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Original Article

Investigating the Exchange Rate Regimes, Agricultural Output, and Economic Growth in Nigeria: A Transmission Approach

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Abstract: Persistent calls for economic diversification in Nigeria underscore the need to reduce reliance on oil revenues and explore alternative sources of income. The agricultural sector emerges as a critical driver in this diversification strategy, offering opportunities for revenue generation, employment creation, and the development of value-added chains. However, Nigeria's heavy dependence on imports renders the agricultural sector susceptible to exchange rate volatility. This study examines the impact of exchange rate regimes on agricultural output and economic growth in Nigeria through a transmission mechanism framework over the period 1970Q1 to 2023Q4. Utilizing secondary quarterly data obtained from the World Bank, this study investigates the direct and indirect effects of exchange rates on economic growth via agricultural output using Structural Vector Autoregression (SVAR), impulse response functions, and variance decomposition. Findings indicate that higher exchange rates negatively affect agricultural output. In low exchange rate regimes, increased agricultural output contributes modestly to economic growth due to limited domestic processing. Conversely, in high exchange rate regimes, agricultural output tends to reduce economic growth, primarily due to the export of unprocessed goods. The study recommends maintaining a stable and low exchange rate, investing in processing facilities, and strengthening institutional support to enhance the agricultural sector's role in long-term economic growth.

Keywords: Exchange Rate Regimes; Agricultural Output; Economic Growth; Structural Vector Autoregression (SVAR); Import Dependence; Value Addition Chains.

1. Introduction

In past decades, the Nigerian economy has heavily relied on the agricultural sector, which was the mainstay of the economy in the early 1960s. It has been a key driver for growth and development. In most

developing countries, particularly low and middle-income nations, the agricultural sector remains the largest contributor. It provides inputs, food, employment opportunities, and raw materials for other industries. Additionally, it generates foreign earnings from the exportation of surpluses and offers significant value-added benefits through various production processes (Izuchukwu, 2011). The Nigerian government has continuously implemented agricultural programs and policies to ensure sustained agricultural productivity. However, the success of the agricultural sector largely depends on determinants such as the exchange rate. Nigeria's economy relies heavily on imported commodities for both direct and indirect consumption. This dependency poses a challenge to many sectors, including agriculture, as the cost of imported agricultural inputs such as mini machines, improved seeds, and chemicals is significantly influenced by the prevailing exchange rate (Oyovwi, 2012).

One of the main objectives of macroeconomic policy is to achieve significant economic growth, measured by continuous increases in national income. Growth is perceived to have occurred when a country's overall productive capacity improves (Akpan, 2008). Therefore, the government utilizes monetary and fiscal instruments to achieve desired growth and development, although the implementation of these instruments can sometimes be contradictory. For instance, the exchange rate, as a monetary policy tool, can be managed through floating or rigid exchange rate regimes, influencing the economy differently. A high exchange rate often leads to a loss of value for the domestic currency, making locally produced goods more attractive internationally. However, this can have a ripple effect on other sectors, such as agriculture (Kalu et al., 2019). Nigeria maintained a low exchange rate for an extended period until the second quarter of 2015, when it experienced a significant upward hike. This shift has sparked mixed reactions regarding the effectiveness of exchange rate regimes, particularly concerning the agricultural sector's contribution to Nigeria's growth and development. This paper examines both the instantaneous and long-term effects of exchange rate regimes on economic growth through agricultural output in Nigeria.

2. Literature Review

2.1. The impact of exchange rate on agricultural output

Eniekezimene et al. (2024) applied the Dutch Disease Syndrome theoretical framework using the non-linear autoregressive distributed lag (NARDL) method to analyze the Asymmetric Impact of Exchange Rate on Agricultural Output in Nigeria from 1981 to 2021. The study finds that the long-term effect of the exchange rate on Nigerian agricultural output is symmetrical, whereas the short-term effect is asymmetrical. Specifically, the long-term symmetrical effect indicates that an appreciation in the exchange rate increases real agricultural GDP by approximately 8.8%, whereas depreciation increases it by only 0.11%. As a result, given the positive impact of the exchange rate on agricultural production in the long run, it is recommended that the Nigerian government explore enhancing the competitiveness of the agricultural sector as part of its economic diversification efforts.

Olaoye (2022) utilized the autoregressive distributed lag (ARDL) technique to investigate the influence of exchange rate fluctuations on the output of Nigeria's agricultural sector. Annual time series data from the Central Bank of Nigeria Statistical Bulletin (2021) was employed for the study. The findings indicate that in the short run, exchange rate fluctuations had a negative impact on agricultural output, although this effect was not statistically significant. However, in the long run, exchange rate fluctuations positively affected agricultural output, and this effect was statistically significant. Therefore, the study concludes that exchange rate fluctuations have a lasting impact on agricultural output in Nigeria.

Dangok and Ige (2020) investigated the impact of exchange rate volatility on agricultural commodity prices in Nigeria. The study employed the Non-linear Autoregressive Distributed Lag (NARDL) model using monthly data on real effective exchange rate, agricultural output prices, inflation rate, and RGDP spanning from 2000 to 2018. The study revealed a positive and statistically significant relationship between both positive and negative changes in the exchange rate and agricultural commodity prices. Additionally, the study found that the inflation rate negatively affects agricultural commodity prices, whereas RGDP positively affects them. Furthermore, the asymmetric test conducted using Wald Statistics indicated that positive and negative changes in the exchange rate of the same magnitude have an equal impact on agricultural commodity prices.

