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# An Investigation on the Macroeconomic Drivers of Agricultural Exports in Nigeria (1996-2024)

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**Abstract**

The persistent underperformance of Nigeria's agricultural exports raises critical policy questions, particularly regarding the role of macroeconomic conditions in shaping agricultural export outcomes. While output growth is found to stimulate agricultural exports, high interest rates, exchange rate instability, inflationary pressures, and protective trade policies often undermine export competitiveness. Given these contradictions, this paper investigated the macroeconomic drivers of agricultural exports in Nigeria from 1996 to 2024 using annual time series data. The Autoregressive Distributed Lag Regression was employed as main analytical technique within the Gravity Model of Trade theoretical framework. Findings revealed that tariff rate at level is positively and significantly related to agricultural exports both in the short-run and long run. Consequently, one percentage increase in tariff rate, will lead to a decrease in agricultural exports in Nigeria by -0.05 and -0.52 percent respectively. On the other hand, the findings indicated that interest rate spread affect agricultural exports negatively in the short-run and long run. Controlling for other factors, for instance, a 1 percent increase in interest rate spread will lead to a decrease in agricultural exports by -0.19% and 0.28% in the short run and long-run respectively. Furthermore, the estimated impact of inflation rate at level on agricultural exports is positive and significant both in the short run and long run. By implication, one percentage change or increase in inflation rate at level will lead to 0.23% and 0.93% increase in agricultural exports respectively. While, the coefficient of exchange rate at level is positive and significant in the short run. Consequently, if there is a 1% increase in exchange rate at level, it is predicted that there may be an increase of 0.02% in agricultural exports in Nigeria in the short run. In the long run, exchange rate is negatively and significantly related to agricultural exports. Consequently, one percentage increase in exchange rate, will lead to a decrease in agricultural exports by -0.03 percent. Therefore, this study recommended that the Federal Ministry of Industry, Trade and Investment, Nigerian Export Promotion Council should establish a Bilateral Tariff Negotiation Unit Within Ministry of Trade and Investment., given that that tariff rate at level is positively and significantly related to agricultural exports both in the short-run and long run. Also, the Central Bank of Nigeria, Bank of Industry, Nigerian Agricultural Insurance Corporation should establish a Single-Digit Interest Rate Window for Agricultural Exporters., since interest rate spread appears to affect agricultural exports negatively in the short-run and long run. While, the National Bureau of Statistics, Nigerian Institute of Social and Economic Research, Central Bank of Nigeria should link inflation monitoring to export performance indicators, stabilize currency to address root cause of inflationary pressure and establish price stabilization mechanism for export commodities, amongst others.

**Keywords:** Credit Guarantee; Agriculture; Exchange Rate; Lending Rate; Monetary Policy

## I. Introduction

Globally agriculture stands tall as a predominant industrial giant sector; this huge industry supports more than one billion employees and is responsible for the creation of around 1.3 trillion U.S dollars' worth of food globally. Moreover; grassland is the prevalent habitat of about 50 percent of habitable countries on Earth and constitutes food and shelter for species. Agriculture in Africa Agriculture in Africa has played a crucial role to the continent's economies, especially in regard to trades, industrial productions etcetera. The importance of agriculture sector can be revealed by the evidence, it has more than 80% value of the whole trades and more than 50% of the row material supplies to African industries across countries (Osabohien *et al*., 2020). Just like for many economies

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in Africa the majority sector is agricultural production taking some 30 to 40 per cent of a country's gross domestic product. As well, for more than two-thirds of the population of the continent the sector acts as the premier employer in the countries (Saghir, 2014). There has not been an equal footing for agriculture performances, however. In fact, to mention a country in Africa like Nigerian, where Agriculture is essential part of their country's economy. More to this, agriculture plays an important role in GDP formation, and it is able to employ a larger percentage of the Nigerian workforce. It is also an important source of generating income from both exports and local sales in the country. Agricultural production has the capability of growth to a vast extent in Nigeria, considering that it has about 37 million hectares of cultivable land, and a variety of climatic zones that allow for year-round planting and cultivation (IFPRI, 2021). Since it is responsible for the security of the nation's food supply and serves as a major input in many industrial processes, the growth in the Nigerian agriculture sector impacts directly on the course of growth in the country.

Yet Nigeria's chronic under-performance in agricultural exports raises important policy issues in understanding the role of macro-economic conditions in driving agricultural export performance, where empirical evidence on the issue has not been conclusive, as the literature show that agricultural export is stimulated by output growth, whereas; however, the performance of exports is constrained by macroeconomic indicators like: interest rates volatility, exchange rate instability, inflation rate, and also by protectionist trade policies. Also, Nigeria has experienced sustained monetary tightness, constrained access to credit at cheaper rates, the depreciating exchange rate without exports increasing commensurately and unpredictable trade policy regimes that have the capacity to exacerbate export limitations, which are the sum and substance of the inconsistencies highlighted above. This provides strong motivation to have empirically robust research to identify the macroeconomic factors determining Nigeria's exports. This paper addresses this gap by examining the impact of tariff rates, interest rate spread, inflation, and exchange rate movements on agricultural export performance using annual time-series data from 1996 to 2024. By focusing on nationally driven macroeconomic factors, the study provides policy-relevant insights crucial for revitalizing Nigeria's agricultural export sector and enhancing its contribution to economic growth and external sector stability.

