

Rice Export and Its Effect on Gross Domestic Product in Nigeria: Growth 2000 - 2023

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Abstract

This study examined the relationship between rice exports, exchange rate and GDP growth in Nigeria using annual time-series data covering the period 2000–2023. The study employed trend analysis, Ordinary Least Squares (OLS) regression, an Autoregressive Distributed Lag (ARDL) dynamic regression model, and pairwise Granger causality tests to examine the relationship among rice exports, exchange rate and GDP growth. Unit root tests using the Augmented Dickey–Fuller (ADF) procedure showed that GDP growth, exchange rate and rice exports were stationary at level, indicating that all variables were integrated of order zero, $I(0)$. Trend analysis showed that the exchange rate exhibited a significant upward trend, whereas GDP growth displayed a significant negative trend over the study period. Rice exports exhibited a positive but statistically insignificant linear trend. The OLS results

showed that the exchange rate had a positive and statistically significant association with GDP growth at the 10% level, while rice exports had a positive but statistically insignificant association with GDP growth. The ARDL dynamic regression results showed that lagged GDP growth was positive and statistically significant at the 1% level, indicating persistence in GDP growth. The exchange rate also had a positive association with GDP growth and was statistically significant at the 10% level, whereas rice exports remained statistically insignificant. The pairwise Granger causality test provided weak evidence that the exchange rate Granger-predicts GDP growth at the 10% level, while no evidence of Granger-predictive causality was found between rice exports and GDP growth. The findings indicate that rice exports had not established a statistically significant relationship with Nigeria's GDP growth during the study period. The study therefore highlights the importance of strengthening rice productivity, export competitiveness and value-chain development to increase the potential contribution of rice exports to economic growth.

Keywords: Rice export; GDP growth; exchange rate; ARDL model; OLS regression; Nigeria

Introduction

International trade refers to the exchange of goods and services across national borders through imports and exports. Imports involve the purchase of goods and services from other countries, while exports involve the sale of domestically produced goods and services to foreign markets. Export activities generate foreign exchange earnings, stimulate production, create employment, and contribute to economic growth (Stojanov et al., 2024). Nigeria's export sector is an important contributor to foreign exchange earnings, employment generation, and economic growth. The sector comprises both oil and non-oil exports, including agricultural commodities, solid minerals, manufactured goods, textiles, and services (Cole and Aminu, 2012). Nigeria has always relied on oil export revenue to support its development objectives and economic expansion (Oyelaran-Oyeyinka, 2022).

The importance of agricultural products, particularly rice to Nigeria's export industry is a reflection of both the country's potential economically and of its rich cultural legacy. Nigeria has made progress in utilizing its non-oil exports, such as agricultural products, to promote diversification, create new sources of income, raise GDP, and provide economic stability. Over the years, the Nigerian government has implemented several policies to boost domestic rice production, aiming to reduce import dependency and enhance self-sufficiency. Although Nigeria primarily focuses on meeting domestic demand, rice exports, albeit limited, have potential implications for its economy

(Otsuka and Larson 2013). Rice is a significant crop in Nigeria, serving as a staple food for the majority of its population. Nigeria is one of Africa's leading rice-producing countries, contributing over 70% to the continental supply; although Nigeria primarily produces rice for domestic consumption, limited quantities are exported to neighboring countries such as Niger, Chad, and Benin Republic (USDA, 2024).

Despite the growing importance of rice production, Nigeria's rice export sector continues to face several challenges. Some of the issues this industry faces are post-harvest losses, insufficient value addition and processing facilities, inadequate infrastructure, currency volatility, hurdles to market access, poor productivity levels and policy gaps (Kaur et al., 2021). Exchange rate fluctuations influence the competitiveness and profitability of rice exports by affecting export prices, production costs, and foreign exchange earnings. Persistent depreciation of the naira creates uncertainty for exporters and may discourage investment in export-oriented rice production (Akpaetti et al., 2024). Exchange rate variations lead to pricing issues, affecting global customers' purchasing power and altering the cost dynamics for exporters. This affects regular financial growth, enterprise sustainability, and funding decisions. Uncertainty over export revenue is brought about by fluctuations in the Naira value relative to major currencies in the world, such as the US dollar and EU Euro. Research has demonstrated that elevated fluctuations in exchange rates impede economic expansion by increasing domestic expenses, weakening productivity and profitability, and reducing competitiveness. The broad objective of the study is to examine the relationship between rice exports, exchange rate and GDP growth in Nigeria from 2000 to 2023. Specifically, the study aims to: (i) examine the trends in rice exports, exchange rate and GDP growth; (ii) estimate the relationship between rice exports, exchange rate and GDP growth; and (iii) examine the predictive causality among rice exports, exchange rate and GDP growth.

