Article:
 https://bit.ly/JazeIssue2
 Journal of Arid Zone Economy 1(2): (2023) 135 – 147
 ISSN: 2992–4952



BANK CREDIT NEXUS AGRICULTURAL OUTPUT GROWTH OF NIGERIA USING ARDL APPROACH

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Abstract

Keywords: Bank Credit Agricultural Output Growth rate ARDL Exchange Rate Interest rate

JEL Classification EO47, Q18

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This study examined the nexus between bank credit and agricultural output growth of Nigeria. To document this study, Quantitative method was employed which was hinged on time series data from 1986 to 2021. Key variables employed include Agricultural output growth rate (AGR), Bank Credit Rate (BCR), Exchange Rate (EXR) and Interest Rate (INT). Econometric tools such as unit root test, Autoregressive Distributive Lag (ARDL) and Granger Causality Test was employed. Findings revealed that AGR and BCR were stationary at levels except for EXR and INT. More so, the bound test result revealed that there exists long run relationship among the variables. Furthermore, the study reveals BCR, INT and AGR are negatively related to AGR except for EXR. About 54% variation in AGR is accounted by the explanatory variables whereas the DW-statistic is 1.9 which is approximately 2 signifies no autocorrelation. Additionally, the Error Correction Model (ECM) coefficient is statistically significant which is CointEq (-1) is -1.02. This implies that AGR has a speed of adjustment of 102% to return to equilibrium if there are deviations from BCR, EXR and INT. The study concluded that the bank credit marginally contributed to agricultural growth rate under the period considered. The study recommended that CBN through the deposit money banks should provide substantial credit especially to the agricultural sector and ensure that the fund is rightly channel for the growth of agricultural output and the economy at large.

1. Introduction

The rapid growth and development in every sphere of human endevours may not be sustainable and completed where there exists a persistent food security challenge amidst the popular. Globally, technology has transformed virtually many areas of human activities such as agriculture, commerce and trade, security and communication networks among others. However, these transformations have not yet totally eradicated the danger of food insecurity in the developed and developing world, and most

especially the African continent. The African challenges of food insecurity is multidimensional in nature which comprises of trade dynamism, technological changes, war, political instability, natural disaster (flooding, drought) climatic changes as well as policy formulation and implementation. These factors have conditioned African countries under threat of perpetual food insecurity. (Fawole, et al, 2015). Consequently, majority of African countries do not have safe, sufficient, and nutritious food at their disposal. These have seriously jeopardized human health, and welfare of the people which invariably affects the economic and political and social development of the countries (FAO, 2019). In an area of global trade and food security, record had showed that from 1960-2011 value of total global trade on agricultural product plummeted from 50% to 6%. Within the same period Africans experienced a constant decline in its agricultural export as a proportion of total merchandised export from 42% to 6% as a result of that Africa gradually become a net importer of food instead of exporting (Lamy, 2011).

Evident to this, shows that in Nigeria between 2016 to 2019, the gross agricultural import amounted to N3.35 trillion which was four times greater than the agricultural export of N803 billion within same years (FAO, 2022). This reveals the fact that, Nigeria is not excluded from this issue of food insecurity, observing from the early discovery of crude oil in 1960s, and attention was shifted from agriculture to crude oil mining and marketing. Instead of producing food for exportation, Nigeria gradually also became an importers of various food items. This plunged the majority of masses into food insecurity as they are not opportune to tap from the proceeds of crude oil revenue. In an effort to rescue the economy out of the plague of food insecurity various policies were formulated on food production, processing, storage as well as marketing both national and international organization. This includes the agricultural promotion policy (APP), Nigeria Africa trade and investment promotion, presidential economic diversification initiative, economic and export promotion incentive, action against desertification (AAD), Commercial Agriculture Credit Scheme (CACS), Agricultural Credit Guarantee Scheme Fund (ACGSF), and Agricultural Credit Support Scheme (ACSS) among others.