## II. Literature Review

### A. Theoretical Framework

This article's theoretical backbone is the Gravity Model of Trade launched by Jan Tinbergen and that states that bilateral flows of goods are influenced by economic size of the countries and by distance existing between them. Used to analyze flows since it gives reasonable estimation of impacts that create impediments and facilitators, it became fundamental on trade analyses. The Gravity model is given as follows:

$$X_{ij} G \frac{Y^{\alpha}_{i} Y^{\beta}_{i}}{D^{\theta}_{ij}} \qquad (1)$$

The term $X_{ij}$ indicates the flows from source i to destination j. Alternatively, it can represent the total volume of interactions between i and j. The term Y measures the country's economic dimension (GDP or population). If it is measured as a cash flow (export values, for example), then Y is usually the Gross Domestic Product for each location. For a people-flow Y-as-population is more natural. Variable D is the distance between location 1 and 2 and represents the parameters for variable (variable coefficient).

So the gravity equation of trade is generally log-linearized for Ordinary Least Squares estimation in empirical research on international trade. Therefore, a linear relationship is obtained, as follows:

$$InX_{ij} = \alpha InY_i + \beta InY_j - \theta InD_{ij} + \delta InG_0 + \varepsilon_{ij} \qquad (2)$$

Where $\varepsilon_{ij}$ represents a random error term that is inserted to explain the factors not observed by the previous equation, while δ represents the coefficient of the gravitational constant. The functional

specification proposed for the gravity equation of the present study is expressed in the following equation:

$$X_{AX} = \alpha + \beta_1 TAR + \beta_2 IRS + \gamma INFR + \eta EXR + \varepsilon_{ij} \quad (3)$$

Where, $X_{AX}$ indicates agricultural exports made by Nigeria in chosen period; α is a constant; $\beta_1, \beta_2, \gamma, \eta$ are coefficients of the corresponding variables; $TAR$ represents Nigeria's export tariff rate for the years of the sample; $IRS$ represents interest rate spread; $INFR$ is inflation rate; $EXR$ is exchange rate, which reflects the value of the Nigerian Naira relative to other currencies; and $\varepsilon_{ij}$; corresponds to the random error term.

The Gravity Model of Trade is a fundamental tool in trade analysis used to estimate the impacts of impediments and facilitators. Furthermore, this paper's empirical review highlighted several recent studies that successfully applied the Gravity Model (or its variants like the Stochastic Frontier Gravity Model) to investigate agricultural exports, including Emmanuel-Rabiu *et al*. (2025), Xu (2023), and Abdullahi *et al*. (2021).

## B. Empirical Review

Emmanuel-Rabiu *et al*. (2025) analysed determinants factor of cocoa exports trade in Nigeria using Panel data covering from 2014- 2022, and trends of Nigeria's cocoa export. The determinants of cocoa export trade in Nigeria were analyzed by Panel corrected standard errors (PCSE) Model within gravity model framework. The outcome of the gravity model estimated via PCSE found that cocoa exports trade of Nigeria was positively (0.001) correlated with Gross Domestic Product of Nigeria (0.468) and its trading partner (0.231), the level of local cocoa production (0.733) and a common language (0.663). Conversely, distance to Nigeria's trading partner (-107.8) and common colonial heritage (-2.154) adversely affected cocoa exports trade in Nigeria.

In addition to analyzing factors affecting agricultural exports to APEC, the authors of the paper (Xu, 2023) also investigated whether there is an export gap between Vietnam and each trading partner in the APEC region over the 1998-2018 period, based on the application of the Stochastic Frontier Gravity Model. The estimation results confirm that the gravity model is appropriate for the behavior of Vietnamese agricultural exports. The new results of the research indicate that it is necessary to promote policy planning by the government to promote enterprises to invest in technological inputs for export-oriented businesses, especially in the USA, Japan and Korean markets (which have large export volumes and consumer demand). Wang *et al*. (2022) investigated grain export potential for Kazakhstan's grains export by applying the gravity model. Within this, among variables which have significant effect on size of Kazakh grains export, the economic development of Kazakhstan and the economic distance contributed to the increase in Kazakh grain export while the Kazakhstan distance and gap between GDP per capita created barrier to Kazakh grains exports. Meanwhile, no relationship was found among the neighbor countries, geography and policy factors with the size of Kazakh grain export.

On the same note, the study of Son et al. (2021) in explaining the determinant of agricultural export in Vietnam by using gravity model reveals that GDP, economic development, exchange rate, population, openness of the economy of Vietnam, as well as, exporter participation into World Trade Organization (WTO) are positively affecting the turnover of Vietnam's agricultural export. Besides the positive impacts, the area of agricultural land and proximity between agricultural product and import country inversely affect Vietnam's export on agricultural. The determinants and opportunities for exports of agri-food products of Nigeria to the 70 principal destination countries from 1995 to 2019, through a Stochastic Frontier Analysis (SFA) of gravity trade model are empirically determined in this Abdullahi *et al*. (2021). From the estimated results, the study reveals that the level of development of trading countries (GDP), the market of the trading countries, members of EU and ECOWAS and countries sharing border with Nigeria has positive impacts on export performance while number of the citizens of importing countries has negative effect on the performance of Nigeria's agri-food export.