Literature Review

Exports refer to domestically produced goods and services sold to foreign markets for foreign exchange earnings (Aliyu, 2007). Gross domestic product, or GDP, refers to the total monetary or market value of all finished goods and services produced inside a country's borders over a specific time period. It serves as a thorough assessment of the state of the economy in a particular nation by serving as a broad gauge of total domestic production (Dynan & Sheiner, 2018). The relative cost of one currency represented in terms of another currency (or collection of currencies) is known as an exchange rate (Reserve Bank of Australia, 1983). It is crucial for figuring out the dynamics of trade and capital flow and is used to calculate the relative values of different currencies. The terms of trade refer to the rate at which the

goods of one country are exchanged for the goods of another country (Jhingan, 2012). It is an indicator of the purchasing power of a country in terms of its exports and imports, and is stated as the relationship between export prices and import prices of products. Nigeria is among the leading rice-producing countries in Africa, with production estimated at approximately 5.23 million metric tons in 2024 (USDA, 2024).

Ricardo (1817), in his famed theory of comparative advantage, showed that countries benefit by specializing in the production of those goods with the lowest opportunity cost and trading the surplus of production over domestic demand, taking as given appropriate exchange-rate regimes. Under this model, a country will specialize in sectors in which it has a comparative advantage. The classical theory is easily couched in terms of comparative cost specifically; the theory states that a country will tend to export the commodity whose comparative cost is higher in pre-trade isolation. Given the assumption of constant costs, a country will specialize completely in the production of the commodity in which it has comparative advantage. Rice-producing countries have a comparative advantage over other countries because they can produce it at a much lower opportunity cost. The neoclassical (modern) theory of international trade arose in an attempt to improve some of the shortcomings of the classical theory. The neoclassical theory provided a more convincing explanation for the presence of comparative cost differences between countries by including capital as a second factor of production and accounting for international differences in demand patterns.

The Ohlin theory (1933) (also known as the H-O model) is a model in international economics that explains how countries engage in trade based on their relative factor endowments, essentially the amounts of labor, land, and capital they possess. The theory, developed by Swedish economists Eli Heckscher and Bertil Ohlin, proposes that countries will export items that intensely use factors of production that are abundant, while importing things that require factors that are relatively scarce. Sanjuán-López and Dawson (2010) use panel cointegration methods to investigate the relationship between GDP and agricultural and nonagricultural exports in 42 nations. Their findings suggest a long-run link between the variables in the model. The findings also demonstrate that agricultural exports from Granger stimulate economic growth. Confirm the export-led growth theory for the 42 nations under consideration. Similarly, Henneberry and Curry (1992) examine the relationship between agricultural exports and economic growth in Pakistan. Using three simultaneous equations representing GDP, agricultural exports, and imports, they find a favourable relationship between agricultural exports and economic growth in the country.

Empirical Review

Several studies have examined the relationship between agricultural exports and economic growth in developing economies. Sanjuán-López and Dawson (2010) investigated this linkage in a panel of 42 developing countries over the period 1970–2004, employing panel cointegration techniques. Their findings confirm a long-run equilibrium relationship between agricultural exports and GDP, with an estimated agricultural export elasticity of GDP at 0.07, while non-agricultural exports exhibit a higher elasticity of 0.13. The results support the export-led growth hypothesis, as total exports Granger-cause GDP, though structural differences emerge across income groups, suggesting balanced export promotion for lower-income countries and greater emphasis on non-agricultural exports for higher-income ones.

Similarly, Kang (2015) analyzed the role of agricultural exports, particularly rice, in major exporting countries including Thailand, Vietnam, India, and Pakistan, using data from 1980–2010. Employing an extended production function framework and time-series methods such as vector error correction models (VECM), the study demonstrates that rice exports exert a significant positive influence on economic growth in both the short and long run, underscoring their importance as a driver of GDP expansion in these economies.