Obiageli (2020) investigated the impact of the nominal exchange rate on the output of Nigeria's agricultural sector. The study employed econometric techniques including Augmented Dickey Fuller tests for Unit Roots and Ordinary Least Squares (OLS) regression analysis. The results indicate that the nominal exchange rate and money supply have a positive and significant effect on agricultural sector output, whereas the interest rate and inflation rate have a negative and insignificant effect on agricultural sector output. Based

on these findings, the study concludes that the exchange rate adversely affects the performance of agricultural sector output and has not contributed to improving investment rates in agriculture in Nigeria.

Awolaja and Okedina (2020) investigated the impacts of real exchange rate appreciation and depreciation on aggregate and sectoral agricultural output in Nigeria. Employing the nonlinear Auto-Regressive Distributed Lag (ARDL) cointegration framework, the study analyzed both long- run and short-run asymmetric relationships between the real exchange rate and aggregate and sectoral agricultural output. The findings demonstrate the presence of cointegration between the real exchange rate and aggregate as well as sectoral agricultural output. In the long run, real exchange rate appreciation significantly increases both aggregate and sectoral agricultural output, whereas real exchange rate depreciation has a negative and significant effect. Moreover, the long- run estimates indicate that the positive effects of real exchange rate increase on agricultural output are greater than the negative effects of real exchange rate decreases.

Gama et al. (2018) examined the impact of exchange rate fluctuations on agricultural output in Nigeria from 1970 to 2015. The study utilized time series data and conducted unit root tests to ensure the data's stationarity at the level. Multiple regression analysis was employed to estimate the effects of the exchange rate and other variables on agricultural output. The results revealed that government expenditure (GE), weather conditions (WR), and total gross domestic product (TGDP) significantly influenced agricultural output. However, while the exchange rate showed a positive relationship with agricultural output, it was not statistically significant.

Wasiu and Ndukwe (2018) employed a combination of stationary and nonstationary variables as determined by the ADF unit root test. The study used the Bounds test for cointegration and found no evidence of a long-run relationship between the real exchange rate and agricultural output, regardless of the model specifications. Overall, the results of the model estimation indicated that the significant drivers of agricultural output include the real exchange rate (in log-levels), real appreciation and depreciation (with some lags), industrial capacity utilization rate, and government expenditure on agriculture (with some lags). The Agricultural Credit Guarantee Scheme Fund (ACGSF) loan had a positive but insignificant influence on agricultural output. Additionally, although the effect of real appreciation was larger than that of real depreciation, the study did not find any evidence supporting the asymmetric effect of real exchange rate dynamics on agricultural output performance in the Nigerian economy.

Oyinbo et al. (2014) investigated the causal relationship between exchange rate deregulation and the agricultural share of gross domestic product (GDP) in Nigeria using econometric methods. The study utilized time series data spanning 26 years (1986 – 2011) for exchange rates and GDP. The analysis included augmented Dickey-Fuller unit root tests, unrestricted vector autoregression, pairwise Granger causality, and vector error correction models. The findings revealed a unidirectional causality from the exchange rate to the agricultural share of GDP. Furthermore, the study concluded that exchange rate deregulation had a negative influence on the agricultural share of GDP in Nigeria.

2.2. The impact of Agricultural output on Economic growth

Nwogwugwu et al. (2023) examine the role agriculture plays in the development of a nation, whose agriculture is agrarian and remained largely traditional and concentrated in the hands of smallholders and pastoralists, who used crude rudimentary implements such as hoes, cutlasses, axe and sticks. The study limits itself to the important role of the agricultural sector in engendering sustainable development, despite its neglect which has resulted to the mass exodus of rural able bodied young men and women to the urban cities in search of non-existence white-collar jobs. The sector has been neglected to the extent that its contribution to the GDP has been dwindling since 1990s, in spite of the various ambitious intervention strategies and policies put in place to boost agriculture. Consequently.

Emmanuel et al. (2021) examined the impact of agricultural output on economic growth in Nigeria. The study carried out pre-diagnostic tests including the Unit root test to test the stationarity of the data and the cointegration test to confirm the long-run relationship between variables. Error correction model (ECM) was used in the data analysis. Findings from the study revealed that there exists a long-run relationship between the variables. The results of the error correction model (ECM) revealed that the coefficient of livestock and fishery production were both positive with values of 5.0526 and 67.26 respectively and significant at a 5% level with the p-value 0.0432 and 0.0292. Crop production and forestry had a negative and insignificant impact on Nigeria's economic growth with the coefficient of -4.593964, and -2.625762 and p-value of 0.6432, and 0.6432, respectively.

Awoyemi et al. (2017) investigated the influence of agricultural productivity on economic growth in Nigeria from 1981 to 2015. The Johansen cointegration test was used to assess the presence of a long-run

relationship between agricultural productivity and economic growth. Additionally, an Error Correction Model (ECM) was employed to analyze the short-run impact of agricultural productivity on economic growth. The results indicated that agricultural labor productivity and agricultural value added were positive determinants of economic growth. Based on these findings, the study concluded that enhancing the performance of the agricultural sector has a substantial effect on economic growth in Nigeria.

Sertoğlu et al. (2017) examines the impact of agricultural sector on the economic growth of Nigeria, using time series data from 1981 to 2013. Findings revealed that real gross domestic product, agricultural output and oil rents have a long-run equilibrium relationship. Vector error correction model result shows that, the speed of adjustment of the variables towards their long run equilibrium path was low, though agricultural output had a positive impact on economic growth.

2.3. The impact of Exchange Rate on Economic growth

Uchechi and Ihuekwumere (2022) focused on establishing the extent to which Naira rate have influenced economic growth from using data spanning between 1987 and 2018; and the extent to which the Naira rate has influenced inflation in Nigeria within the same time frame. This study however employed Ordinary Least Squares technique of analysis to construct a regression model to test stated hypotheses. Findings revealed that the Naira rate has no significant impact on economic growth in Nigeria and that the Naira rate has a significant influence on inflation rate in Naira.