Using the gravity estimation model and a fixed- effects model for the interpretation of the gravity model results, Etuk and Idem (2021) examined the trade flow determinants for selected non-traditional agricultural export commodities in Nigeria for the years 2007 to 2017. It found that non-traditional agricultural products of Nigeria follow apriori, basic gravity model whereby trade flows of trading partners, based on their GDP and distance involved. While similarly Nguyen (2020) also used the Stochastic Frontier Gravity Model (SFGM) to assess the agricultural Vietnamese's export with focus on rice and coffee; the research highlights that, "behind the border" constraints have a statistical significance effect on exporting rice and coffee, indicating that Vietnam's exports of these goods do not maximize their potentials. The report also underscores the need to expand these commodities exported goods to ASEAN and European Union countries. Tesfaye (2014) explored theoretically and estimated empirically the demand and the supply factors contributing for agricultural exports from SSA countries. To analyze the issues, the fixed effect estimation method with panel data set of 47 SSA countries covering the period of 2000-2008 is applied. It is concluded that on the supply side factors like the level of real GDP, lagged real GDP of the exporting country and the lagged agricultural input usage exert significant and positive impact on exports of SSA countries. From demand perspective, the impact of US per capita GDP with which most SSA countries traded intensively was positive and statistically significant while the impact of US tariff on imports from SSA was significant and negatively affects the exports.

Another strand of the literature focuses on how domestic economic conditions, prices, and financial variables drive agricultural exports. A good example was the study carried out by Amunigun and Oluwoye (2025) that tested how macroeconomic variables influence Nigeria's agricultural exports. For estimation, multiple regression model was set with the regression of percentage of agricultural exports to total merchandise export as dependent variable against a set of macroeconomic determinants of agricultural exports with Ordinary Least Squares (OLS) method. Results reveal that all macroeconomic variables have positive impact on agricultural exports except the rate of tariff which has a negative effect. While, using an autoregressive distributed lag (ARDL) model, Yadav and Chattopadhyay (2024) studied the influences of macroeconomic variables on the cotton export of India. Results show that both export price and yield produced a statistical positive significant on performance of the cotton of India in both long-run and short-run. Estimates derived from market and exchange rates market sizes however produce an inconsistency in relation to cotton export of the country over the period.

Ayambila *et al*. (2023) applied the Auto-regressive Distributed Lag(ARDL) approach to determine the underlying drivers of the expansion of non-traditional agricultural exports in Ghana. Their results show that both current RGDP and lag real GDP significantly influence NTAE growth. In addition, inflation, real capital formation and foreign direct investment affect NTAE growth at their respective lags while exchange rate, inflation and RGDP significantly explain long run growth in NTAEs. A study by Eshetu and Mehare (2020) investigated on the determinants of Ethiopian agricultural exports. The analysis of the study used the imperfect substitutes' model as the theoretical and System Generalised Moment Method as a methodology to analyze for a period of 1998 to 2018. The results of the study revealed that gross domestic product, exchange rate, road network, Ethiopian corruption index, lagged export value, domestic savings and indirect tax revenue significantly determine Ethiopian agricultural exports. On the other hand, foreign direct investment and labour force negatively and significantly affect the Ethiopian agricultural exports.

Niftiyev (2020) Examined nominal and real effective exchange rates along with other export-oriented macroeconomic factors and agricultural exports of Azerbaijan to uncover Azerbaijan's non-oil sub-sector dynamics during 2001-2018 by using OLS estimations. His estimation results found that potato, fresh fruits, and fresh vegetables exports had been negatively affected from nominal effective exchange rate. Other findings suggested that both potato and fresh fruits exports were stable during economic crisis. Degu (2019) has explored the influence of some macroeconomic factors on agricultural output for Ethiopia on period of 1991 to 2017 by utilizing Autoregressive Distributed Lag(ARDL) bounds test approach and error correction model (ECM). It found there is a long run

relationship between agricultural output and various macroeconomic variables such as; inflations rate, loan rate, trade balance, foreign direct investment, exchange rate and stock of external debt stock. Trade balance which has a negative value for all time of study period and also external debt stock do have negative influence on agricultural output both in the short and long run. Official exchange rate and loan rate also showed both significant and positive effect but inflations rate and FDI do have insignificant effect on agricultural output. Onwusiribe *et al*. (2018) investigated short-run and long-run determinants of potato exports from Nigeria between 1961-2016. Autoregressive distributed lag model was employed to assess the short-run and long-run determinants of potato exports. From findings, the long-run determinants of Nigeria's potato exports were; potato production, world export of potato, inflation, interest rate, gross domestic product (GDP), tariff, exchange rate and potato price. The major determinant of potato exports in short-run was the exchange rate.

## III. Data and Method

The paper relied solely on the use of secondary data collection method from CBN 2025 Statistical Bulletin, World Bank 2025 development indicator for 1996-2024. In the study of this paper, ex-post facto design was chosen as the appropriate research design. Ex-post facto design is the appropriate methodology for research which seeks to uncover and establish the magnitude of a statistical association between and independent and dependent variables so as to conclude to the element of causality.

