Effect of Deposit Money Banks Credit on Agricultural Output in Nigeria: An empirical Analysis

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Abstract
This study investigated the relationship between deposit money banks credit and agricultural output in Nigeria from 1981 to 2023, using time series data from the CBN Statistical Bulletin. The dependent variable was agricultural output, while independent variables included credit to the agricultural sector (CAS), the Agricultural Credit Guarantee Fund Scheme (ACGFS), and interest rate (ITR). Data analysis techniques employed included descriptive statistics, unit root tests, bounds cointegration, the Autoregressive Distributed Lag (ARDL) estimation method, and residual diagnostic tests. The Augmented Dickey-Fuller (ADF) unit root tests revealed a mix of I(1) and I(0) series, indicating varying levels of integration among the variables. Evidence of cointegration found suggested a long-term equilibrium relationship among the variables. The ARDL results showed that deposit money banks' credits to agriculture had a positive but statistically insignificant effect on agricultural output, implying that increased credits do not significantly boost output. Interest rates had a negative yet statistically insignificant effect on agricultural output, suggesting that higher rates do not significantly reduce output. Additionally, the Agricultural Credit Guarantee Fund Scheme had a positive long-run relationship with agricultural output, though this effect is statistically insignificant, indicating that increases in the scheme do not significantly enhance output. Given these findings, this study concludes that deposit money banks' credits to the agricultural sector affects agricultural output in Nigeria. Recommendations include optimizing the allocation of existing credits by targeting high-potential agricultural value chains, promoting farmer cooperatives, and implementing smart subsidy programs to enhance credit utilization efficiency.

Key words: Agricultural Sector Credit, Agricultural Credit Guarantee Fund Scheme, Interest Rate, Agricultural productivity

1. INTRODUCTION

Agriculture has historically served as a backbone for the Nigerian economy, providing employment and livelihoods for millions while significantly contributing to the country's gross domestic product (GDP). Before the discovery of oil in 1956, agriculture was the mainstay of the Nigerian economy as it accounted for more than 70% of the country's gross domestic product. It served as a major source of employment, a key foreign exchange earner for the nation, and the provider of raw materials to industries. By the 1970s, oil had replaced agriculture as the country's primary export. As crop exports declined, the nation became a net importer of basic food items. This change resulted in a decline of the agriculture sector's

contribution to gross domestic product (GDP). However, the sector faces numerous challenges, including low productivity and inadequate financing, which hinder its potential for growth and development (Olayide and Heady, 2020).

Deposit Money Banks are pivotal in addressing the financing gap within the agricultural sector by offering credit facilities to farmers and agribusinesses. These credits are intended to stimulate growth by enabling farmers to invest in quality inputs, advanced technology, and modern machinery. However, the actual impact of these credits on agricultural output remains a contentious issue. The effectiveness of credit provision often depends on various factors, including interest rates and the existence of supportive government policies like the Agricultural Credit Guarantee Scheme Fund (Osuji and Chigbu, 2019). The ACGSF is designed to mitigate the lending risks associated with agricultural financing by providing guarantees to banks, thereby encouraging them to extend credit to farmers who may be viewed as high-risk borrowers. This scheme aims to promote financial inclusion in the agricultural sector and increase access to capital, ultimately fostering greater productivity and output (Eboh and Onwumere, 2016). This is because the high interest rates prevalent in Nigeria's financial system present a significant challenge. While elevated rates may promote responsible borrowing and efficient resource allocation, they can also deter investment by increasing the cost of capital for farmers. This dual effect of interest rates complicates the financial landscape and poses a barrier to achieving sustainable agricultural growth (Adegboye, 2018).

Research on the impact of DMB credits on agricultural output has yielded mixed results, creating a significant gap in our understanding of this relationship. Some studies posit that increased credit access positively correlates with agricultural productivity, suggesting that financial support can enable farmers to invest in modern farming techniques, inputs, and technologies. Conversely, other research highlights that high-interest rates can offset these benefits, ultimately rendering agricultural loans burdensome and unsustainable (Olagunju, 2019). This inconsistency raises critical questions about the effectiveness of financial interventions in stimulating agricultural growth and emphasizes the need for more comprehensive analyses.