Ani and Udeh (2021) examined the effect of exchange rate on the economic growth of Nigeria. It specifically looked at effect of exchange rate on gross domestic product (GDP), gross national product (GNP) and unemployment. Secondary data from the Central Bank of Nigeria Statistical Bulletin were collected for a period of ten years, 2009 to 2018. Diagnostic tests were carried out to confirm the integrity of the data and their relatedness in both short- and long-term basis, Ordinary Least Square technique was employed in the analysis of hypotheses. It was found that while exchange rate had significant effect on GDP and GNP, it was non- significant on unemployment. This implies that micro economic indices of GDP and GNP could be used to consciously adjust standard of living of the citizens. The study concludes that exchange rate should be handled with utmost concern by experts in the field to avoid unnecessary fluctuations that may inflict unbearable economic consequences on the Nigerian people.

Akinbode et al. (2019) assessed empirically the impact of exchange rate on economic growth in Nigeria from 1981 to 2016. Data series were assessed for stationarity with the aid of the ADF test. Bound test was conducted, and the model was estimated within the ARDL framework supported by the relevant post estimation diagnostic tests. The bound test showed that there was long run relationship among the study variables. Model estimation revealed that import, lag of trade openness, FDI, lag of exchange rate, interest rate and inflation significantly affected the growth of the economy in the short run. In the long run, economic growth was affected by trade openness, FDI, exchange rate, government expenditure and interest rate. It was concluded that the present year exchange rate did not affect economic growth in the short run, but its one-year lag did, while exchange rate had negative effect on the growth of the Nigerian economy in the long run.

Jonathan and Ezekiel (2019) examined the effects of exchange rate fluctuation on economic growth in Nigeria from 1981-2018. Autoregressive Distributed Lag Model (ARDL) model was used for data analysis, dependent variable for the study is Real Gross Domestic Product (RGDP) which is used as a proxy for Economic Growth and the independent variables are Import (IMPO), Export (EXP), Exchange rate (EXR), government capital expenditure (GOCEXP) and Inflation rate (INFR). The findings of the study revealed that exchange rate, export, government capital expenditure have positive impact on RGDP both in the long-run and short-run however IMP has a negative impact on RGDP both in the short-run and long-run meanwhile INFR has a negative and statistically significant impact on RGDP in the short-run.

3. Materials and Methods

The study made use of Secondary data, and the data is sourced from world bank data site. Preliminary tests were performed on the data, including the Augmented dickey-fuller (ADF), and the Johansen co-integration test. Additionally, the diagnostic tests were performed, such as the Choleskey Normality test, VAR Residual serial correlation LM and VAR Residual Heteroskedasticity. The study applies unit root with structural breaks to determine the low and high regime exchange rate. The study further, examined instantaneous and the pass-through effect of exchange rate on economic growth through agriculture output with the aid of SVAR, impulse response and variance decomposition. The effect of exchange rate regimes on economic growth through agricultural output is expressed by:

$$\ln RGDP = f(\ln AOUT, \ln EXCR), \quad (1)$$

Where: GDP is Gross Domestic product, a proxy for economic growth, EXCR is Exchange Rate, AOUT is Agricultural Output and ln is Natural Logarithm. When the above equation is converted to a stochastic form, it is specified as follows:

$$\ln GDP_t = \beta_0 + \beta_1 \ln AOUT_t + \beta_2 \ln EXCR_t + \mu_t, \quad (2)$$

The generic expression of SVAR is stated as:

$$A_0 = A_1 Y_{t-1} + \varepsilon_t, \quad (3)$$

Whereas $A0$ is the value of the dependent variable in the current period, $A1$ is the parameter estimate, $Yt{-}1$ is the value of the independent variable in period t-1 and ϵ_t is the stochastic error term

$$\ln GDP_t = \theta^1_{11} \ln GDP_{t-1} + \theta^1_{12} \ln EXCR_{t-1} + \theta^1_{13} \ln AOUT_{t-1} + \theta^0_{12} \ln EXCR_t + \theta^0_{13} \ln AOUT_t + \mu_{1t}, \quad (4)$$

$$\ln EXCR_t = \theta^1_{21} \ln GDP_{t-1} + \theta^1_{22} \ln EXCR_{t-1} + \theta^1_{23} \ln AOUT_{t-1} + \theta^0_{21} \ln GDP_t + \theta^0_{23} \ln AOUT_t + \mu_{2t} \quad (5)$$

$$\ln AOUT_t = \theta^1_{31} \ln RGDP_{t-1} + \theta^1_{32} \ln EXCR_{t-1} + \theta^1_{33} \ln AOUT_{t-1} + \theta^0_{31} \ln RGDP_t + \theta^0_{32} \ln EXCR_t + \mu_{3t} \quad (6)$$

Upon rewriting the SVAR model to account for contemporaneous effects and imposing some constraints, it becomes:

$$\ln GDP_t - \theta^0_{12} \ln EXCR_t - \theta^0_{13} \ln AOUT_t = \theta^1_{11} \ln GDP_{t-1} + \theta^1_{12} \ln EXCR_{t-1} + \theta^1_{13} \ln AOUT_{t-1} + \mu_{1t} \quad (7)$$

$$-\theta^0_{21} \ln GDP_t + \ln EXCR_t - \theta^0_{23} \ln AOUT_t = \theta^1_{21} \ln GDP_{t-1} + \theta^1_{22} \ln EXCR_{t-1} + \theta^1_{23} \ln AOUT_{t-1} + \mu_{2t} \quad (8)$$

$$-\theta^0_{31} \ln GDP_t - \theta^0_{32} \ln EXCR_t + \ln AOUT_t = \theta^1_{31} \ln GDP_{t-1} + \theta^1_{32} \ln EXCR_{t-1} + \theta^1_{33} \ln AOUT_{t-1} + \mu_{3t} \quad (9)$$