### A. Model Specification

The model for this paper is based on the theoretical framework as expressed in equation (3). Thus, the linear specification model applied in this paper is of the form:

$$AGEXP = \beta_0 + \beta_1 TAR + \beta_2 IRS + \beta_3 INFR + \beta_4 EXR + \varepsilon_t \qquad (4)$$

Where, AGEXP = Agricultural exports. TAR = Tariff., IRS = Interest rate spread., INF = Inflation., EXR = Exchange rate., $\beta_0$ = The intercept or autonomous parameter estimate, $\beta_1 to \beta_4$ = Parameter estimate representing the coefficient of TAR, IRS, INFR, and EXR respectively, and $\varepsilon_t$ - other variables not explicitly included in the model. Further, this research apriori expectations of the parameters to be estimated are as expressed below:

$\beta_1 < 0$; The expected sign of tariff on agriculture exports is negative since tariff increases the costs of trade, limits foreign competitive products and markets for agricultural products. $\beta_2 < 0$; The coefficient on interest rate spread should negatively affect agricultural exports. High values of interest rate spread is associated with a high cost of borrowing, low investment, lower competitiveness and therefore negative effect on agricultural exports. $\beta_3 < 0$; Coefficients for the inflation index indicate that the index reduces agricultural exports for higher production costs. Increases in inflation can erode international price competitiveness and create macro-economic policy uncertainty. $\beta_4 > or < 0$; The exchange rate depreciation coefficient is also expected to positively influence agricultural exports through providing better price competitiveness to agricultural products and raising agricultural export profitability. In contrast, exchange rate appreciation coefficient is expected to decrease agricultural exports.

This study aims at investigating the impact of Macroeconomic variables on the export of agricultural products in Nigeria between the years 1996 and 2024. The method of analysis used in this study is the bound test approach to cointegration which is associated with Autoregressive Distributed lag (ARDL) method developed by Pesaran et al. (2001). An ARDL Model that was used to run the bound test for cointegration is;

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{p} \beta_i \Delta y_{t-1} + \sum_{j=0}^{q} \partial_j \Delta X_{t-J} + \phi_1 y_{t-1} + \phi_2 X_{t-1} + \mu_t \qquad (5)$$

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Where Δ denotes the first difference operator, $\beta_i$, $\partial_j$ stand for the short-run coefficients, $\phi_1$, $\phi_2$ are for the long-run coefficients and $\mu_t$ is the disturbance (white noise) term. Transforming equation (3.4) into an ARDL Model results as follows:

$$\Delta AGEXP_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} AGEXP_{t-i} + \sum_{j=0}^{n} \alpha_{2i} \Delta TAR_{t-j} + \sum_{k=0}^{o} \alpha_{3i} \Delta IRS_{t-k} + \sum_{l=0}^{p} \alpha_{4i} \Delta INFR_{t-l}$$

$$+ \sum_{l=0}^{r} \alpha_{5i} \Delta EXR_{t-l} + \alpha_6 AGEXP_{t-1} + \alpha_7 TAR_{t-1} + \alpha_8 IRS_{t-1} + \alpha_9 INFR_{t-1} + \alpha_{10} EXR_{t-1} + \varepsilon_t \quad ----(6)$$

The bounds test is conducted by testing the null hypothesis ($H_0$) against the alternative hypothesis ($H_1$) using the following equations:

$H_0 : \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = 0$ and $H_1 : \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq \alpha_5 \neq 0$

The results of bounds test based on calculated F-Statistic are similar with those of Pesaran et al. (2001), who stated cointegration among the series exists if the F-Statistic is larger than the upper bound I(1) on each test and reject null hypotheses no co-integration exist. Formally, the series Error Correction Model based on the ARDL framework are given by:

$$\Delta AGEXP_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} \Delta AGEXP_{t-i} + \sum_{j=0}^{n} \alpha_{2i} \Delta TAR_{t-j} + \sum_{k=0}^{o} \alpha_{3i} \Delta IRS_{t-k} + \sum_{l=0}^{p} \alpha_{4i} \Delta INFR_{t-l} + \sum_{l=0}^{q} \alpha_{5i} \Delta EXR_{t-l}$$

$$+ ECT_{t-1} + \varepsilon_t \quad ----------(7)$$

Where, $ECT_{t-1}$ = lagged Error correction term. The output evolution process that agents use to react to the prior period of prediction errors is captured by the ECT.

This method has various advantages over Johansen co-integration approach; i.e. It can be used to analyze variables having any order of integration because of its dynamic nature. Since for this research the estimated variables have different order of integration (from the unit root tests), ARDL is applied to this research for analyzing dynamic relationships between the variables. The ARDL approach has been followed because the estimated independent variables can be any order of integration as they can either be purely I (0) or purely I (1) or mutually co-integrated (Pesaran et al., 2001; Katircioglu, 2009, 2010; Gkmenolu & Taspinar, 2016). The ARDL model provides valid results because serial correlation and endogeneity problem issues don't exist in the ARDL estimates and also since it can be applied if there are endogenous regressors (Pesaran, Shin and Smith, 2001). Also, the ARDL approach appears to yield more reliable estimates on data for small samples compared to other techniques for conventional tests of co-integration.

## IV. Results and Discussions

### A. Descriptive Statistics

Table 1 presents the descriptive statistics for the paper.