In the Nigerian context, where heavy reliance on crude oil exports has rendered the economy vulnerable to external shocks, numerous studies advocate diversifying export earnings toward agricultural commodities to foster sustainable economic growth. Ijirshar (2015) conducted an empirical analysis using time-series data and econometric techniques, revealing a positive and significant long-run impact of agricultural exports on GDP growth. Olaleye et al. (2013) examined export diversification over a 30-year period, finding that increases in the shares of agricultural and non-oil exports positively affect per-capita GDP, with bidirectional causality between agricultural exports and growth confirmed via Granger causality tests.

Further supporting evidence includes Muhammad (2020), who utilized cointegration and vector error correction methods on 1980–2016 data to highlight agriculture's role in reducing oil dependence and enhancing non-oil exports and broader growth. Recent contributions, such as Utuk et al. (2023), affirm a positive association between agricultural exports and growth, amplified by value-added agriculture, while Owan (2020) notes positive effects from non-oil exports (including agriculture) on overall growth, albeit moderated by exchange-rate volatility.

Methodology

The study was conducted in Nigeria. Nigeria is a major country in West Africa, recognized for the size of its population and economic power. Nigeria

is one of the continent's largest countries, with an area of around 923,769 square kilometers. It is a federal republic with 36 states and the Federal Capital Territory, which includes the capital city, Abuja. (Federal Republic of Nigeria, 2024) Nigeria's topography is very diversified, with dry zones in the north, savannahs in the center, and tropical rainforests in the south. This diversified climate supports a wide range of agricultural operations. The country's diversified ecosystems enable the production of a wide variety of crops. Descriptive statistics were used to summarize and describe the key elements of the data on the quantity of rice exports, exchange rates, and GDP over the study period. Ordinary Least Squares (OLS) regression was employed to estimate the relationship between GDP and the explanatory variables.

Secondary data were used in the study. The data were obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin, National Bureau of Statistics (NBS), and Food and Agriculture Organization (FAO) database, covering the period 2000 to 2023. The dataset comprised annual observations on GDP growth, rice exports and exchange rate.

GDP growth (GDPG) was used as the dependent variable and was measured as Nigeria's annual percentage growth rate of real GDP (%). Rice exports (RE) were measured as the annual quantity of rice exported in metric tonnes (MT), while the exchange rate (EXR) was measured as the official Nigerian naira value per United States dollar (₦/US\$). The variables were compiled as annual time-series observations for the period 2000–2023.

The study employed trend analysis, Ordinary Least Squares (OLS) regression, an Autoregressive Distributed Lag (ARDL) dynamic regression specification and pairwise Granger causality tests to examine the relationship among rice exports, exchange rate and GDP growth.

Before estimating the regression models, unit root tests were conducted using the Augmented Dickey-Fuller (ADF) procedure to determine the stationarity properties of the time series variables. Testing for stationarity is essential in time series analysis because non-stationary variables may lead to spurious regression results. The ADF test was therefore applied to examine whether the variables are stationary at level or become stationary after differencing.

The Ordinary Least Squares (OLS) regression technique was then applied to estimate the short-run relationship between GDP growth rate and the explanatory variables. OLS was selected because it provides unbiased and efficient estimates when classical regression assumptions are satisfied.

To further capture dynamic relationships among the variables, the Autoregressive Distributed Lag (ARDL) model was employed. The ARDL approach is suitable for small sample sizes and allows for the inclusion of lagged values of both dependent and independent variables in the model. It also helps to examine both short-run and dynamic adjustments in the

relationship between rice export, exchange rate, and economic growth. Diagnostic statistics including the coefficient of determination, F statistic, and Durbin-Watson statistic were used to evaluate the goodness of fit and reliability of the estimated models.

Trends Model:

Trend Model

To examine the trends in rice export quantity, exchange rate and GDP growth in Nigeria over the period 2000–2023, a simple linear trend analysis was employed. The trend model is specified as:

$$Y_t = \alpha + \beta t + \varepsilon_t$$

where:

Y_t = the value of the variable of interest in year t ;

t = time trend, measured from 2000 to 2023;

α = constant term;

β = coefficient of the time trend; and

ε_t = error term.