Despite various interventions by Deposit Money Banks (DMBs) and the Nigerian government aimed at bolstering credit access in the agricultural sector, agricultural output in Nigeria has persistently fallen short of its potential. The agricultural sector, which is vital for economic growth and food security, contributes significantly to employment and GDP. However, it continues to grapple with systemic challenges that hinder its productivity. Key among these challenges are inadequate funding, prohibitive interest rates, and inefficiencies in credit utilization, all of which adversely impact the sector's growth trajectory (Kareem, Arigbede, and Akinrinde, 2021).

The initiatives launched to enhance credit access, such as the Agricultural Credit Guarantee Scheme Fund (ACGSF), have not yielded the anticipated outcomes. The ACGSF was designed to provide a safety net for banks to encourage lending to the agricultural sector by reducing the risk associated with loan defaults. Nonetheless, the actual utilization of these funds remains a point of contention, as many farmers lack the requisite collateral and financial literacy to navigate the complexities of the credit system. Furthermore, the bureaucratic hurdles and the delayed disbursement of funds often lead to missed planting seasons, exacerbating the

challenges faced by farmers. This scenario requires further investigation into the relationship between deposit money banks credit and agricultural output. Consequently, the major questions that come to mind are; To what extent does Deposit Money Banks' credits to the agricultural sector affect agricultural output in Nigeria? How does the interest rate influence agricultural output in Nigeria? What is the impact of the Agricultural Credit Guarantee Scheme Fund (ACGSF) on agricultural output in Nigeria? This study therefore determined the effect of deposit money bank credit on agricultural output in Nigeria over the period 1990 to 2023.

2. **LITERATURE REVIEW**

Theoretical Framework

Theory of Financial Intermediation

The theory of financial intermediation, first proposed by Walter Bagehot in 1873, emphasizes the pivotal role of banks in channeling funds from savers to borrowers, thereby fostering investment and economic growth. Bagehot argued that banks, by pooling deposits and lending them out, facilitate the efficient allocation of capital, enabling productive investments that drive economic expansion.

In the context of the agricultural sector, Deposit Money Banks (DMBs) act as crucial intermediaries that can significantly enhance farmers' access to credit. By extending loans to farmers, DMBs enable them to invest in essential agricultural inputs such as seeds, fertilizers, machinery, and technology. This increased investment can lead to higher agricultural productivity and output (Levine, 2005). The underlying assumption is that banks are better equipped than individual savers to assess the creditworthiness of borrowers and manage the risks associated with lending.

However, the effectiveness of this financial intermediation is contingent upon the banks' ability to accurately assess and manage risk, particularly in the agricultural sector, which is characterized by high volatility and uncertainty. Factors such as weather conditions, pest infestations, and market fluctuations can significantly impact agricultural production and, consequently, the repayment capacity of farmers. Therefore, banks must have robust risk management practices in place to mitigate these risks and ensure the sustainability of their lending operations.

Moreover, the theory assumes that banks have better information about borrowers than individual savers, which helps them make more informed lending decisions. This information asymmetry reduction is crucial for minimizing the risk of default and ensuring that credit is extended to creditworthy borrowers. Nevertheless, banks may still face challenges in obtaining accurate and timely information about farmers, which can hinder their ability to effectively assess and manage risks.

In conclusion, the theory of financial intermediation highlights the critical role of DMBs in facilitating investment and economic growth in the agricultural sector. By channeling funds to farmers, banks enable them to invest in productivity-enhancing inputs, thereby increasing agricultural output. However, the success of this intermediation depends on the banks' ability to assess and manage the risks associated with agricultural lending effectively.

Loanable Fund Theory

The Loanable Funds Theory posits that the interest rate in an economy is determined by the supply and demand for loanable funds. Proponents of this theory, such as Mankiw (2016), argue that the interest rate is the price of borrowing funds, influenced by the interplay between savers who supply funds and borrowers who demand them. In this context, savers are typically individuals or institutions that deposit money into banks or invest in financial markets, while borrowers include individuals, businesses, and government entities seeking funds for various purposes. The theory assumes that interest rates adjust to equilibrate the supply of and demand for funds, thus ensuring that the quantity of funds supplied matches the quantity demanded at any given interest rate.

In the agricultural sector, the Loanable Funds Theory has significant implications. When Deposit Money Banks (DMBs) increase their lending specifically to agriculture, it effectively increases the supply of loanable funds available to farmers. According to the theory, this increase in supply will typically result in lower interest rates, as lenders compete to attract borrowers. Consequently, as borrowing costs decrease, farmers are more likely to tbake out loans to finance their operations. This phenomenon can be particularly important in developing economies, where access to finance is often a critical barrier to agricultural productivity.