**Table 1: Descriptive Statistics**

| | AGEXP | TAR | IRS | INFR | EXR |
|---|---|---|---|---|---|
| Mean | 0.942506 | 13.11759 | 7.609262 | 13.90964 | 249.8362 |
| Median | 0.309646 | 10.70000 | 7.415833 | 12.50000 | 150.6600 |
| Maximum | 7.268343 | 21.47000 | 11.06417 | 34.42000 | 1535.000 |
| Minimum | 0.005946 | 8.220000 | 3.268333 | 5.400000 | 81.20000 |
| Std. Dev. | 1.736424 | 4.305204 | 1.659189 | 6.627744 | 282.3791 |
| Skewness | 2.749615 | 0.678633 | -0.012925 | 1.442565 | 3.503502 |
| Kurtosis | 9.597728 | 1.925266 | 3.466391 | 5.052055 | 16.10274 |
| Jarque-Bera | 89.14063 | 3.621643 | 0.263644 | 15.14634 | 266.7756 |
| Probability | 0.000000 | 0.163520 | 0.876497 | 0.000514 | 0.000000 |
| Observations | 29 | 29 | 29 | 29 | 29 |

***Source: Author's Computation, 2026 (Eviews-12)***

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From Table 1, Agricultural exports (AGEXP) has an approximate average of 0.94% and they range from 0.005946 (minimum) to 7.268343 (maximum), with a standard deviation of 1.74%. While, Tariff (TAR) has a mean value of 13.12%, with the standard deviation of 4.31%, minimum and maximum values of 8.220000 and 7.268343 respectively. Similarly, Interest rate spread (IRS) has an approximate average of 7.61% and it ranges from 3.268333 (minimum) to 11.06417 (maximum), with a standard deviation of 1.66% Also, Inflation rate (INF) has an approximate average of 13.91% and it ranges from 5.400000 (minimum) to 34.42000 (maximum), with a standard deviation of 6.63%. Further, Exchange rate (EXR), has an approximate average of ₦249.84 and it ranges from 81.20000 (minimum) to 1535.000 (maximum), with a standard deviation of ₦282.38.

Furthermore, Table 1 displayed the skewness coefficient, a measure of how far a distribution deviates from symmetry, with all the variables having skewness values greater than one, except TAR and IRS variables with skewness value less than one. The entire data series are not platykurtic (not having negative values), as confirmed by the kurtosis result, which measures a distribution's degree of peakedness in relation to a normal distribution. Additionally, majority of the variables are not nominally distributed, since the accompanying Jarque-Bera probability values of these variables have a significance level less than 5%. However, TAR and IRS corresponding Jarque-Bera statistics are nominally distributed. Since the accompanying Jarque-Bera probability values of these variables have a significance level greater than 5%, it may be concluded that they have a normal distribution.

## B. Correlation Analysis

Correlation analysis helps shed light on each variable (e.g., Tariff, Interest rate spread, Inflation rate, and Exchange rate) individually and their association with the dependent variable (Agricultural Exports). A positive correlation would indicate a positive relationship between the two variables. An inverse correlation, alternatively, indicates a negative correlation.

**Table 2: Correlation Matrix Result**

| | AGEXP | TAR | IRS | INFR | EXR |
|---|---|---|---|---|---|
| AGEXP | 1 | | | | |
| TAR | -0.289569 | 1 | | | |
| IRS | 0.271189 | 0.007819 | 1 | | |
| INFR | -0.083280 | 0.159022 | -0.274864 | 1 | |
| EXR | -0.135254 | -0.041408 | -0.235393 | 0.690805 | 1 |

***Source: Researcher's Computation Using EViews-12 (2026)***

The correlations in Table 2 is much less than 0.8, showing that no serious concern over the problem of multi-collinearity of the variables in the model is identified. By implication, there are no multicollinearity problems among the variables identified. However, the correlations in Table 4.2 shows a negative relationship among Agricultural exports (AGEXP) and some economic and policy variables such as Tariffs (TAR), Inflation rate (INF) and Exchange rate (EXR) in Nigeria. Though, Agricultural exports (AGEXP) and Interest rate spread (IRS) have strong relationship. But the relationship between agricultural exports (AGEXP) and tariff (TAR) was found to be largest and about 29%.

## C. Unit Root Results

Commonly used among the unit root tests is the Augmented Dickey-Fuller (ADF) test for testing for stationarity. A stationary process is said to have properties (such as its mean, variance, and autocorrelation function) which are unchanging over time, while for a non-stationary series these properties change over time and often render its' properties invalid for regression analysis. The output of the Augmented Dickey-Fuller (ADF) unit root test is reported in Table 3 below:

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**Table 3 Traditional Unit Root Test Results**

| Variable | Method | Level Stat. (Prob.) | First Diff. Stat. (Prob.) | Order of Integration |
|---|---|---|---|---|
| AGEXP | ADF | -1.550974 (0.1116) | -5.242302*(0.0000) | I(1) |
| TAR | ADF | -1.709806 (0.7200) | -4.066219**(0.0188) | I(1) |
| IRS | ADF | -3.864942*(0.0068) | -5.896714*(0.0000) | I(0) |
| INFR | ADF | -2.645777 (0.0096) | -6.645576*(0.0000) | I(1) |
| EXR | ADF | -3.691089** (0.0000) | -4.502532*(0.0000) | I(0) |

**Note: *, ** Indicates stationary at the 1% and 5% level.**
***Source: Researcher's Computations using E-Views 12***

From Table 3 Interest rate spread (IRS) and Exchange rate (EXR) variables tends to be stationary at level according to the conventional test of the Augmented Dickey-Fuller (ADF). However, Agricultural exports (AGEXP), Tariff (TAR) and Inflation rate (INF) variables are likely to be stationary in first difference.