The trend model was estimated separately for rice export quantity, exchange rate and GDP growth. A positive and statistically significant coefficient of the time trend indicates an increasing trend, whereas a negative and statistically significant coefficient indicates a declining trend. A statistically insignificant coefficient indicates that the variable did not exhibit a statistically significant linear trend over the study period.

Ordinary Least Squares (OLS) Regression

Ordinary Least Squares (OLS) regression was employed to estimate the association between GDP growth, rice exports and the exchange rate in Nigeria. The model is specified as:

$$GDPG_t = \beta_0 + \beta_1 RE_t + \beta_2 EXR_t + \varepsilon_t$$

where:

$GDPG_t$ = annual GDP growth rate in year t (%);

RE_t = quantity of rice exports in year t (MT);

EXR_t = exchange rate in year t (₦/US\$);

β_0 = intercept;

β_1, β_2 = regression coefficients; and

ε_t = stochastic error term.

A priori, $\beta_1 > 0$ and $\beta_2 > 0$.

Autoregressive Distributed Lag (ARDL) Dynamic Regression

To examine the dynamic association between GDP growth, rice exports and exchange rate, the study estimated an ARDL (1,0,0) dynamic regression specification. The model is expressed as:

$$GDPG_t = \alpha + \phi GDPG_{t-1} + \beta_1 EXR_t + \beta_2 RE_t + \varepsilon_t$$

where $GDPG_t$ represents the current annual GDP growth rate, $GDPG_{t-1}$ represents the one-period lag of GDP growth, EXR_t represents the exchange rate, RE_t represents rice exports, α is the intercept, and ε_t is the error term.

The inclusion of the lagged dependent variable allows the model to capture persistence in GDP growth and the dynamic association between current GDP growth and the explanatory variables. Since the estimated specification does not include an ARDL bounds test or an error-correction representation, the coefficients are interpreted as dynamic regression associations rather than evidence of a long-run cointegrating relationship.

Results and Discussion

Summary Statistics for all the variables

Summary Statistics for the Variables

Table 1 presents the summary statistics for exchange rate (EXR), GDP growth and rice exports (RE) for the period 2000–2023. The mean exchange rate was ₦198.9996/US\$, while the mean GDP growth rate was 5.0506%. Rice exports averaged 337.5417 MT during the study period. The exchange rate recorded positive skewness of 1.0624, while GDP growth had relatively low positive skewness of 0.4301. Rice exports exhibited substantial positive skewness of 3.5658, indicating that the distribution was strongly influenced by relatively high export observations in some years. The Jarque–Bera statistics indicate that exchange rate and GDP growth do not significantly depart from normality at the 5% level, whereas rice exports significantly depart from normality ($p < 0.001$). The descriptive statistics provide an overview of the distribution and variability of the variables prior to the econometric analysis.

Table 1: Summary Statistics for all the variables

	EXR	GDP	RICE
Mean	198.9996	5.050559	337.5417
Median	153.8625	5.612804	0.000000
Maximum	425.9792	15.32916	5196.000
Minimum	101.6973	-1.794253	0.000000
Std. Dev.	100.3166	3.630260	1158.649
Skewness	1.062442	0.430121	3.565803
Kurtosis	2.699514	4.287476	14.64698
Jarque-Bera	4.413531	2.397611	186.5120
Probability	0.110056	0.301554	0.000000
Sum	4576.991	121.2134	8101.000
Sum Sq. Dev.	221395.4	303.1120	30876760
Observations	24	24	24

Unit Root Test of the variables

The Augmented Dickey–Fuller (ADF) unit root test was conducted to examine the stationarity properties of gross domestic product (GDP), the exchange rate (EXR), and rice exports (RE). The results in Table 2 show that all three variables are stationary in levels. The ADF test statistics for GDP (−4.3828), EXR (−4.1846), and RE (−4.9101) are more negative than the reported 1% critical value of −3.7500. Similarly, their respective p-values of 0.0041, 0.0067, and 0.0009 are below the 1% significance threshold. The null hypothesis of a unit root is therefore rejected for each variable, indicating that GDP, EXR, and RE are integrated of order zero, $I(0)$, under the reported test specification.