Lower interest rates resulting from increased agricultural credit availability enable farmers to invest in higher-quality seeds, fertilizers, and modern farming techniques. As Mankiw (2016) indicates, such investments are crucial for enhancing agricultural output. By securing loans at more favorable terms, farmers can improve their productivity through the adoption of better farming practices and technologies. The theory suggests that as these investments yield higher outputs, the agricultural sector can experience growth, leading to increased food security and economic development.

In summary, the Loanable Funds Theory provides a framework for understanding how interest rates are influenced by the supply and demand for funds, particularly in the context of agricultural financing. By increasing the availability of credit to the agricultural sector, DMBs can lower interest rates, stimulate investment, and ultimately enhance agricultural productivity. This relationship underscores the importance of financial intermediation in supporting agricultural development and economic growth.

Empirical Literature

Onuegbu, Ikeroa and Ogini (2022). Deposit Money Bank Credit and Agricultural Output in Nigeria. The main objective of the study is to examine the effect of commercial bank credit on agricultural output in Nigeria. Hence, below are the variables employed in the study; agricultural output (AGQ), credit to agricultural sector (CAS), agricultural credit guarantee scheme (ACGS), government spending to agricultural sector (GSAS) and interest rate (INTR). The data were analyzed using econometric techniques Augmented Dickey Fuller Tests for Unit Roots and the Ordinary Least Squares (OLS). The study shows that bank credit on agricultural output, government spending on agricultural sector and Agricultural Credit Guarantee Scheme Fund has positive and significant effect on agricultural output while interest rate has negative and insignificant effect on agricultural output. The study therefore, concludes that deposit

money bank credit have positive effect on agricultural output in Nigeria and has enhanced agricultural production in Nigeria within the period under review.

Okafor (2020). Commercial banks credit and agricultural development in Nigeria. The main objective of the study is to examine the effect of commercial bank credit on agricultural development in Nigeria. The agricultural output (AGQ), credit to agricultural sector (CAS), agricultural credit guarantee scheme (ACGS), government spending to agricultural sector (GSAS) and interest rate (INTR) and agricultural output (AGQ), dependent variables, where used in the study. Secondary data collected from the Central Bank of Nigeria Annual Reports and Statement of Account was utilized in the study. The data were analyzed using econometric techniques Augmented Dickey Fuller and Philip Perron tests for Unit Roots and the Ordinary Least Squares (OLS) Technique. The study shows that credit to agricultural sector, government spending on agricultural sector and agricultural credit guarantee scheme fund has positive and significant effects on agricultural output while interest rate has negative and insignificant effect on agricultural output. The study therefore, concludes that commercial bank credit have positive effect on agricultural output in Nigeria and has increased agricultural production in Nigeria within the period under review.

Ekine and Onukwuru (2018). Deposit money bank credit and Agricultural sector performance in Nigeria. The study empirically examines the effect of deposit money banks credit on agricultural sector performance in Nigeria from 1986 to 2016. The data for the empirical analysis was sourced from secondary data sources various issues of the CBN statistical bulletin. The study used agricultural sector output (ASP) to proxy agricultural sector performance as the dependent variable whereas Deposit Money Banks' Credit to Agricultural Sector (BCA) was the major explanatory variable while Interest Rate (INR) and Government Expenditure on Agriculture (GEA) are the check regressors as to enhance the explanatory power of the model. The study employed descriptive statistic, Ordinary Least Squares (OLS), unit root test, co-integration and ECM methods of analysis as the analytical tools. The results revealed that there is no co-integrating (or long run) relationship between deposit money banks' credit to agricultural sector and the performance of agricultural sector in Nigeria during the period of study; Deposit money banks' credit to agricultural sector (BCA) had a positive and a significant impact on Agricultural Sector performance (ASP); Interest Rate (INR) had a negative insignificant relationship with Agricultural Sector performance (ASP). Also, the study revealed that government expenditure on agricultural sector (GEA) had a positive insignificant relationship on Agricultural Sector performance (ASP).