The following equations can be expressed as matrices:

$$\begin{matrix} 1 & -\emptyset^0{}_{12} & -\emptyset^0{}_{13} \\ \{-\emptyset^0{}_{21} & 1 & -\emptyset^0{}_{23}\} \\ -\emptyset^0{}_{31} & -\emptyset^0{}_{32} & 1 \end{matrix} \begin{matrix} GDP_t \\ \{EXCR_t\} \\ AOUT_t \end{matrix} = \begin{matrix} \emptyset^1{}_{11} & \emptyset^1{}_{12} & \emptyset^1{}_{13} \\ \{\emptyset^1{}_{21} & \emptyset^1{}_{22} & \emptyset^1{}_{23}\} \\ \emptyset^1{}_{31} & \emptyset^1{}_{32} & \emptyset^1{}_{33} \end{matrix} \begin{matrix} GDP_{t-1} \\ \{EXCR_{t-1}\} \\ AOUT_{t-1} \end{matrix} + \begin{matrix} \mu_{1t} \\ \{\mu_{2t}\} \\ \mu_{3t} \end{matrix}$$

Using the recursive method, we can limit the upper elements above the matrix diagonal to zero. That is, $\emptyset^0{}_{12} = \emptyset^0{}_{13} = \emptyset^0{}_{23} = 0$. Thus, the restricting parameters in A_0 yields:

$$\begin{matrix} 1 & 0 & 0 \\ \{-\emptyset^0{}_{21} & 1 & 0\} \\ -\emptyset^0{}_{31} & -\emptyset^0{}_{32} & 1 \end{matrix} \begin{matrix} GDP_t \\ \{EXCR_t\} \\ AOUT_t \end{matrix} = \begin{matrix} \emptyset^1{}_{11} & \emptyset^1{}_{12} & \emptyset^1{}_{13} \\ \{\emptyset^1{}_{21} & \emptyset^1{}_{22} & \emptyset^1{}_{23}\} \\ \emptyset^1{}_{31} & \emptyset^1{}_{32} & \emptyset^1{}_{33} \end{matrix} \begin{matrix} GDP_{t-1} \\ \{EXCR_{t-1}\} \\ AOUT_{t-1} \end{matrix} + \begin{matrix} \mu_{1t} \\ \{\mu_{2t}\} \\ \mu_{3t} \end{matrix}$$

We separate the actual spill overs from the correlated errors by specifying the above structural model to avoid cross-error correlation to determine the shock spill overs. As a result, the matrix is specified as follows:

$$\begin{matrix} 1 & 0 & 0 \\ \{-\emptyset^0{}_{21} & 1 & 0\} \\ -\emptyset^0{}_{31} & -\emptyset^0{}_{32} & 1 \end{matrix} \begin{matrix} \mu_t{}^{GDP} \\ \{\mu_t{}^{EXCR}\} \\ \mu_t{}^{AOUT} \end{matrix} = \begin{matrix} \delta_1 & 0 & 0 \\ \{0 & \delta_2 & 0\} \\ 0 & 0 & \delta_3 \end{matrix} \begin{matrix} \mu_{1t} \\ \{\mu_{2t}\} \\ \mu_{3t} \end{matrix}$$

Hence, variance forecast can be stated in matrix form as:

$$e_t = A_0{}^{-1} B U_t = \begin{matrix} \mu_t{}^{GDP} \\ \{\mu_t{}^{EXCR}\} \\ \mu_t{}^{AOUT} \end{matrix} = \begin{matrix} a & 0 & 0 \\ \{b & c & 0\} \\ d & e & f \end{matrix} \begin{matrix} \mu_{1t} \\ \{\mu_{2t}\} \\ \mu_{3t} \end{matrix}$$

4. Results

4.1. Descriptive Statistics

Table 1. Result of Descriptive Statistic Analysis

	EXCR	AOUT	GDP
Mean	95.5381	8.27E+12	3.44E+13
Median	21.9456	1.14E+12	4.25E+12
Maximum	390.34	4.96E+13	2.02E+14
Minimum	0.54678	1.21E+10	8.96E+09
Skewness	1.14404	1.767861	1.559719
Kurtosis	3.21612	5.270428	4.374227
Jarque-Bera	47.5382	158.9056	104.5746
Probability	0.00000	0.00000	0.00000

Table 1 shows descriptive statistics, including the mean, maximum, minimum, and the Jarque-Bera test for exchange rate, agricultural output, and economic growth. The mean values indicate that, on average, the exchange rate is ₦95.53, agricultural output is ₦827 billion, and economic growth is ₦3440 billion. The highest exchange rate, agricultural output, and economic growth were recorded in 2023Q1 and 2022Q1, respectively. Conversely, the lowest levels for these variables were observed in 1980Q1 for the exchange rate, and 1970Q1 for both agricultural output and economic growth. The Jarque-Bera test results indicate that the data is not normally distributed, as evidenced by the probabilities of 0.00 for the exchange rate, agricultural output, and economic growth.

4.2. Unit Root

To assess the stationarity of the data, the Augmented Dickey-Fuller (ADF) test is used to determine whether the variables are stationary or require differencing to achieve stationarity. The study first applies unit root with structural breaks to determine low regime and high regime of exchange rate. The study further uses ADF unit root tests to examine the dynamic properties of the data and in modeling the relationships between indicators more accurately.