Additionally, financial institutions were not left behind; efforts were made to formulate policies towards regulating bank credit, exchange rate and interest rate tilted towards growth of agricultural production, trade and marketing. All these drives aim at agricultural growth development Nigeria. and in Furthermore, various studies were made to examine: bank credit in relation to private sector; agricultural production in relation to formal credit in Nigeria; private sector credit in relation to economic growth in Nigeria; commercial banks' credit on agricultural output in Nigeria; deposit money banks' credit and economic growth in Nigeria just to mention a few (Nwakanma et al., 2014; Nnamocha and Eke, 2015; Fapetu and Obalade, 2015; Marshal et al., 2015; Olowofeso et al., 2015; Okafor et al., 2016; Udoka et al., 2016). However, unlike the other studies, this study has integrated most of the variables but specifically in relation to agricultural outputs growth rate of Nigeria. Moreover, models used, the study areas used by other researchers as well as period gap to be covered are the distinguishing area of interest that propelled the researchers to examine the nexus between agricultural credit and growth rate of Nigeria using an ARDL Approach.

2. Literature review

This section comprises of three sub division namely; conceptual review where major key concepts were discussed, theoretical framework which captures theory related to the study and empirical review which covers detail review of previous studies adopted to buttressed research findings.

2.1 *Conceptual review*

Gross Domestic Product (GDP) Growth Rate

It will be absurd to defined Gross Domestic Product (GDP) growth gate without understanding the meaning of GDP. Therefore, GDP simply refers to the total monetary value of goods and services produced in a country over a given period of time which is usually one fiscal year (Ibrahim et al, 2022). In the words of Andrew and Hartzell (2011), GDP refers to "the total value of goods and services that are produced within a specified country (including those produced by non-residents) over a period of (usually one year) excluding all goods and services used during that period to produce further goods and services". Hence, GDP growth rate is the annual percentage growth rate of GDP at market prices based on the constant local currency. Most especially aggregate are based on constant United State (US) dollar price of a given year. In other words, it refers to total sum of gross value added by all residence producers in the country with any production taxes and subtracting any subsidies not included in the value of the product. In a nut shell, it expresses the differences between two period GDP values which is divided by the GDP of the based period, multiplied by 100.

Exchange Rate

According to The Reserve Bank of Australia (RBA) 2018, An exchange rate is a relative price of one currency expressed in terms of another currency (or group of currencies) in other words it is the rate at which one currency exchanges for another and affects trade and the movement of money between countries. Exchange rates are imparted by both the domestic currency value and the foreign currency value. Globally, most exchange rates are defined as floating – rising or falling with respect to supply and demand of the market. While some other exchange rates are

being pegged (fixed) to the value of a given country's currency. Its fluctuation influences business/trade by changing the cost of supplies that are purchased from a different country, at the same time changes the demand for the country's product overseas (James, 2012).

Interest Rate

This is the amount charged over and above the principal amount by the lender from the borrower (Balami, 2006). It is expressed as a percentage of the principal, by a lender to a borrower for the use of money. Normally, it is usually expressed as a percentage of the amount borrowed (principal) for one year or any other time - month, week, day etc., as agreed by the lender and borrower at the time of contracting the loan. In other words, interest rate is the percentage of the principal that is paid as a fee over a specified period of time. In summary, it can be described as the rental payments for the use of credit by borrower and return for the parting with liquidity by the lenders over time. It can be nominal or real interest rate. Nominal interest rate it does not take into account the effect of inflation while the real interest rate is the contrary. That is, it adjust to the changes in the price levels- which can also be expected or actual changes. (CBN, 2016).

Bank Credit Rate

In order to define bank credit rate, it will be of significance to know the meaning of bank credit. Hence, Bank credit is usually referred to as a loan given for business requirements or personal needs to its customers, with or without a guarantee or collateral, with an expectation of earning periodic interest on the loan amount. In other words, Bank Credit is the aggregated amount financial institutions (i.e., banks) are willing and able to offer a loan or advance to an individual or organization. The principal amount is refunded at the end of loan tenure, duly agreed upon, and mentioned in the loan covenant (Ashish, 2023). Therefore, bank credit rate simply refers to the rate at which bank issue out credit to customers for their businesses or personal needs.