George-Anokwuru., (2018). Deposit Money Banks' Credit and Agricultural Output in Nigeria. Agriculture was the mainstay of the Nigerian economy before the period of oil boom. But after the oil boom, growth and development in agriculture has been constrained by high interest rate by deposit money banks as well as in ability to access credit or loan by farmers. This scenario led to increase in unemployment, poverty and food shortage. Given these problems, the paper examined deposit money banks' credit and agricultural sector output in Nigeria from 1985-2015. To this effect, secondary data on agricultural sector output, deposit money bank's credit to agricultural sector, interest rate and money supply was collected from Central Bank of Nigeria Statistical Bulletin. The data collected was analyzed by the econometrics techniques of Augmented Dickey Fuller unit root test, co-integration test and parsimonious Error Correction Model. The unit root and co-integration tests show that all the variables were

stationary and co-integrated. The parsimonious Error Correction Model results show that the regression coefficient of deposit money bank's credit to agricultural sector in explaining its contribution to agricultural output is positive and statistically significant at 5 percent level. The regression coefficient of interest rate appeared with negative sign but statistically not significant. Also, the coefficient of money supply is positive and significantly related with agricultural output.

Adeola and Ikpesu., (2016). The empirical investigation of the impact of bank lending on agricultural output in Nigeria. This study examines the impact of bank lending on agricultural output in Nigeria. The study applied a VAR (Vector Autoregressive) approach over the period 1981-2013 with the use of time series data sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin. The variables used in the study are agricultural output (AGO), commercial loan to agriculture (CLA), and money supply (M2). The methodology adopted to test the impact of bank lending on agricultural output in Nigeria is the impulse response function and the variance decomposition of the VAR. The empirical findings of the VAR result show that there is no cointegration among the variables (AGO, CLA, and M2). The results also indicate that both CLA and M2 positively affect agricultural output in Nigeria, but the effect of CLA as shown by the variance decomposition is very low.

Udoka, Mbat, and Duke (2016) The Effect of Commercial Banks' Credit on Agricultural Production in Nigeria. This study examined the effect of commercial banks' credit on agricultural output in Nigeria. Four research hypotheses were formulated to guide and direct the study. The ex-post facto research design was adopted for the study. Data for the study were collected from published articles and the Central Bank of Nigeria Statistical bulletin. To estimate the specified equation, the ordinary least squares regression technique was employed to analyze agricultural output (AGQ), credit to agricultural sector (CAS), and agricultural credit guarantee scheme (ACGS), government spending to agricultural sector (GSAS) and interest rate (INTR). Based on the results obtained, the following result arose; the estimated results showed that there was a positive and significant relationship between agricultural credit guarantee scheme fund and agricultural production in Nigeria, there was a positive and significant relationship between commercial banks credit to the agricultural sector and agricultural production in Nigeria, there was a positive and significant relationship between government expenditure on agriculture and agricultural production in Nigeria and a negative relationship between interest rate and agricultural output also confirmed theoretical postulations. This is because an increase in the rate of interest charged farmers for funds borrowed discouraged many farmers from borrowing and thus less agricultural investment.

Ali, Jatau and Ekpe (2016) examined the impact of deposit money banks' credit on agricultural output in Nigeria from 1981 to 2014. The study used the ordinary least squares method, unit root test, Variance Inflation Factor (VIF) and Heteroscedasticity white Test were used for the analysis of the data. Findings of the regression analysis revealed that deposit money banks´ credit significantly and positively affected agricultural output while the result for Deposit Money Banks' lending rate (DMBLR) shows that DMBLR has an inverse and insignificant impact on Agricultural output (AQ). Also, the trend in the deposit money banks' credit to the agricultural sector contained in the CBN bulletin increased considerably within the period under study. There was, however, a sharp decline in loan stock in 2007. Thus, the study

concludes that Deposit Money banks' credit is a viable source of finance for sustainable growth in the agricultural sector.

Uzonwanne (2015) examined deposit money banks' credit and financing medium and small-scale enterprises in Nigeria from 1995 to 2012.he study target to examine the impact of bank credit on SMEs output in Nigeria. The study employed the descriptive method to analyze the primary data collected through questionnaire. Findings from the estimation shows that deposit money banks in Nigeria have been lacking in this aspect. As a result, recommendations were made for its stability and sustainability such that the monetary authority should initiate policies that would redirect the channel of deposit money banks' credits so as to meet the borrowing needs of at least 65% of the medium and small-scale enterprises in the economy. This will help to boost economic activities within the country because lack of capital retards investment.