4.2.1. Unit Root with Structural Break

Figure 1 captures that the Dickey-Fuller t-statistics indicate that the Nigerian exchange rate experienced a breakpoint in 2015Q1. This led to the implementation of the conventional unit root on 3 datasets 1970 – 2015Q1, 2015Q2 – 2023Q4 and 1970Q1 – 2023Q4.

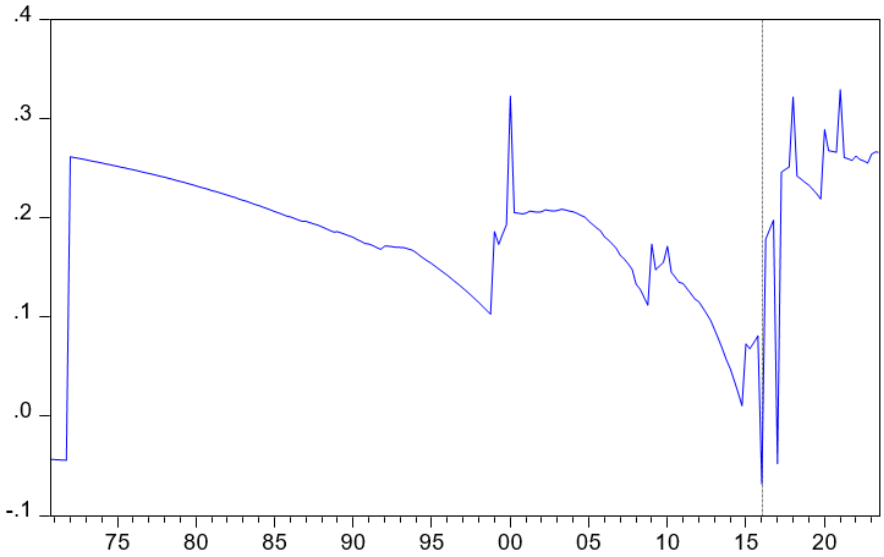


Figure 1. Result of Unit Root with Structural Breaks for Exchange rate

4.2.2. Unit Root Test using Augmented Dickey-Fuller

Table 2. Result of Unit Root Test using Augmented Dickey-Fuller

Variables	Full Sample 1970-2023		1970Q1-2015Q1		2015Q2-2023Q4		Decision
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	
EXCR	0.9995	0.0000	0.9956	0.0000	0.2863	0.0000	I(1)
AOUT	0.9081	0.0026	0.9586	0.0068	0.5131	0.0063	I(1)
GDP	0.3356	0.0002	0.8356	0.0000	0.4227	0.0001	I(1)

Table 2 reveals result of ADF unit root test result for full, low regime and high regime. The result show that exchange rate, agricultural output and economic growth are integrated of order one. This implies the variables were not stationary at levels thus were difference once to achieve stationarity.

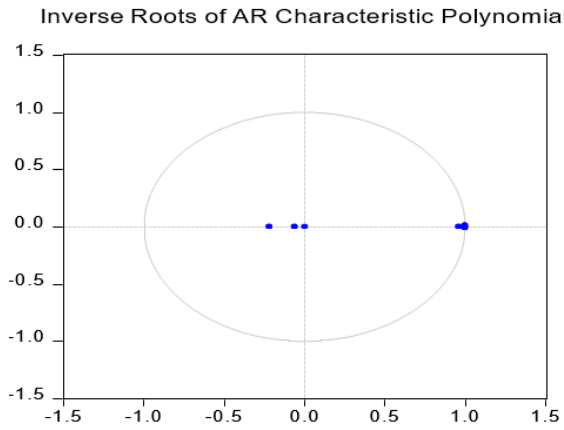
4.3. Diagnostics

To ensure data quality and validity, the study employs diagnostic tests designed to identify potential issues, errors, or violations of assumptions that could affect the reliability or interpretation of the results. Specifically, the study uses the Cholesky normality test, VAR serial correlation test, and VAR heteroscedasticity test to validate the dataset.

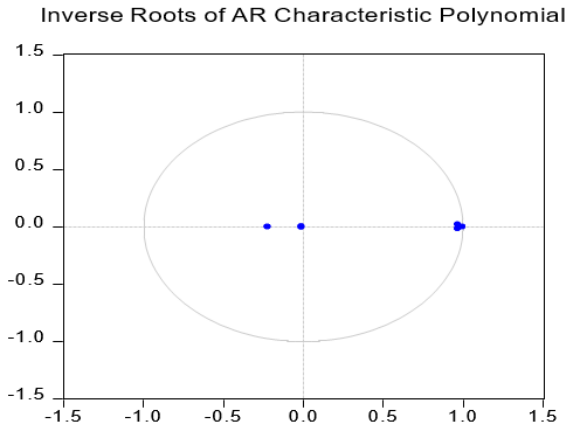
Table 3. Result of Diagnostics

	Normality Test	Serial Correlation	Heteroscedasticity
Full Sample 1970-2023	0.0000	0.3630	0.4150
Low Regime 1970Q1-2015Q1	0.0000	0.0770	0.4346
High Regime 2015Q2-2023Q4	0.0027	0.1534	0.6230