2.2 Theoretical framework Keynesian Theory

This research work hinges on the Keynesian theory of income, output and employment developed by a British economist popularly called John Maynard Keynes in the 1930s. In the Keynesian theory, employment depends upon effective demand and effective demand results in output, then output create income. Meanwhile, employment depends on investment and it varies in the same direction as the volume of investment. Investment in turn depends on the rate of interest and marginal efficiency of capital (MEC). Investment can also be increased by a fall in the rate of interest and or a rise in marginal efficiency of capital. The MEC depends also on the supply price of capital assets and their prospective yield. It can be raised when the supply price of capital assets falls or their prospective yield increases (Jhingan, 2010).

Hence, the growth of agricultural output as a function of agricultural bank credit is serves as investment into the agricultural sector in form of liquid cash for buying farm machineries, farming chemical, hiring of farmlands as well as settling farm workers. However, the following purchases can be more effective where exchange rate for those farm implements and chemicals produced abroad and imported is economically affordable. Where exchange rate becomes very high, even with the availability of the bank credit to the agricultural sector, growth in the sector may not be appreciable. This is synonymous to the Keynesian theory that investment depends on interest rate as well as marginal efficiency of capital (Ammaini, 2012).

Moreover, bank credit to agricultural sector can also be patronized much and propel growth in agricultural sector if the interest rate become higher, bank credit patronage decreases and as bank credit patronage decreases, investment in the agricultural sector also decrease which invariably influence growth of agricultural output in the economy (Ibrahim et al, 2022).

2.3 Empirical review

There are many researchers that conducted researches in order to examine the impact of bank credit on agricultural output in particular and country's GDP as a whole which are reviewed as follows; Imoisi et al. (2012) while examining the effects of credit facilities on agricultural output and productivity in Nigeria using data from 1970-2010. It was discovered that there is a significant relationship between Deposit Money Banks loans and advances as well as agricultural output. Similarly, Ammaini (2012) studied the relationship between agricultural production and formal credit supply in Nigeria. The result shows that formal credit is positively and significantly impacting the productivity of the crop, livestock and fishing sectors in the Nigerian economy.

In another study by Nwakanma et al. (2014) while examining the nature of the long-run relationship that existed between bank credits, the private sector and economic growth of Nigeria's economy from 1981 to 2011 adopted Autoregressive Distributed Lag Bound (ARDL). The results showed a significant long-run relationship between the study variables. Moreover, Emecheta and Ibe (2014) also employed the reduced Vector Autoregresion approach using annual data from the year 1960-2011 to examine the relationship between bank credit and economic growth in Nigeria. It was found that there is a significant positive relationship between bank credit and economic growth of Nigeria.

Furthermore, Nnamdi and Nwiyordee (2014) investigated the nature and direction of causal relationships existing between classified sectoral microcredit allocations and sectorally classified entrepreneurship contributions to Nigeria's economic growth using data of 1992 to 2011. The result showed that in the sectors where

microcredit operations have become significant and/or near significant, they only function to service rather than promote entrepreneurial activities. More so, Additionally, Olowofeso *et al.* (2015) examined the impacts of private sector credit on economic growth in Nigeria using quarterly data from the period 2000 first Quarter to 2014 fourth Quarter, They found a cointegrating relationship between output and its selected determinants, though with a structural break in 2012 first Quarter. In addition, the error correction model confirmed a positive and statistically significant effect of private sector credit on output.