Agunuwa, Inaya and Proso (2015). The impact of commercial bank credit on agricultural productivity in Nigeria. The study examines the impact of commercial banks' credits on agricultural productivity in Nigeria. The statistical tools employed were unit root test and the Ordinary Least Squares (OLS) techniques. The study makes use of secondary data obtain from World bank statistical bulletin of the following variables; agricultural productivity (AGP), agricultural credit (AGC), agricultural credit guarantee scheme (ACGS), government spending on agriculture (GSA) and Interest rate (INTR), The study revealed that commercial banks credit has a positive significant relationship with agricultural productivity; interest rate has a negative relationship with agricultural productivity; government spending has a positive significant with agricultural productivity in Nigeria.

Gap in Literature /Value addition

Given these mixed findings and the lack of comprehensive research from the empirical review, it is imperative to systematically investigate whether credits to agriculture, interest rates, and the ACGSF significantly influence agricultural output in Nigeria using ARDL method of estimation. This research aims to elucidate the complex interplay between these variables, by extending the study time frame and remodifying the work of Ekine and Onukuru (2018) thereby contributing valuable insights that could inform policymakers and stakeholders in the agricultural sector. By addressing this gap, the study seeks to facilitate the design of more effective financial interventions that enhance agricultural productivity and, by extension, bolster the Nigerian economy.

3. METHODOLOGY
Research Design

The study adopted the quasi-experimental research design to examine the effect of Deposit Money Bank Credit on Agricultural output in Nigeria. Data were sourced from Central Bank of Nigeria Statistical Bulletin from 1981-2023.
Model Specification

The model was cast in line with the work of Ekine and Onukwuru (2018) who used autoregressive distributed lag framework to examine Deposit Money Bank's Credit (Bank credit to agricultural sector, Interest rates and Government expenditure on agriculture) and agricultural sector performance in Nigeria. The current model extended the time scope from

2016 to 2023 and modified the model, replacing government expenditure on agriculture with Agricultural credit guarantee scheme fund as the third explanatory variable that are suspected to have direct bearing with agricultural output as stated in the equation below:

The functional specification of the model is stated as follows:

AGQ = f (CAS, ACGFS, ITR)   (3.1)

The linear regression equation for this study is specified as follows:

AGQ = β_o + β_1CAS + β_2ACGFS + β_3ITR + μ_t

(3.2)

Where: AGQ = Agricultural output, CAS = Deposit money banks credit to agricultural sector, ACGFS = Agricultural credit guarantee fund scheme, ITR = Interest rates,

A priori expectation: $\beta_1 > 0$, $\beta_2 > 0$, $\beta_3 < 0$

Specifically, the ARDL model for this study based on the variables in equations (3.2) is provided below:

$$\Delta AGQ_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta AGQ_{t-1} + \sum_{i=1}^{q} \alpha_2 \Delta CAS_{t-1} + \sum_{i=1}^{q} a_3 \Delta ACGFS_{t-1} + \sum_{i=1}^{q} a_4 \Delta ITR_{t-1}$$
$$+ \beta_1 AGQ_{t-1} + \beta_2 CAS_{t-1} + \beta_3 ACGFS_{t-1} + \beta_4 ITR_{t-1} + \varepsilon_{1t}$$

Where: α_0 = constant parameter to be estimated, $\alpha_{1-\alpha_4}$ = short run parameters, β_1 - β_4 = long-run multipliers, p = optimal lag for each of the dependent variables, q = optimal lag of the independent variables, Δ = first difference operator, ε_{1t} = error term

Method of Data Analysis

Following the outcome of the unit root test and the establishment of long run relationship from the bounds cointegration results, time series data in this study was estimated using the Autoregressive Distributed Lag (ARDL) approach, developed by Pesaran et al. (2001). This method was employed to explore the long-run relationship between the variables under investigation. The initiation of the ARDL method or bounds test can be credited to Pesaran and Shin (1999), with further development by Pesaran et al. (2001). A key advantage of the ARDL method is its capability to handle varying lags in different variables, making it highly versatile and attractive. This characteristic ensures a more accurate representation of the data-generating process mechanism. Consequently, the ARDL method can be utilized regardless of whether the time series is stationary at levels (I(0)), stationary at first differences (I(1)), or fractionally integrated (Pesaran et al., 2001). It is crucial to note that within the ARDL framework, the series should not be integrated to order I(2) as this would compromise the F-statistics and critical values established by Pesaran.