## D. Cointegration Test

The variables were all observed to be integrated at various levels and thereby, all the variables satisfied the ARDL - bounds test approach criteria which holds that if any or all the variable in the equation are integrated at level and first differencing or modifying, the (ARDL)- Bounds test approach would be applied. To carry out this test for variables in bound the reason behind testing for stationary test or property of variable is for ARDL bounds testing to become usable which holds that when variables are integrated at Level -I(0), and First difference - I(1) Or Mixed of the variable. This means that the assumption of bounds testing will collapse in the presence of I(2) variable. This will imply that the use of bounds testing hypothesis breaks down in presence of I(2) variable. As shown in Table 3 based on the unit roots test of the Augmented Dickey-Fuller (ADF), in this paper, the test results indicated that use of bounds test approach is appropriate for this research, because all the variables consist of a mixture of I(1) and I(0).

The co-integration test attempts to verify the presence of long-run relationship among these variables concerned. In case if co-integration exists between those concerned variables, then ARDL error correction model may apply. The results of cointegration tests is presented in Table 4:

**Table 4: Result of ARDL Bounds Test for Cointegration**

| **Null Hypothesis: No Long-run Relationships Exist** | | |
|---|---|---|
| **Test Statistic** | **Value** | **K** |
| F-Statistic | 19.01077 | 4 |
| | Critical Value Bounds | |
| Significance | Lower Bound | Upper Bound |
| 5% | 2.56 | 3.49 |

***Source: Researcher's Computations based on E-Views 12***

It is clear from Table 4 that the bounds test result of the F-statistic of 19.01077 is far above the value of upper bound limit and lower bound limit value of 2.56 and 3.49 respectively at 5% level of significance and a critical value on and above at both bounds in a range of upper tail values of F-statistic above 3.49. It indicates the presence of long-run equilibrium relationship between dependent and explanatory variable. Since long-run relationships are established between variables, the next step is to determine Error Correction Model.

## E. Autoregressive Distributed Lag (ARDL) Regression Results

Considering the cointegration on the dependent variable to the regressors in this study, it was therefore to estimate the error correction models and the long-term model. The estimates are displayed as follows, given in table 5.

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**Table 5: ARDL Regression Results**

**Dependent Variable: D(AGEXP)**

| Co-integrating Estimates (ECM Estimates) | | | | |
|---|---|---|---|---|
| **Variable** | **Coefficient** | **Std. Error** | **t-Statistic** | **Prob.** |
| D(TAR) | -0.054636 | 0.020778 | -2.629483 | 0.0784 |
| D(TAR(-1)) | 0.566994 | 0.035664 | 15.89817 | 0.0005 |
| D(TAR(-2)) | 0.428631 | 0.038004 | 11.27867 | 0.0015 |
| D(IRS) | -0.198554 | 0.045777 | -4.337397 | 0.0226 |
| D(IRS(-1)) | 0.587154 | 0.036098 | 16.26566 | 0.0005 |
| D(IRS(-2)) | 0.623364 | 0.032477 | 19.19396 | 0.0003 |
| D(INFR) | 0.229565 | 0.017923 | 12.80808 | 0.0010 |
| D(INFR(-1)) | -0.537098 | 0.039926 | -13.45247 | 0.0009 |
| D(INFR(-2)) | -0.290106 | 0.026354 | -11.00795 | 0.0016 |
| D(EXR) | 0.002233 | 0.000566 | 3.942594 | 0.0291 |
| D(EXR(-1)) | 0.001484 | 0.002666 | 0.556628 | 0.6166 |
| D(EXR(-2)) | 0.001959 | 0.002427 | 0.807256 | 0.4786 |
| CointEq(-1)* | -0.974410 | 0.055870 | -17.44054 | 0.0004 |
| R-squared | 0.992700 | | | |
| Adjusted R-squared | 0.978099 | | | |
| Durbin-Watson stat | 2.236384 | | | |
| **Long Run** | | | | |
| **Variable** | **Coefficient** | **Std. Error** | **t-Statistic** | **Prob.** |
| TAR | -0.521622 | 0.055982 | -9.317647 | 0.0026 |
| IRS | -0.280713 | 0.232049 | -1.209712 | 0.3130 |
| INFR | 0.934147 | 0.121040 | 7.717702 | 0.0045 |
| EXR | -0.026865 | 0.002792 | -9.623162 | 0.0024 |
| C | 4.031398 | 2.502387 | 1.611021 | 0.2056 |

***Source: Researcher's Computation Using EViews-12 (2026)***

As indicated by Table 5, the study has demonstrated that tariff., interest rate spread., inflation rate and exchange rate variables are considered to have a statistically significant influence on agricultural exports, both at their level and with one period lag in the short run. In the long run however, tariff., inflation rate and exchange rate variables alone were found to have statistically significant effects on agricultural exports. Additionally, in the short run, tariff., interest rates spread., one period lagged inflation rate and exchange rate variables appear to move in line with our apriori expectations as anticipated in our study. Meanwhile, tariff., interest rate spread. And exchange rate variables abide by these expectations of the study Apriori in long. Run Thus, estimated ARDL regression result shows that tariff, the spread on interest rate, and exchange rates, one-lagged inflation rate are among the major driver for Nigeria to export agricultural products. With tariff., exchange rates and the spread on interest rates among the major driving factor of the Nigeria's agriculture in long run.