Table 2: Augmented Dickey–Fuller unit root test results

Variable	Test specification	ADF statistic	1% critical value	5% critical value	10% critical value	p-value	Decision	
GDP	Level/trend	-4.3828***	-3.7500	-3.0000	-2.6300	0.0041	Stationary at level, $I(0)$	at
EXR	Level/trend	-4.1846***	-3.7500	-3.0000	-2.6300	0.0067	Stationary at level, $I(0)$	at
RE	Level/trend	-4.9101***	-3.7500	-3.0000	-2.6300	0.0009	Stationary at level, $I(0)$	at

*** Significant at 1%, ** Significant at 5%, * Significant at 10% Probability Levels

Where EXR= Exchange Rate, GDP= Gross Domestic Product, RE= Rice Export

Trend Analysis of the variables

Table 3 shows the trend equation of the exchange rate. The result shows that the coefficient of the time variable is positive and significant at the 1 percent level of probability. This implies that it has a positive trend. Figure 4.1 below shows the trend of growth in the Exchange Rate (EXR) from 2000 to 2023. From the graph, the exchange rate shows a sharp rise around 2016, likely due to the economic recession and reduced oil revenues, which pressured the naira. This period also saw the introduction of the Central Bank's flexible exchange rate policy in an attempt to stabilize the currency. Additionally, this continuous increase can be influenced by government policies like the removal of fuel subsidies and exchange rate adjustments, which contributed to the Naira's depreciation during this period.

Table 3: Trend equation of Exchange Rate

Variable	Coefficient	t-Statistic	Probability
YEAR	13.16819	8.958935	0.0000
R-squared	0.792618		
Adjusted R-squared	0.782743		
F-statistic	80.26252		
Durbin-Watson stat	0.201957		

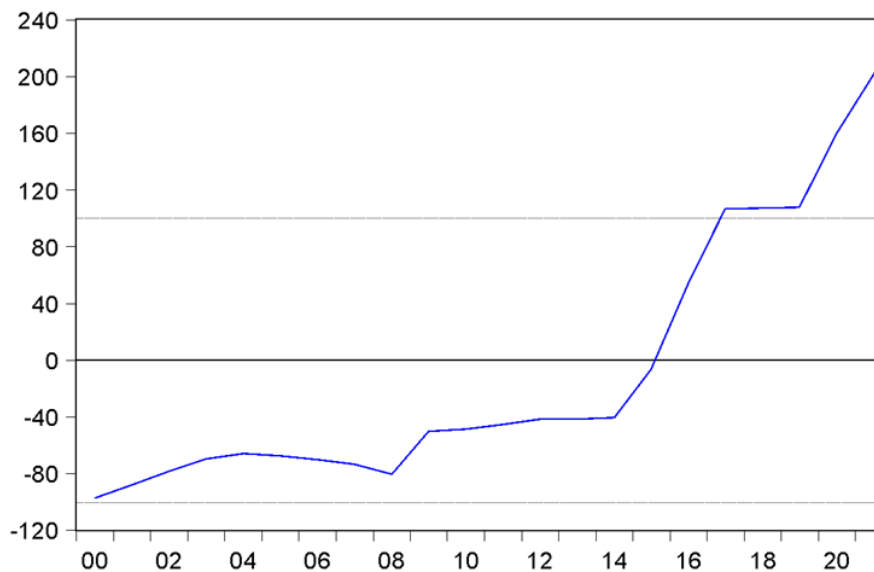


Figure 1: Graphical trend of the exchange rate: 2000 - 2023

Trend equation of Gross Domestic Product

Trend Equation of GDP Growth

Table 4 presents the estimated linear trend in Nigeria's GDP growth rate from 2000 to 2023. The coefficient of the time variable is negative and statistically significant at the 1% level ($\beta = -0.3571$, $p = 0.0002$). This indicates a statistically significant downward trend in the annual GDP growth rate over the study period. The estimated coefficient implies that, on average, the GDP growth rate declined by approximately 0.36 percentage points per year over the period, based on the fitted linear trend.

The R-squared value of 0.4839 indicates that approximately 48.4% of the variation in GDP growth is explained by the linear time trend. The significant negative trend should not, however, be interpreted as evidence that Nigeria's GDP level declined continuously throughout the period. Rather, it indicates a decline in the annual rate of economic growth over the study period. The graphical pattern shows periods of relatively stronger growth followed by periods of slower or negative growth, including the pronounced slowdown associated with the 2016 recession.