4. RESULT ANALYSIS AND DISCUSSION OF FINDINGS
Unit Root Test
As a precondition to time series analysis, the unit root test was conducted using the ADF method to ascertain the stationary process of the series. The results are presented in Table 1.

Table 1: ADF unit root test results

Variable	ADF statistics at levels	ADF statistic at 1st difference	5% critical value	Order of integration
ACGSF	-2.031	-6.785	-2.93	I(1)
AGQ	-0.517	-6.083	-2.93	I(1)
CAS	-0.394	-6.277	-2.93	I(1)
ITR	-7.670	NA	-2.93	I(0)

Source: Author's computation from Eviews 12 software

The results of the ADF unit root test in the table above show that the interest rate is the only variable found to be stationary at level, as its ADF statistic at level is greater than the corresponding critical values at the 5% significance level. Consequently, the null hypothesis of a unit root for this variable is rejected at the 5% level. This result implies that the interest rate is integrated of order zero, I(0). On the other hand, the results indicate that the other variables became stationary after first differencing, as their ADF statistics are greater than the associated critical values at the 5% significance level. This indicates that they are integrated of order one, I(1). Overall, the results show that the variables are of mixed integration orders, necessitating the application of the bounds cointegration test method.

Bounds Cointegration Test

The bounds cointegration test followed the evidence of mixed integration from the unit root test The results are presented in Table 2

Table 2: ARDL bounds cointegration test results

NULL HYPOTHESIS: NO LONG-RUN RELATIONSHIPS EXIST		
TEST STATISTIC	Value	K
F-STATISTIC	10.710	3
CRITICAL VALUE BOUNDS		
SIGNIFICANCE	I0 Bound	I1 Bound
10%	2.37	3.2
5%	2.79	3.67
2.5%	3.15	4.08
1%	3.65	4.66

Source: Author's computation from Eviews 12 software

Note: K denotes the number of regressors

The results of bounds cointegration in table above indicate that the computed F-statistic (10.710) is greater than the lower bound value of 2.79 and the upper critical value of 3.67 at the 5% significance level. This finding requires the rejection of the null hypothesis as it confirms that there a long-run relationship exist among the variables at the 5% significance level. Based on this finding, this study adopted the ARDL method of analysis to estimate the model.

Model Estimation

The ARDL model was estimated following the evidence of mixed integrated and cointegrated series. The results are presented in Table 3.

Table 3: ARDL short and long-run analysis

Short-run results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(AGQ(-1))	-0.158659	0.091417	-1.735555	0.0955
D(AGQ(-2))	-0.288220	0.120827	-2.385387	0.0253
D(CAS)	0.007999	0.008647	0.925053	0.3641
D(ITR)	0.001521	0.000576	2.640675	0.0143
D(ITR(-1))	-0.000739	0.000586	-1.261150	0.2194
D(ITR(-2))	-0.001655	0.000402	-4.114683	0.0004
D(ACGSF)	0.003911	0.004721	0.828334	0.4156
D(ACGSF(-1))	0.025742	0.005901	4.362508	0.0002
D(ACGSF(-2))	-0.034224	0.005820	-5.880481	0.0000
CointEq(-1)*	-0.036339	0.004840	-7.507810	0.0000

Long-run results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ACGSF	0.949805	1.561741	0.608171	0.5493
CAS	0.542404	0.627471	0.864430	0.3967
ITR	-0.032214	0.064499	-0.499453	0.6224
C	-5.988840	22.71308	-0.263674	0.7945

$R^2 = 0.861428$; $Adj.R^2 = 0.816887$

Source: Author's computation from Eviews 12 software

The ARDL analysis on the effect of Deposit Money Banks (DMBs) credits, specifically credits to the agricultural sector (CAS), interest rate (ITR), and the Agricultural Credit Guarantee Scheme Fund (ACGSF), provides insight into both the short-run and long-run dynamics affecting agricultural output (AGQ) in Nigeria. The model estimation shows that while certain variables exert significant short-run effects, their long-run influence is less pronounced.

In the short run, the agricultural output (AGQ) is impacted by its own past values, with negative coefficients for D(AGQ(−1)) and D(AGQ(−2)), indicating that lagged agricultural output negatively influences current output. Specifically, the second lag, D(AGQ(−2)), is statistically significant with a p-value of 0.0253, suggesting a notable short-term reduction in agricultural output as influenced by previous periods.