Another study by Nnamocha and Eke (2015) investigating the effect of Bank Credit on Agricultural Output in Nigeria via Error Correction Mode (ECM) using yearly data of 1970-2013. The results showed that, in the longrun bank credit contributed a lot to agricultural output in Nigeria. While Udoka et al. (2016) examined the effect of commercial banks' credit on agricultural output in Nigeria. The results also showed that there was a positive and significant between agricultural relationship credit guarantee scheme fund and agricultural production. There was also a positive and significant relationship between commercial banks credit to the agricultural sector and agricultural production in Nigeria. Likewise, Okafor et al. (2016) examined the causal relationship between deposit money banks' credit and economic growth in Nigeria over the period 1981-2014 using Vector autoregressive (VAR) and Granger causality test. The findings show a unidirectional causality from private sector credit to economic growth.

More so, Interest rate has been playing significant role over the years in influencing economic activities of a nation as well as economic decisions of individuals and the economy at large. Apart from influencing savings and investment, it also redirect the flow of funds from savers to borrowers. These are some of the imperial findings by scholars. According to Orr Malcoim and Michael (1995) where they used a panel data set covering 17 countries to investigate the determinants of longterm real interest rates. They found a significant positive correlation with the rate of return on physical capital with significant spillover effect from interest rates in other countries. In another study by Ford and Laxton (1999), using panel data showed that an aggregate of OECD debt to GDP was a significant determinant of short-term real interest rates in member countries and that the aggregate measure often eliminated the influence of own-country debt.

In addition, Aydemir and Demirhan (2009) also studied the behaviour of interest rates and investment in Nigeria using time series data from 1976 – 2006. It was found that investment behaviour significantly influences the interest rate. In another research by Cole and Akintola (2021), titled 'interest rate and economic growth of Nigeria' using data from 1999 to 2019. It was found that interest rate had positive and insignificant effect on gross domestic product in Nigeria. Moreover, Mutinda (2014) studied the effects of interest rate on economic growth of Kenya. Taken data from 2003 to 2012, analyzed using ordinary least square multiple regression. It was found that interest rate has negative effect on economic growth of Kenya. So also Maiga, 2017 in assessing the effect of interest rate on the Nigerian economy using data for the period of 1990-2013, found that interest rate did not have a much effect on economic growth of Nigeria, nonetheless, the study suggested that the Nigeria can benefit from lower interest rate which in turn will have a positive effect on the country's investment. Meanwhile, Harswari and Hamza, (2017) while investigating the impact of interest rate on the economies of selected countries in Asia. Using 48 countries and sample of 20 companies, found that interest rate has negative effect on GDP and statistically significant. Lastly, Matarr and Momodou (2021), analyzed the effects of interest rate on economic growth of Gambia using data for the period 1993 to

2017. They used Vector Error Correction Model (VECM) to check the relationships between the dependent variable (Gross Domestic Product) and independent variables (Real Effective Exchange Rate and Real Interest Rate), both in the short-run and long-run. The result indicates that there is no short-run association between the growth of the Gambian economy and interest rate but that there is a long run connection that runs from real interest rate and real exchange rate to GDP.

Furthermore, in a study by Akpan and Atan (2011) where they examined the effect of exchange rate movement on economic growth in Nigeria, the results shows that there is no evidence of a strong direct relationship between changes in exchange rate and output growth in Nigeria. However, Nigeria's economic growth has been directly affected by monetary variables. In another study by Akinbonola (2012) on the dynamics of money supply, exchange rate and inflation in Nigeria. Using quarterly data from 1986 – 2008 and Vector Error Correction Model (VECM) was applied. It was found that in the long run, money supply and exchange rate have significant inverse effect on inflationary pressure.

Moreover, Martins and Muftau (2014) also examined the impact of exchange rate depreciation on balance of payment (BOP) in Nigeria over the period of 1961 – 2012. Multivariate Vector Error Correction framework was applied. The result shows a long-term equilibrium relationship between exchange rate and other variables employed. Furthermore, Nwafor (2018) studied the effect of Naira rate on economic growth in Nigeria between 2006 and 2016. The Ordinary Least Square technique of analysis was employed. The result showed that the Naira rate has a significant influence on economic growth in Nigeria.

