicates that the interest rate distribution has a less pronounced tail behaviour. The Jarque-Bera statistic (1.64) and the p-value (0.44) suggest that the interest rate data is consistent with a normal distribution. For LOGAGRIC (Logarithm of Agricultural Financing), the skewness is close to zero (0.11), suggesting a relatively symmetric distribution. The kurtosis (3.26) indicates that the logarithm of agricultural output has relatively heavy tails. The Jarque-Bera statistic (0.11) and the p-value (0.95) suggest that the logarithm of agricultural output data is consistent with a normal distribution. The descriptive statistics revealed that all the variables are normally distributed.

Unit Root Test Results

It is empirically expedient to examine the presence of stochastic non-stationarity of the variables to establish the order of integration of individual variables. This study adopts Augmented Dickey-Fuller**.**

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Table 2: Augmented Dickey-Fuller (ADF) Unit root test result

Variables	Level	Ist Difference	Remarks
LOGAGRIC	-2.334318	-5.971430	**(1)**
EXCR	2.022355	-4.495755	**(1)**
INTR	-1.620179	-6.023185	**(1)**
INF	-3.321451		**(0)**

Source: Authors Computation from E-Views, 2023

The test for unit root, often applied in time series econometrics, is crucial for determining the stationarity of a variable. One popular test is the Augmented Dickey-Fuller (ADF) test. The ADF test assesses the null hypothesis that a unit root is present in a time series against the alternative hypothesis of stationarity. The null hypothesis of the ADF test is that the variable has a unit root, indicating non-stationarity.

The alternative hypothesis is that the variable is stationary (no unit root). The ADF test produces a test statistic. If this test statistic is less than the critical value (provided in ADF tables), you reject the null hypothesis in favour of stationarity.

We hereby reject the null hypothesis of non-stationarity, implying that the variables in our study are stationary. Stationarity of variables is often desired in time series analysis, as many econometric models assume stationary variables.

Unit root test results showed that the series are of different orders: 1(1) and 1(0). This necessitates the need to establish the existence of long-run relationships among the variables.

Cointegration Test

Date: 11/29/23 Time: 12:47

Sample (adjusted): 2002 2022

Included observations: 21 after adjustments

Trend assumption: Linear deterministic trend

Series: EXCR INTR INF LOGAGRIC

Lags interval (in first differences): 1 to 1

Table 3: Unrestricted Cointegration Rank Test

(Trace)				
Hypothesized		**Trace**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.725879	52.01887	47.85613	0.0193
At most 1	0.489611	24.84096	29.79707	0.1672
At most 2	0.398466	10.71672	15.49471	0.2295
At most 3	0.002046	0.043001	3.841466	0.8357
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level				
* Denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values.				

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Table 3 presents the result of the Unrestricted Cointegration Rank Test using the Trace statistic. This test is commonly used in time series analysis to determine whether a long-term relationship (cointegration) exists among the variables in the model (Engel & Granger, 1987). The series are EXCR, INTR, INF, and LOGAGRIC. The test is based on the null hypothesis of no cointegration, as opposed to the alternative hypothesis of the presence of 1, 2, or 3 cointegrating equations. The trace test indicates the presence of 1 cointegrating equation at the 0.05 significance level because the test statistic for the hypothesis of "None" exceeds the critical value. This implies that there is a long-term relationship among the variables EXCR, INTR, INF, and LOGAGRIC. Based on the apparent existence of long-term relationships among the series, we therefore adopt the Fully Modified Ordinary Least Square (OLS).

Model Estimation

Fully Modified Ordinary Least Square (FMOLS)

FMOLS is designed for cointegration analysis. When dealing with time series data, cointegration is a crucial concept that indicates a long-term relationship among variables. FMOLS accounts for endogeneity issues in the time series data. Endogeneity arises when the explanatory variables are correlated with the error term. FMOLS addresses this concern by considering the simultaneous relationship between variables.