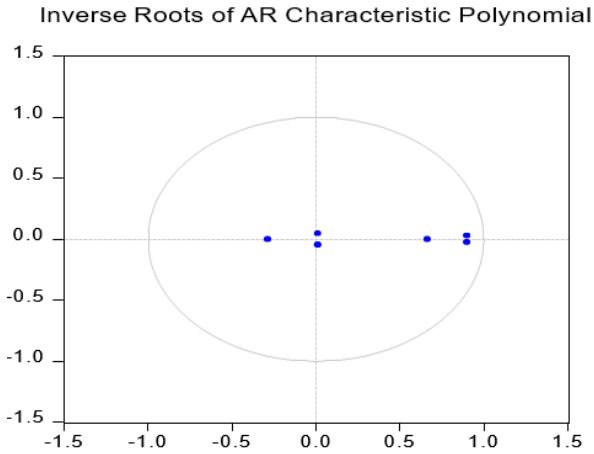
Table 3 captures the results of the diagnostic tests for the full sample (1970-2023), the low regime (1970Q1-2015Q1), and the high regime (2015Q2-2023Q4) are presented in Table 3. Given a threshold of 0.05, if the probability value is greater than this threshold, the null hypothesis is rejected, indicating that the residuals contain measurement errors. The probability values for the full sample, low regime, and high regime are 0.0000, 0.0000, and 0.0027, respectively, which are all below the critical level of 0.05. This implies that the residuals are not normally distributed. Additionally, the data for the full sample, low regime, and high regime show no evidence of serial correlation, with probability values of 0.630, 0.0770, and 0.1534, respectively. Finally, the probability values for heteroskedasticity in the full sample, low regime, and high regime are 0.4150, 0.4346, and 0.6230, respectively, indicating that the data do not exhibit heteroskedasticity. Despite the expectation that data should be normally distributed, the study carefully selected estimation techniques that produce reliable estimates.



(a) Full sample



(b) Low regime sample



(c) High regime sample

Figure 2. Result of model stability

To evaluate the robustness and stability of the model, this study utilizes the inverse roots of the autoregressive (AR) characteristic polynomial. This method checks if the model meets the essential stability condition. For the model to be considered stable, all inverse roots of the AR characteristic polynomial must lie within the unit circle. A close examination of Figures 2 (a, b and c) indicates that the models for the full sample, low regime, and high regime are stable.

4.4. Contemporaneous effect of Exchange Rate Regimes, Agricultural Output and Economic Growth in Nigeria

Table 4. Result of SVAR Contemporaneous Coefficient

Sample(s)		C1	C2	C3
Full Sample 1970-2023	Coefficient	-0.0019	0.0004	-0.7477
	Prob.	0.0109	0.5676	0.0000
Low Regime 1970Q1-2015Q1	Coefficient	0.0022	-0.0006	-0.7370
	Prob.	0.0613	0.5530	0.0000
High Regime 2015Q2-2023Q4	Coefficient	-0.0021	0.0021	-1.1533
	Prob.	0.0000	1.1380	0.0045

Table 4 presents the contemporaneous effect coefficients: C1 represents the response of economic growth to a shock in agricultural output, C2 represents the response of economic growth to a shock in the exchange rate, and C3 represents the response of agricultural output to a shock in the exchange rate. The full sample coefficients indicate that a one-time shock in agricultural output will negatively impact economic growth by 0.0019%. This result is statistically significant at the 5% level, suggesting that an increase in agricultural output will increase economic growth in Nigeria, although the effect is negligible. Additionally, the results show that a unit change in the exchange rate will positively affect economic growth in Nigeria. However, with a probability value of 0.5676, this result is not statistically significant at the 5% critical level, indicating insufficient evidence to conclude that an increase in the exchange rate will boost economic growth in Nigeria. Conversely, a one-time shock in the exchange rate will negatively affect agricultural output in Nigeria by 0.7477%, a result that is significant at the 5% level. This implies that a unit change in the exchange rate will instantaneously reduce agricultural output. This finding is theoretically plausible, as an increase in the exchange rate may lead to higher costs for agricultural inputs, thereby negatively affecting output.

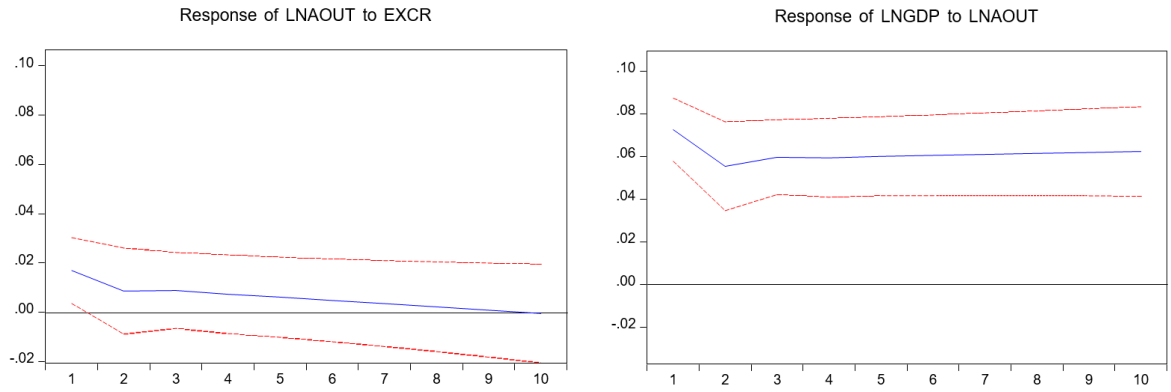
The results for the low regime exchange rate period (1970Q1-2015Q1) indicate that a unit change in agricultural output will positively impact economic growth by 0.0022%. However, this result is not statistically significant at the 5% critical level, suggesting that there is insufficient evidence to assert with confidence that an increase in agricultural output will affect economic growth in Nigeria. This might be because most agricultural outputs are not processed within Nigeria, which would otherwise add value and

contribute to economic growth. Conversely, a one-time shock in the exchange rate is shown to negatively impact economic growth by 0.0006%, but this result is also not statistically significant at the 5% critical level. This suggests that there is not enough evidence to definitively conclude that an increase in the exchange rate will decrease economic growth in Nigeria. However, the results show that a one-time shock in the exchange rate will negatively influence agricultural output by 0.7370%, a result that is statistically significant at the 0.05 critical level. This implies that an increase in the exchange rate will reduce agricultural output, aligning with theoretical expectations. An increased exchange rate adds pressure on agricultural input costs, which in turn negatively affects agricultural output.