At the one percent level, the Error Correction Model is very significant, negative and expected. This is further proof that the dependent variable and the regressors are long run. The magnitude of the error correction is between zero and one and this means that each year there is adjustment made to the short run equilibrium for disequilibrium from the long run which is about 97% to regain it. The R-squared value of 0.992700 suggest that the model is very good as the explaining factors capture above 99% of variation in agricultural export. While, the DW statistic of 2.236384 indicates no problem with serial correlation. As such the findings from this study can be used reliably for policy formulation.

## F. Post Estimation Tests

This paper conducted a few diagnostic tests to assess the model's stability and applicability as well as the validity of the results. Results is as presented in Table 6 as follows:

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**Table 6: Diagnostic Test Results**

| Test | Null Hypothesis | T-Statistic | Prob |
|---|---|---|---|
| Jarque-Bera | There is a normal distribution | 2.17 | 0.33 |
| Heteroskedasticity: LM | No conditional heteroscedasticity | 14.11 | 0.81 |
| Heteroskedasticity: Breusch-Pagan-Godfrey | No conditional heteroscedasticity | 0.45 | 0.88 |

***Source: Researcher's Computations based on E-Views 12***

According to Table 6, the models have not presented any serial correlation and heteroskedasticity in the study periods. From the tests for heteroskedasticity shows that the residuals are homoscedastic. With regards to the outcome of the tests on the existence of serial correlation and heteroskedasticity for the research periods show that data is quite well behaved. Also from the normal distribution test, the value of p-value for the research periods > 0.05. So, it seems that the residues are having a common distribution. In such instance, null hypothesis regarding normal distribution was not accepted.

## G. Stability Test Result

From the stability test as given in Fig.1 the agricultural export model is also stationary over the period of study as the plots of the graphs fall inside the critical bound at 5% significant level. According to Bahmani-Oskooee and Rehman, (2005) where the plots of these variables fall within critical band at 5% level of significant the null hypothesis the regression equation is well specified could be accepted or not rejected.

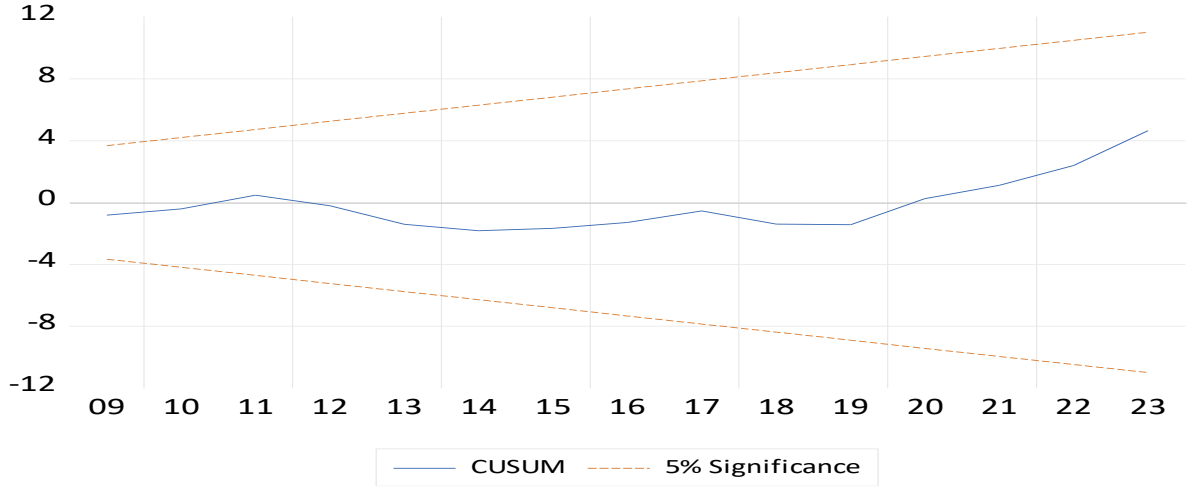


**Figure 1: Stability Tests Result**

## H. Discussion of Findings

Estimation results based on the ARDL Regression presented in table 5, we notice that tariff., interest rate spread., inflation rate and exchange rate variables have statistically significant effect on agricultural export with either level or one lag in short run. As tariff., inflation rate and exchange rate have statistically significant effect in long run with the agricultural export. Also, tariff., interest rate spread., one period lagged inflation rate and exchange rate variables are in conformity to this study apriori expectation in the short run, while tariff., interest rate spread and exchange rate variables conform to this study apriori expectations in the long run.

Variable by variable analysis found from the estimated ARDL regression equation in Table 5 shows that tariff rate at level has a positive and significant association with agriculture exports in both short run and long run. Thus, one percentage rise in the tariff rate will results to decline in the Nigeria agricultural exports by -0.05 percent and -0.52 percent in the short run and long run respectively. This outcome is consistent with the a priori expectations of this investigation and studies such as Tesfaye (2014) that attempted to explain theoretically and assess empirically the demand and the supply side

factors affecting agricultural export of SSA countries and found the effect of US import tariff imposed on agricultural products from SSA countries is negative and significant.