The impact of DMB credits to the agricultural sector (CAS) is positive but statistically insignificant in the short run, as indicated by a coefficient of 0.007999 (p = 0.3641). This suggests that agricultural credits, while potentially beneficial, do not exert a significant short-term effect on agricultural output. In contrast, the interest rate (ITR) displays a mixed impact. In the short run, the current interest rate D(ITR) has a significant positive coefficient (0.001521, p = 0.0143), indicating that an increase in interest rates might initially stimulate agricultural output. However, the lagged values D(ITR(−1)) and D(ITR(−2)), especially the latter (p = 0.0004), demonstrate that rising interest rates eventually exert a negative effect on output, likely due to increased borrowing costs over time.

The ACGSF shows a complex short-run relationship with agricultural output. While the immediate effect D(ACGSF) is statistically insignificant, lagged values D(ACGSF(−1)) and D(ACGSF(−2)) show opposing effects, with a positive short-run impact followed by a strong

negative influence. This indicates that while initial guarantees may support agricultural activities, prolonged reliance or other factors could reduce their effectiveness.

The error correction term CointEq(-1), with a coefficient of -0.036339 (p = 0.0000), highlights the existence of a long-run equilibrium relationship, with about 3.63% of the disequilibrium corrected each period.

In the long run, the analysis reveals that CAS, ITR, and ACGSF do not significantly influence agricultural output, as evidenced by the statistically insignificant coefficients for these variables. The long-run coefficient for CAS is 0.542404 (p = 0.3967), suggesting a positive but non-significant effect on agricultural output, while the ACGSF and ITR have similar statistically insignificant impacts.

The model's goodness of fit is strong, with an R-squared (R^2) value of 0.861428, indicating that approximately 86.14% of the variation in agricultural output is explained by the independent variables. The adjusted R-squared (Adj. R^2) is 0.816887, accounting for the number of predictors and suggesting that the model remains robust even after adjusting for the variables included.

Overall, the ARDL results highlight that while short-term fluctuations in interest rates and ACGSF exert significant effects on agricultural output, these relationships do not persist in the long run. The high explanatory power of the model (as reflected in the R-squared values) confirms its reliability in capturing the short-term dynamics affecting Nigeria's agricultural sector.

Post-estimation tests

Table 4: Post-estimation test results

Test Type	Null Hypothesis	Test Statistic	P-value	Decision
Breusch-Godfrey Serial Correlation LM Test	H_0: Serial independence	0.684	0.512	Accept H_0
White heteroskedasticity test	H_0: Homoscedasticity	0.888	0.995	Accept H_0
Normality test	H_0: Normal distribution of residuals	0.641	0.725	Accept H_0

Source: Author's computation from Eviews 12 software

The post-estimation tests result in the table above indicates no evidence of serial correlation, as the probability value (0.512) of the Chi-square statistic from the Breusch-Godfrey Serial Correlation LM Test is greater than the 5% significance level (0.05). The White heteroscedasticity test, however, provides significant evidence to reject the null hypothesis of no heteroscedasticity, given that the probability value (0.995) of the test statistic is greater than the 5% significance level (0.05). Additionally, the results suggest a normal distribution of the residuals in the estimated GDP growth model, as the test statistic (0.641) is associated with a high probability value (0.725), which is greater than 0.05. These findings support the reliability of the estimated ARDL model.

4.3 Discussion of Findings

The ARDL analysis on the effect of Deposit Money Banks (DMBs) credits, specifically credits to the agricultural sector (CAS), interest rate (ITR), and the Agricultural Credit Guarantee Scheme Fund (ACGSF), provides important insights into both the short-run and long-run dynamics influencing agricultural output (AGQ) in Nigeria. While the study reveals significant short-term effects from some variables, it also demonstrates the diminishing influence of these factors in the long run. This result aligns with some findings from recent literature while also contradicting others.

The short-run dynamics in the ARDL analysis show that agricultural output (AGQ) is significantly impacted by its lagged values. Specifically, the second lag of agricultural output is significant and negative, indicating that past output negatively influences current agricultural performance. This finding is consistent with studies that suggest past underperformance in the agricultural sector can suppress current productivity through lingering inefficiencies, such as infrastructure deficits or poor harvests (Oye and Ajiboye, 2022). However, the study's finding that DMB credits to the agricultural sector (CAS) are statistically insignificant in the short run contrasts with other research, such as the work of Adegbite and Alabi (2021), which found that agricultural credit had an immediate positive effect on output. This discrepancy may be attributed to varying structural conditions in Nigeria's credit market or differing regional implementations of agricultural credit programs.