Table 4: Trend equation of Gross Domestic Product: 2000 - 2023

Variable	Coefficient	t-Statistic	Probability
YEAR	-0.357142	-4.541952	0.0002
R-squared	0.483923		
Adjusted R-squared	0.460465		
F-statistic	20.62933		
Durbin-Watson stat	1.709233		

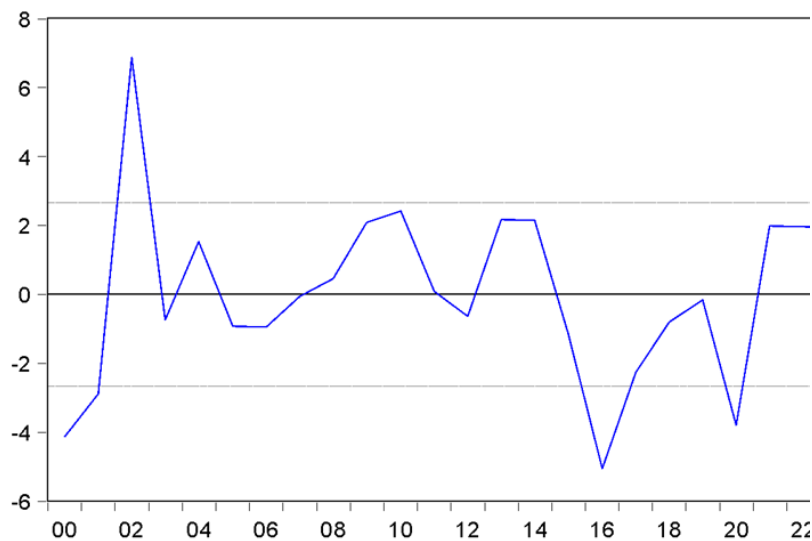


Figure 2: Graphical trend of Gross Domestic Product: 2000 - 2023

Trend equation of Rice Export

Table 5 shows the trend equation of rice exports. The coefficient of the time trend is positive but statistically insignificant ($p = 0.8168$), indicating that rice exports did not exhibit a significant upward trend over the study period. The very low R^2 of 0.0025 indicates that the time trend explains only about 0.25% of the variation in rice exports. The negative adjusted R^2 of -0.0428 further confirms that the fitted linear trend provides virtually no explanatory improvement over a model containing only the intercept. The F-statistic of 0.0550 is also consistent with the absence of a statistically significant linear trend. The Durbin-Watson statistic of 2.1826 does not indicate an obvious first-order positive serial-correlation problem in the residuals.

Figure 4.3 below shows the trend of growth in Rice Export (RE) from 2000 to 2023. The graph shows that Nigeria's rice exports were minimal from 2000 to 2012 due to low production and reliance on imports. Exports increased between 2010 and 2014 with government efforts to boost local production but faced a decline due to production challenges before rising again as self-sufficiency efforts improved.

Table 5: Trend equation of rice exports

Variable	Coefficient	t-Statistic	Probability
YEAR	8.182174	0.234507	0.8168
R-squared	0.002493		
Adjusted R-squared	-0.042848		
F-statistic	0.054993		
Durbin-Watson stat	2.182572		

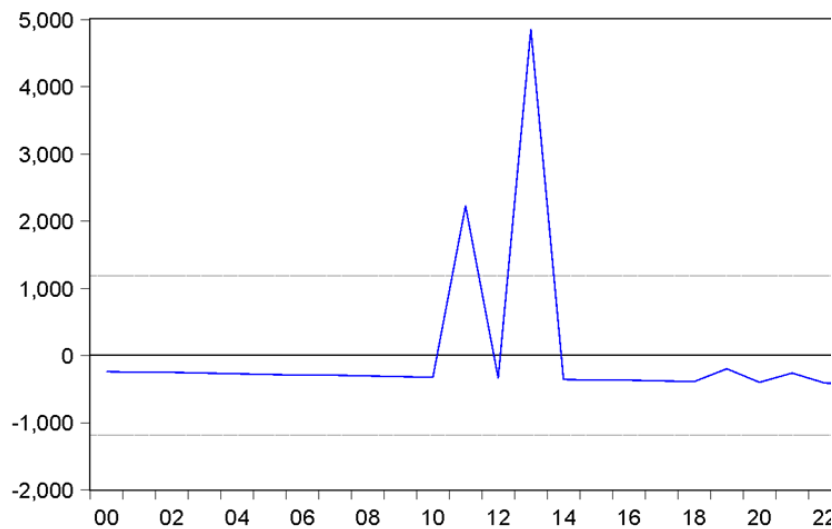


Figure 3: Graphical trend of Rice Export: 2000 - 2023

Estimated result of the relationship between GDP and the independent variables (EXR and RE)