The instantaneous coefficient for the high exchange rate regime (2015Q2-2024Q4) suggests that a one-time shock in agricultural output will negatively impact economic growth by 0.0021%, a result that is statistically significant at the 5% level. This indicates that an increase in agricultural output in Nigeria will reduce economic growth in the short term. Although this finding contradicts theoretical expectations, it may be due to the time required for agricultural output to contribute positively to growth through value-added processing. Additionally, the results reveal that a change in the exchange rate will positively influence economic growth by 0.0021%. This suggests that an increase in the exchange rate will lead to a rise in economic growth. However, this increase may be nominal, as a higher exchange rate raises the value of imported commodities. For Nigeria, an import-dependent nation, this results in higher commodity costs, reflecting an increase in nominal growth rather than real growth. Nonetheless, this result is not statistically significant at the 5% critical level. Lastly, the results show that a one-time shock in the exchange rate will negatively impact agricultural output by 1.1533%, a result that is statistically significant at the 5% critical level. This implies that an increase in the exchange rate will significantly reduce agricultural output.

4.5. VAR Impulse Response Function

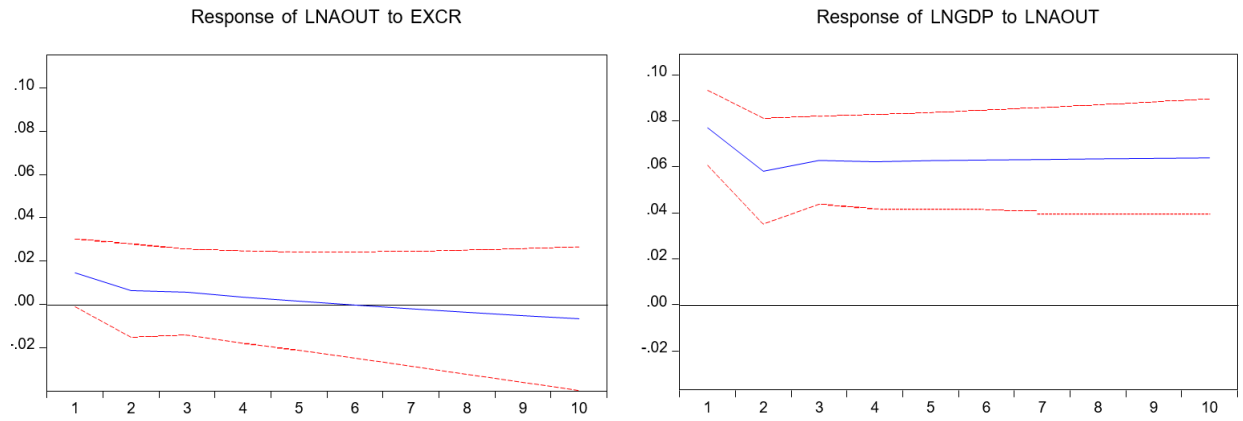
The impulse response function plots illustrate how endogenous variables respond to one-time volatility in their present and future values. These responses are detailed in three subsections: impulse response function for full sample, low regime sample and high regime sample.



(**a**) Agricultural Output to Exchange Rate (**b**) Economic Growth to Agricultural Output

Figure 3. Result of Impulse Response Function (IRF) for Full regime sample

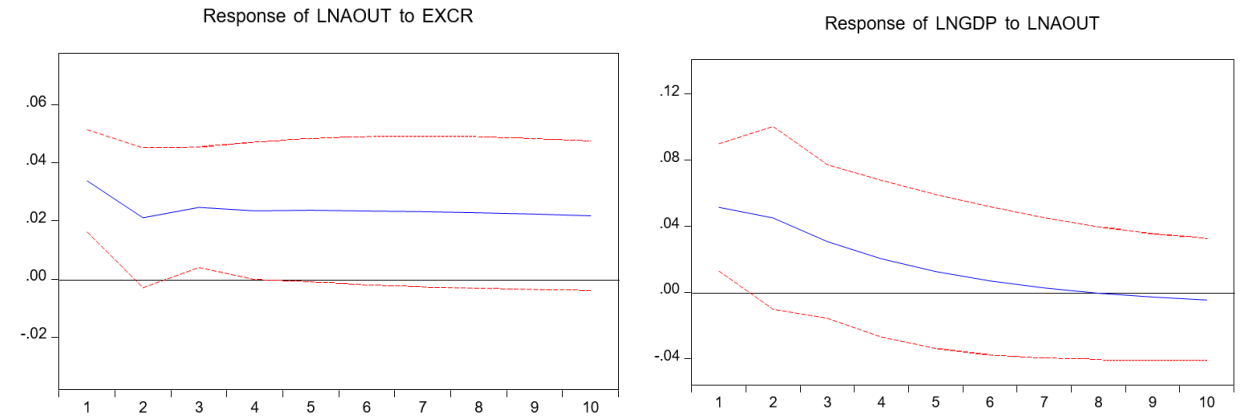
The result of VAR impulse response in Figure 3 (a) reveals that a positive shock to the exchange rate initially will leads to a small but positive increase in agricultural output. However, this positive effect will diminish over time, approaching zero by the seventh period and fizzle out in the eight period thereafter. This suggests that while exchange rate changes can have a short-term positive impact on agricultural output, the effect does not persist in the long term. Figure 3 (b) illustrates that an initial shock to agricultural output causes a decline in economic growth. However, from the second period onward, the response improves slightly and stabilizes, remaining positive throughout the forecast period. This suggests that increases in agricultural output exert a positive and enduring influence on economic growth in Nigeria.