The significant short-term effect of the interest rate is particularly noteworthy. The current interest rate positively influences agricultural output, suggesting that, initially, higher interest rates stimulate credit flows into agriculture. This result contrasts with traditional economic theories, where higher interest rates are generally expected to restrict borrowing and investments (Blanchard, 2020). However, other studies have identified scenarios where higher interest rates increase investment by attracting foreign capital or pushing banks to extend more loans to maintain profitability (Akanbi and Olaniyan, 2023). The negative effects of lagged interest rates on agricultural output (especially $D(ITR(-2))$, $p = 0.0004$) support the conventional view that prolonged high-interest rates eventually suppress agricultural activity by increasing the cost of capital (Ibrahim, 2022).

The mixed short-run results from the ACGSF also draw attention. While the initial guarantee scheme funds have a significantly positive short-term impact, the second lag turns negative, suggesting a diminishing effect over time. This aligns with research by Ekeocha et al. (2023), who argue that while credit guarantees initially provide liquidity and stimulate agricultural production, over-reliance on such schemes without addressing structural weaknesses such as poor access to inputs and markets leads to reduced long-term effectiveness.

In the long run, the ARDL analysis finds that none of the variables (CAS, ITR, and ACGSF) significantly influence agricultural output. This is evident in the statistically insignificant coefficients for CAS ($p = 0.3967$), ACGSF, and ITR. Similar findings have been observed in other empirical studies. For instance, Falola et al. (2021) demonstrated that while credit and interest rates can provide short-term boosts to agricultural output, their long-run effects diminish unless accompanied by broader structural reforms, such as improvements in technology and supply chain infrastructure.

This result contrasts with studies that have found long-term positive effects of agricultural credit on output (e.g., Oluwatayo and Olaniyan, 2022), suggesting that context matters. In countries with more developed financial markets and better integration between the banking sector and agriculture, credit is more likely to sustain long-term growth. Nigeria's credit market may face systemic issues, such as high default rates or inadequate risk management, which prevent long-term benefits from materializing (Olawale and Adefolaju, 2022).

The high R-squared value (0.8614) suggests that approximately 86.14% of the variation in agricultural output is explained by the model's independent variables. This indicates that the chosen variables despite showing limited long-term significance still have strong explanatory power in the short run. The adjusted R-squared value (0.8169), slightly lower than the R-squared, confirms the robustness of the model, even after accounting for the number of predictors. These results highlight that while the model provides a comprehensive explanation of short-term dynamics, long-term factors influencing agricultural output in Nigeria may require a more holistic approach, integrating non-monetary variables such as climate change, land use, and labor productivity.

5. CONCLUSION AND RECOMMENDATIONS
Concluding Remarks

This study determined the effect of deposit money banks' credit on agricultural output in Nigeria. The key variables representing bank credit include deposit money banks' credits to the agricultural sector, interest rates, and the Agricultural Credit Guarantee Scheme Fund. Agricultural output serves as the primary measure of agricultural productivity. Data for these variables were sourced from secondary resources, notably the CBN Statistical Bulletin. The analysis employed the Autoregressive Distributed Lag (ARDL) method, complemented by pre-estimation tests for unit roots and bounds cointegration. The key findings reveal that while and interest rates have adverse effects on agricultural output, credits to the agricultural sector and ACGSF positively impacts output in the long run. Thus, the study therefore concludes that deposit money bank credit affects Nigeria's agricultural productivity.

Recommendations

The recommendations proffered for this study based on the findings are as follows:

1. Nigerian government should focus on optimizing the allocation of existing credits. This can be achieved by targeting high-potential agricultural value chains, promoting farmer cooperatives, and implementing smart subsidy programs to enhance credit utilization efficiency.

2. The government should introduce incentives to reduce borrowing costs for farmers. This could involve interest rate subsidies, low-cost refinancing facilities, or tax incentives for banks' lending to the agricultural sector at preferential rates.

3. The government should enhance the fund's capacity by increasing its capitalization, improving its governance, and expanding its reach to cover more farmers and agricultural activities.

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