On the other hand, the findings indicated that interest rate spread appears to affect agricultural exports negatively in the short-run. Controlling for other factors, for instance, a 1 percent increase in interest rate spread will lead to a decrease in agricultural exports by -0.19% in the short run. This outcome is inconsistent with the apriori expectations of this research., as higher interest rate spread is expected to exert a negative impact on agricultural exports by increasing the cost of credit, constraining investment, and reducing export competitiveness. This outcome is consistent with the investigation of Onwusiribe *et al*. (2018) that stabilization and regulation of macroeconomic variables such as inflation, exchange rate, tariff rate and interest rate will boost the export of potato. Similarly, interest rate spread appears to affect agricultural exports negatively in the long run. Specifically, one percentage increase in interest rate spread will lead to a decrease in agricultural exports by approximately -0.28% in the long-run.

Furthermore, the estimated impact of inflation rate at level on agricultural exports is positive and significant both in the short run and long run. By implication, one percentage change or increase in inflation rate at level will lead to 0.23% and 0.93% increase in agricultural exports respectively. This outcome is inconsistent with the apriori expectations of this investigation, as the coefficient of inflation is expected to have a negative impact on agricultural exports by increasing production costs, eroding international competitiveness, and generating macroeconomic uncertainty. This outcome suggests that agricultural exports might be used as **a** hedge against domestic inflation, where producers prefer selling in foreign markets to earn stable foreign currency as domestic prices rise. However, this finding aligns with Ayambila *et al*. (2023) who also identified inflation as a significant determinant of agricultural export growth in a similar West African context (Ghana).

The coefficient of exchange rate at level is positive and significant in the short run. Consequently, if there is a 1% increase in exchange rate at level, it is predicted that there may be an increase of 0.02% in agricultural exports in Nigeria in the short run. This outcome is inconsistent with the a priori expectations of this study and studies such as Eshetu and Mehare (2020) and Degu (2019) that official exchange rate has a positive and significant effect on agricultural exports in Ethiopia. In the long run, exchange rate is negatively and significantly related to agricultural exports in Nigeria. Consequently, one percentage increase in exchange rate, will lead to a decrease in agricultural exports in Nigeria by -0.03 percent. This outcome is consistent with the priori expectations of this investigation and studies such as Abdullahi *et al*. (2021) and Niftiyev (2020) that exchange rate, language, and landlocked adversely affect agri-food exports.

In order to ascertain whether the joint impact of macroeconomic variables (independent variables) actually have a significant influence on agricultural exports in Nigeria (the dependent variable), the Wald statistic and associated probability values (PV) were used as the test statistic. From the results, interest rate spread and inflation rate has a significant impact on agricultural exports in Nigeria within the study period. While, tariff and exchange rate variables have no significant impact on agricultural exports in Nigeria during the period under investigation.

## V. Conclusion and Recommendations

This paper examined the macroeconomic drivers of agricultural exports in Nigeria from 1996 to 2024 using annual time series data. The Autoregressive Distributed Lag (ARDL) Regression was employed as main analytical technique. Results revealed that tariff rate at level is positively and significantly related to agricultural exports both in the short-run and long run. On the other hand, the findings indicated that interest rate spread appears to affect agricultural exports negatively in the short-run. Similarly, interest rate spread appears to affect agricultural exports negatively in the long run. Furthermore, the estimated impact of inflation rate at level on agricultural exports is positive and significant both in the short run and long run. While the coefficient of exchange rate at level is positive and significant in the short run. In the long run, exchange rate is negatively and significantly related to

agricultural exports in Nigeria. Therefore, the following recommendations were raised from the research findings.

i. The Federal Ministry of Industry, Trade and Investment (FMITI), Nigerian Export Promotion Council (NEPC) create Bilateral Tariff Negotiation Unit Within Ministry of Trade and Investment to protect her export., since tariff rate at level is positively and statistically related with export. By establishing a Bilateral Tariff Negotiation Unit, the government can target specific high-volume partners (as mentioned in the literature regarding the EU or ECOWAS) to negotiate preferential access that broad multilateral agreements might not immediately address.

ii. Nigeria's apex bank, Central Bank of Nigeria (CBN) in partnership with the Bank of Industry, Nigerian Agricultural Insurance Corporation (NAIC), must provide a Single-Digit Interest Rate Window for Agricultural Exporters. This is due to the fact that evidence suggests that the level of interest rate spread tends to hurt agricultural export performance in both short and long run.

iii. The NBS, NISER, CBN should come up with structural studies on the positive inflation-export relation and establish inflation monitoring-linked mechanism that closely monitor export commodities for purposes of stabilize commodity prices for both export markets and to stabilize Nigeria currency in the economy in order to remove fundamental source of price pressures in Nigerian.

iv. CBN should provide preferential treatment to agricultural exporters for foreign exchange availability through dedicated forex window with minimum of $50M monthly. Nigeria Export Import Bank and Federal Ministry of Finance (FMF) on their part should institute exchange rate protection on export contracts.

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