(**a**) Agricultural Output to Exchange Rate (**b**) Economic Growth to Agricultural Output

Figure 4. Result of Impulse Response Function (IRF) for Low regime sample

The results in Figure 4 (a) shows that an initial shock in the exchange rate positively influences agricultural output, but this effect diminishes quickly and turns slightly negative over time. This suggests that while agricultural output may initially benefit from changes in the exchange rate, the long-term impact is neutral to slightly negative, highlighting the sensitivity of the agricultural sector to exchange rate volatility. The result presented in Figure 4 (b) indicates that an initial shock in agricultural output leads to a positive impact on GDP. Despite a slight decline in the second period, the response stabilizes and remains positive over the long term. This suggests that increases in agricultural output positively and significantly contribute to economic growth in Nigeria, with the effect being stable and persistent over time.



(**a**) Agricultural Output to Exchange Rate (**b**) Economic Growth to Agricultural Output

Figure 5. Result of Impulse Response Function (IRF) for High regime sample

Figure 5 (a) suggests that an initial shock in the exchange rate leads to a positive impact on agricultural output. Despite a decline in the second period, the response become stable and remains positive over the forecast period. This connote that changes in the exchange rate will positively and significantly contribute to agricultural output in Nigeria, with the effect being stable and persistent over the forecast period. Figure 5 (b) shows that while a shock in agricultural output initially has a positive effect on GDP, this effect diminishes over time and turns negative in the long run. This implies that short-term gains in agricultural output do not translate into sustained economic growth, possibly due to structural inefficiencies or other economic factors in Nigeria that prevent agricultural output from having a long-term positive impact on GDP.

5. Discussion

The results from the contemporaneous SVAR coefficients for both low and high exchange rate regimes reveal that an instant increase in the exchange rate will decrease agricultural output in Nigeria, which is

theoretically plausible. This finding is consistent with Olaoye (2022), who found that the exchange rate negatively impacts agricultural output in Nigeria. This result is logical because an increase in the exchange rate raises the cost of agricultural inputs, thereby reducing agricultural output. Thus, the low exchange rate regime sample suggests that an increase in agricultural output will marginally increase economic growth in Nigeria. This finding aligns with Emmanuel et al. (2021), who concluded that agricultural output contributes positively to economic growth. However, the contribution is minimal, likely because most agricultural outputs are not processed within Nigeria, contributing less to economic growth. On the other hand, the high exchange rate regime sample reveals that an increase in agricultural output will decrease economic growth in Nigeria. Although this finding contradicts theoretical expectations, it may be because most Nigerian agricultural products are exported raw without value-added processing, which would otherwise reflect in real economic growth. Overall, these results highlight the complex relationship between exchange rates, agricultural output, and economic growth in Nigeria, underscoring the importance of processing agricultural products domestically to enhance their contribution to economic growth.

Secondly, the study objective is to examine the transmission effect of low and high exchange rate regimes on economic growth through agricultural output in Nigeria. The impulse response results for the low exchange rate regime suggest that agricultural output may benefit from a low exchange rate, but these benefits are confined to the short and medium term. The findings indicate that agricultural output contributes significantly to economic growth and remains stable throughout the forecast period. This implies that a low exchange rate is a key contributor to stable and sustained economic growth in Nigeria via agricultural output. A lower exchange rate reduces the cost of agricultural inputs, stimulating agricultural activities and increasing output. This increase in agricultural output can then enhance economic activities, leading to economic growth. Conversely, the results for the high exchange rate regime indicate that while agricultural output might benefit from a high exchange rate, the positive effects on economic growth are not sustained due to structural inefficiencies. A high exchange rate leads to increased costs for agricultural inputs, which can reduce agricultural output. Although there might be short-term benefits, these are outweighed by the long-term negative impacts on agricultural productivity and, consequently, economic growth. Again, the variance decomposition analysis for both low and high exchange rate regimes suggests that the exchange rate is a major determinant of economic growth in Nigeria. This highlights the critical role of exchange rate policies in influencing economic outcomes through their impact on agricultural output.

6. Conclusions

The study underscores the importance of maintaining a low exchange rate to support agricultural output and, by extension, economic growth in Nigeria. While high exchange rates may offer short-term benefits, they are less effective for sustaining long-term economic growth due to the increased costs of agricultural inputs and the resulting reduction in output. Based on the findings, the study recommends the following: The Nigerian government, through the monetary authorities, should prioritize policies that ensure a stable and low exchange rate. This approach will reduce the cost of agricultural inputs, making farming more affordable and stimulating agricultural production, which will, in turn, boost economic growth. The government should encourage and invest in agricultural processing facilities. This will help create jobs, improve the country's trade balance, and enhance the earnings of farmers and intermediaries. Value addition through processing will also contribute to a more robust and sustainable agricultural sector. Lastly, the government should reinforce institutional support to ensure the successful implementation of monetary and agricultural policies. This involves strengthening the regulatory framework to effectively implement and monitor these policies. An effective regulatory framework will ensure that both monetary and agricultural policies are properly executed, significantly contributing to economic growth in Nigeria.

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