More so, Mahonnye and Tenda (2019) examined the exchange rate impact on output and inflation. The study used quarterly data from 1990 - 2006 and applied the Johansen co-

integration regression test and Vector Error Correction Model (VECM) in the analysis. The study revealed that in both the short run and long run, fluctuations in the real exchange rates are significant on real output growth and expansion. Lastly, Godwin, and Sergius (2021) examined the effect of exchange rate on the economic growth of Nigeria. Data from 2009 to 2018 was used. Ordinary Least Square technique was employed in the analysis. It was found that exchange rate had significant effect on GDP.

In view of the above studies, most of the studies have used this study's variables independently (interest rate, exchange rate, agricultural credit rate) in relation to economic growth. However, this study has integrated the variables but in relation to agricultural outputs growth rate of Nigeria. Moreover, models used, the study areas by other researchers as well as period gap to be covered are the distinguishing area of interest that propelled the researchers to examine the nexus between agricultural credit and growth rate of Nigeria, using agricultural credit rate, interest rate, exchange rate, in relation to economic growth of Nigeria from 1986 - 2021.

3. Methodology

This study used Quantitative approach which was hinged on a time series data from 1986 – 2018sourced from National Bureau of Statistics (NBS). Key variables include Agricultural output rate (AGR), Bank Credit Rate (BCR) of Agriculture, Exchange Rate (EXR) and Interest Rate (INT). Moreso, the Agricultural output rate (AGR) is the dependent variable while Bank Credit Rate (BCR), Exchange Rate (EXR) and Interest Rate (INT) served as independent variables which were all measured in their percentages (%). Consequently, the linear function was adapted and modified from the works of Ibrahim et al, 2022.

$$AGR = f (BCR, EXR, INT)$$
 1

2

The functional relation can be written as:

$$Y_t = \beta_0 + \beta_1 X_{it} + \mu_t$$

While the linear equation form can be;

$$AGR_{t} = \beta_{0} + \beta_{1}BCR_{t} + \beta_{2}EXR_{t} + \beta_{3}INT_{t} + \mu_{t}$$

where AGR represents Agricultural output rate; BCR is Bank Credit Rate of Agriculture; EXR is Exchange Rate; and INT is Interest Rate proxied by Prime lending rate. $\mu_{1:}$ is error term.

The ARDL model is specified as follows which was buttressed by the works of Pesaran & Shin (1999); Pesaran, Shin, &Smith,(2001). This model was adopted based on the outcome of the pre-test specifically unit root test conducted. The model is specified as thus:-.

$$\Delta Y_t = \beta_0 + \sum_{i=1}^n \beta i \Delta Y_{t-1} + \sum_{i=0}^n \lambda i \, \Delta X_{t-1} + \theta_1 Y_{t-1} + \theta_2 X_{t-1} + \mu_t$$

Where:

 $\beta i, \lambda i$: Short-run coefficients θ_1, θ_2 : ARDL long-run Coefficients

Table 1:Unit Root Test (Stationarity Test)

μ_t : Disturbance term

Therefore, it model can be re-written as thus:

$$\Delta AGR_{t} = \beta_{0} + \sum_{i=1}^{n} \beta i \Delta AGR_{t-1} + \sum_{i=0}^{n} \lambda_{1} \Delta BCR_{t-1}$$

$$_{1} + \lambda_{2} \Delta EXR_{t-1} + \lambda_{3} \Delta INT_{t-1} + \theta_{1} BCR_{t-1} + \theta_{2} EXR_{t-1}$$

$$_{1} + \theta_{3} BCR_{t-1} + \mu_{t} \qquad 5$$

Additionally, pre-test conducted include the unit root test and VAR lag selection criteria. More so, the ARDL bound test, causality test was carried out to determine the long run relationship as well as the causal relationship between the variables. To determine the robust nature of the model, other post estimation test conducted include Serial Correlation Test, Heteroskedasticity Test, Normality Test (Jarque-Bera) and Stability Test.