Estimated Relationship between GDP Growth and the Independent Variables

Table 6 presents the Ordinary Least Squares (OLS) estimates of the relationship between GDP growth, exchange rate, and rice exports in Nigeria. The coefficient of determination ($R^2 = 0.1452$) indicates that exchange rate and rice exports jointly explain approximately 14.5% of the variation in GDP growth over the study period, while the remaining variation is associated with other factors not included in the model. The overall F-statistic of 1.7839 indicates that the explanatory variables are not jointly statistically significant at conventional probability levels. The Durbin–Watson statistic of 1.4137 suggests the possibility of positive first-order serial correlation in the residuals, which warrants caution in interpreting the static OLS estimates. The coefficient of the exchange rate is positive (0.2181) and statistically significant at the 10% level ($p = 0.0799$). This indicates that, holding rice exports constant, a one-unit increase in the exchange rate, measured as naira per US dollar, is associated with an estimated 0.218 percentage-point increase in Nigeria's annual GDP growth rate. The result represents an association with GDP growth rather than the GDP level. The positive coefficient may reflect the role of exchange-rate movements in influencing export competitiveness and other external-sector components of economic activity, although the statistical evidence is relatively weak because significance is attained only at the 10% level.

Rice exports have a positive coefficient of 0.000546, but the relationship is statistically insignificant ($p = 0.4101$). This indicates that the estimated positive association between rice export quantity and GDP growth is not statistically distinguishable from zero during the study period. Given that rice exports were relatively small and highly variable over the period, their direct contribution to aggregate GDP growth may have been limited.

Table 6: The estimated results of the relationship between GDP) and the independent variables (EXR and RE)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXR	0.218080*	0.118511	1.840169	0.0799
RE	0.000546	0.000650	0.840549	0.4101
C	2.347276	1.604667	1.462781	0.1583
R-squared	0.145223			
Adjusted R-squared	0.063815			
F-statistic	1.783899			
Durbin-Watson stat	1.413702			

***Significant at 1%, ** Significant at 5%, * Significant at 10% Probability Levels where RE = (Rice Export) EXR = (Exchange Rate) and GDP = (Gross Domestic Product)

Autoregressive Distributed Lag Dynamic Regression Results

The dynamic regression results in Table 7 show that the one-period lag of GDP growth has a positive coefficient of 0.514862 and is statistically significant at the 1% level ($p = 0.0093$). This indicates that previous-period GDP growth is positively associated with current GDP growth, conditional on the exchange rate and rice exports. The result indicates persistence in the annual GDP growth rate, whereby stronger growth in the preceding period is associated with stronger growth in the current period.

The exchange-rate coefficient is positive at 0.205423 and statistically significant at the 10% level ($p = 0.0810$). Thus, holding the other variables constant, a one-unit increase in the exchange rate is associated with an estimated 0.205 percentage-point increase in the GDP growth rate. However, because the relationship is statistically significant only at the 10% level, the evidence should be regarded as relatively weak.

Rice exports have a positive coefficient of 0.000490, but the relationship is statistically insignificant ($p = 0.3944$). The result therefore does not provide sufficient statistical evidence that changes in rice export quantity were associated with changes in GDP growth within the estimated dynamic specification.

The model has an R-squared value of 0.4213 and an adjusted R-squared of 0.3299, indicating that approximately 42.1% of the sample variation in GDP growth is accounted for by the variables included in the specification, with the adjusted measure accounting for the number of explanatory terms. The Durbin-Watson statistic of 1.9638 is close to 2, suggesting no obvious first-order residual autocorrelation in the estimated

dynamic regression. However, the estimated coefficients should be interpreted as dynamic associations because no ARDL bounds test or error-correction model was estimated to establish a long-run cointegrating relationship.