Table 3: Fully Modified Ordinary Least Square Result

Dependent Variable: LOGAGRIC			
Variable	**Coef.**	**t-Stat.**	**Prob.**
EXCR	0.0135	3.2252	0.0045
INTR	-0.1142	-1.1198	0.2767
INF	-0.0809	-0.9840	0.3375
C	15.8762	7.5353	0.0000
R^2	0.4142		
ADJ. R^2	0.3217		
F-Stat.	4.4789		
Prob. F-Stat.	0.0153		

Source: Authors Computation from E-Views, 2023

The regression equation of this study is as stated below:
LOGAGRICF=15.87628+0.013551×EXCR−0.114287×INTR−0.080931×INFLOGAGRIC=15.87628+0.013551×EXCR−0.114287×INTR−0.080931×INF

Table 3 displays the outcomes of the Fully Modified Ordinary Least Square (OLS) regression analysis. The coefficient of determination R-squared (0.414) indicates that the explanatory variables account for approximately 41.4% of the variability in the logarithm of the dependent variable, agriculture export financing. Specifically, the exchange rate coefficient (0.0135) suggests that, while keeping all other variables constant, a one-unit increase in the exchange rate is linked to a 0.0135 unit increase in the logarithm of the dependent variable, agriculture export financing. This indicates a positive relationship between the exchange rate and agriculture export financing, which contradicts the findings of Efanga et al. (2020). The

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coefficient of interest rate (-0.1142) indicates that, while holding other variables constant, a one-unit increase in the interest rate is associated with a 0.1142 unit decrease in the logarithm of the dependent variable, agriculture export financing. This suggests an inverse relationship between interest rates and agriculture export financing. The coefficient of inflation rate (-0.0809) suggests that, while holding other variables constant, a one-unit increase in the inflation rate is associated with a 0.0809 unit decrease in the logarithm of the dependent variable, agriculture export financing. This implies an inverse relationship between inflation rate and agriculture export financing. The t-statistic and associated p-value are employed to assess the null hypothesis that the corresponding coefficient is equal to zero. The F-statistics of 4.4789 with a probability of 0.0153 indicates that the model is appropriately formulated. The intercept (C) and exchange rate coefficients are statistically significant (p-value < 0.05), providing evidence to reject the null hypothesis for these variables. On the other hand, the interest rate and inflation rate coefficients are not statistically significant (p-value > 0.05), indicating insufficient evidence to reject the null hypothesis for these variables.

Robustness Test

Table 4: Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.610665	Prob. F (2,17)	0.5545
Obs*R-squared	1.541633	Prob. Chi-Square (2)	0.4626

Source: Authors Computation from E-Views, 2023

Table 4 presents the Breusch-Godfrey serial correlation LM test based on the null hypothesis that no serial correlation exists in the residuals. A high p-value suggests that there is not enough evidence to reject the null hypothesis. In this case, with a p-value of 0.5545, we fail to reject the null hypothesis, indicating that there is no strong evidence of serial correlation in the residuals. Additionally, an Obs*R-squared of 1.5416 and a high p-value of 0.4626 indicate the absence of serial correlation in the residuals.

Table 5: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.292374	Prob. F (3,19)	0.3058
Obs*R-squared	3.897947	Prob. Chi-Square (3)	0.2727
Scaled explained SS	7.288425	Prob. Chi-Square (3)	0.0633

Source: Authors Computation from E-Views, 2023

The results of the Breusch-Pagan-Godfrey Heteroskedasticity Test suggest no strong evidence of heteroskedasticity in the residuals of the regression model. The p-values associated with both the F-statistic and the Chi-Square tests are relatively high, indicating that we fail to reject the null hypothesis of homoskedasticity. However, the p-value for the scaled explained sum of squares is borderline, so it is worth considering this result cautiously. Overall, the evidence for heteroskedasticity is not strong based on these results.

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CONCLUSIONS AND RECOMMENDATIONS

This study investigated the nexus between exchange rate management and agriculture export financing in Nigeria. Time series data of agricultural export financing, exchange rate, interest rate, and inflation rate in Nigeria from 2000 to 2022. Data for the study were obtained from Central Bank of Nigeria Statistical Bulletin. This paper adopted Fully Modified Ordinary Least Squares (FMOLS) to experience efficient and unbiased estimates when the errors in the model are normally distributed and to test whether a specific variable has a statistically significant impact on the dependent variable. The findings from the study revealed that exchange management is significant in determining agricultural export financing in Nigeria. It is therefore recommended that the Central Bank of Nigeria (CBN) adjust interest rates to stabilize the Naira because changes in interest rates can influence the cost of borrowing for farmers. If higher interest rates accompany a currency depreciation, it can increase the cost of agricultural financing. It is therefore recommended that the Central Bank of Nigeria (CBN) adjust interest rates to stabilize the Naira because changes in interest rates can influence the cost of borrowing for farmers. If higher interest rates accompany a currency depreciation, it can increase the cost of agricultural financing.

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