4. Results

4.1 Unit Root Test

Under this sub-section, the Augmented Dickey Fuller and Philip Perron Unit root test was conducted to ascertain the stationarity of the variables as shown in Table1.

	ADF Test			Philip-Peron Test		
Variable	Order of	(t-statistic)	Intercept/	Order of	(t-statistic)	Intercept/
S	Integration	P- Values	Trend	Integration	P- Values	Trend
AGR	1(0)	(-5.708)	Intercept	1(0)	(-5.7095)	Intercept
		0.0000*			0.0000*	
BCR	1(0)	(-6.9160)	Intercept	1(0)	(-11.1070)	Intercept
		0.0000**			0.0061*	
EXR	1(1)	(-3.8176)	Intercept	1(1)	(-3.7136)	Intercept
		0.0064*			0.0083*	
INT	1(1)	(-8.2651)	Intercept	1(0)	(-6.9210)	Intercept
		0.0000			0.0000*	

Note: the Null hypothesis is that the variable has Unit Root. *, **, denote Oder of Integration at 1% and 5% level of significant respectively. Source: authors' computation

Table 1 indicates that the variable AGR and BCR is stationary at levels using ADF and Philips-Peron Test whereas INT and EXR is stationary at their first differences. This shows that the series are stationary at different level of integration i.e., 1(0), 1(1) or 1(1), 1(1). Hence,

satisfies the condition for the adoption of ARDL model as buttressed in the works of Pesaran & Shin (1999); Pesaran, Shin, & Smith, (2001). Consequently, prior, to the conduct of ARDL,

there is the need to obtain the numbers of lag suitable for ARDL model which further lends the need to conduct the VAR lag selection criteria.

4.2 Lag Selection Criteria

Table 2: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-552.135	NA	1.46E+10	34.75845	34.94167	34.81918
1	-490.161	104.5818	8.36e+08*	31.88505*	32.80114*	32.18871*
2	-485.885	6.146079	1.83E+09	32.61783	34.26678	33.16441
3	-474.278	13.78332	2.76E+09	32.89239	35.27421	33.6819
4	-445.326	27.14238*	1.64E+09	32.0829	35.19759	33.11533

Source: authors' computation

Table 4.2 indicates the VAR lag order selection criteria which comprises of different criteria which includes Akaike information criterion, Schwarz information criterion, Hannan-Quinn information criterion among others. The maximum lag is one (1) as majority of the criteria have the asterisk (*) which corresponds to 1 lag. Hence, the study used one (1) lag in the ARDL model. 4.3 ARDL Long Run Form and Bounds Test Table 3, the bound test result suggested that there is cointegration relationship between the series. This is attributed to the fact that the F-statistic value is 6.870 which is greater than all the significance level (1%, 5%, 10%) of both the lower and upper limit.

Test Statistic	Value	Significance level.	I(0) Lower Limit	I(1)Upper Limit
F-statistic	6.870	10%	2.618	3.532
K	3	5% 1%	3.164 4.428	4.194 5.816

 Table 3 Bound Test Result

Source: authors' computation

Table 4 depicts the short and long run coefficient of the series. INT in the both the short and long run has a negative relationship with AGR but it is not statistically significant owing to the fact that its p-value is greater than 5%. This implies that a one percent reduction in INT will result to 26 percent increase in AGR. This is because a reduction in INT will make more farmers have access to more funds for agricultural purposes. By so doing, it will result to an increase in agricultural output which invariably will spur growth. In addition, the correlation outcome of

the INT and GDP is in tandem with the apriori expectation and other empirical studies like the

works of Maiga, 2017; Harswari and Hamza, 2017; and Matarr et al, 2021.