Table 7: Autoregressive Distributed Lag (ARDL) dynamic regression results for GDP growth, exchange rate and rice exports

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
GDPG(-1)	0.514862***	0.177830	2.895251	0.0093
EXR	0.205423*	0.111468	1.842879	0.0810
RE	0.000490	0.00053	0.871361	0.3944
C	0.043415	1.603971	0.027067	0.9787
R-squared	0.421273			
Adjusted R-squared	0.329896			
F-statistic	4.610234			
Durbin-Watson stat	1.963785			

***Significant at 1%, ** Significant at 5%, * Significant at 10% Probability Levels where RE = (Rice Export) EXR = (Exchange Rate) and GDP = (Gross Domestic Product)

Pairwise Granger Causality Tests

Table 8 presents the pairwise Granger causality tests for GDP growth, exchange rate and rice exports. The results show no evidence that GDP growth Granger-predicts the exchange rate ($p = 0.5217$), while there is weak evidence that the exchange rate Granger-predicts GDP growth at the 10% significance level ($F = 3.25582$; $p = 0.0635$). Thus, the null hypothesis that the exchange rate does not Granger-predict GDP growth can be rejected at the 10% level, but not at the 5% level. This result should therefore be interpreted as weak evidence of predictive content rather than as a firm unidirectional causal relationship.

The results further indicate no evidence of Granger predictive causality between rice exports and exchange rate. Specifically, rice exports do not Granger-predict the exchange rate ($p = 0.2181$), while the exchange rate does not Granger-predict rice exports ($p = 0.6438$). Similarly, neither rice exports nor GDP growth significantly Granger-predicts the other. The null hypothesis that rice exports do not Granger-predict GDP growth cannot be rejected ($p = 0.8413$), while the null hypothesis that GDP growth does not Granger-predict rice exports also cannot be rejected ($p = 0.9795$).

Overall, the results provide no evidence of predictive causality between rice exports and GDP growth during the study period. The only comparatively notable result is the weak evidence that exchange-rate movements contain information useful for predicting GDP growth at the 10% significance level. These results should be understood within the Granger framework, which evaluates whether past values of one variable contain predictive information for another variable and does not, by itself, establish structural or policy causation.

Table 8: Pairwise Granger Causality Tests

Null hypothesis	Observations	F-statistic	Probability
GDPG does not Granger Cause EXR	22	0.67628	0.5217
EXR does not Granger Cause GDPG	22	3.25582	0.0635
RICE export does not Granger Cause EXR	22	1.66761	0.2181
EXR does not Granger Cause RICE export	22	0.45197	0.6438
RICE export does not Granger Cause GDPG	22	0.17455	0.8413
GDPG does not Granger Cause RICE export	22	0.02078	0.9795

Conclusion

This study examined the relationship between rice exports, exchange rate and GDP growth in Nigeria using annual time-series data covering the period 2000–2023. The trend analysis showed that the exchange rate exhibited a significant upward trend, while GDP growth recorded a significant downward trend over the study period. In contrast, rice exports did not exhibit a statistically significant linear trend.

The OLS results showed that the exchange rate had a positive association with GDP growth and was statistically significant at the 10% level, whereas rice exports had a positive but statistically insignificant association with GDP growth. The dynamic regression results further showed that lagged GDP growth was positive and statistically significant at the 1% level, indicating persistence in economic growth performance. The exchange rate also had a positive and statistically significant association with GDP growth at the 10% level, while rice exports remained statistically insignificant.

The pairwise Granger causality results provided weak evidence that the exchange rate Granger-predicts GDP growth at the 10% significance level. However, no evidence of Granger predictive causality was found between rice exports and GDP growth in either direction. The findings therefore indicate that rice exports had not established a statistically significant relationship with Nigeria's GDP growth over the study period.

The relatively weak statistical contribution of rice exports may partly reflect the limited scale and variability of Nigeria's rice export activity during the period. Strengthening rice productivity, processing, quality standards, market access and export competitiveness may increase the potential contribution of the rice value chain to economic growth. However, the econometric results presented in this study do not provide statistical evidence of a significant effect of rice exports on GDP growth during 2000–2023.

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