	Short run Coefficients		Long run Coefficients		
Variable	Coefficient	Std. Error	Variable	Coefficient	Std.Error
D(INT)	-0.26	0.46	BCR	-0.0268	0.032
	(-0.55)			(-0.8162)	
CointEq(-1)*	-1.022	0.163	EXR	0.0081	0.013
	(-6.252)			(-0.6013)	
R-squared	0.54		INT	-0.6558	0.734
				(-0.8931)	
Adjusted R-squared	0.53		С	-6.989	13.492
				(-0.5180)	
Durbin-Watson stat	1.9				

Table 4. Short run and Long run Coefficients

Note: The values in parenthesis () represent the t-statistics. Source: authors' computation

The coefficient for BCR is 0.026 in the long run indicates a negative effect on AGR but it's not statistically significant at 5percent level of significance. The negative relationship between BCR and AGR implies that a decrease in AGR by one percent will result to an increase in BCR by 2.6 percent. This is because as AGR declines, lending rate will have to be reduced so that BCR can be increased and by extension, it will boast agricultural production or output. Consequently, this relationship outcome between BCR and AGR is in compliance with the works of Nnamocha and Eke, (2015) and Udoka *et al.*, (2016).

Also, the coefficient of EXR for the long run stood at 0.0081 which depicts a positive impact on AGR and it is statistically insignificant at 5 percent level of significance. This implies that an increase in EXR will result to an increase in AGR. This can be attributed to the fact that an increase in EXR will discourage farmers to import agricultural input but rather source it within at low cost in order to increase AGR. Moreover, the correlation outcome is in compliance with the result of Godwin et al, (2021); Mahonnye and Tenda (2019).

However, the adjusted R-squared is 0.54 which implies that 54 percent variation in AGR is accounted by the explanatory variables whereas the DW-statistic is 1.9 which is approximately 2 implying that there is no autocorrelation. Although, the ECM satisfies the criteria that the CointEq (-1) must be NEGATIVE and statistically significant as evident. That is the CointEq(-1) is -1.022 and has a p-value of less than 5%. This implies that the dependent variable (AGR) has a high speed of adjustment of 102% to return to equilibrium if there are deviations from the explanatory variables. Even though the variables are not significant, but that does not mean they cannot have effects on the AGR, only that the effects may be minimal.

4.4 Residual Diagnostics Testing

Despite, the white heteroskedasticity test that had already been checked at the point of running the ARDL model, it was still conducted alongside with the serial correlation test. The result revealed that the ARDL model is free from serial-correlation, heteroskedasticity problems because all these tests conducted have their pvalue(s) greater than 0.05, which implies the acceptance of null hypothesis that there is no serial correlation and no heteroscedasticity.

Table 5: ARDL Diagnostic Results

Test Statistic	Result
Serial Correlation $\chi^2(2)$:	0.0010 [0.9748]
Heteroscedasticity $\chi^2(2)$	1.1135 [0.3749]
Source: authors' computation	

4.5 Stability Test

Figure 1 is the Cumulative Sum of recursive (CUSUM) test of stability. It shows that it is stable under 5% level of significance. For the fact that the residual line moves closer and even along the horizontal line (point 0.0) meanwhile, it does not move outside the 95% confidence level. This means that over the entire sample investigation, the stability of the estimated coefficient exist, so that the regression coefficients are reliable and suitable for policy making. Table 6 depict that EXR granger cause INT because their p-value is less than 5 per cent whereas INT does not granger cause EXR which implies that they have a unidirectional relationship. However, all other series BCR, EXR, INT and AGR does not granger cause each other.

5. Conclusion

This paper examined Bank credit nexus Agricultural output growth rate of Nigeria while adopting an ARDL approach. However, based on the analysis Bank credit and interest rate are negatively related to Agricultural growth rate, with the exception of exchange rate but not statistically significant. Even though the variables are not significant, but that does not mean they cannot have effects on the AGR, only that the effects may be minimal. Therefore, the study concluded that bank credit marginally contributed to agricultural output growth rate under the period considered, though requiring augmented variables to be more effective.



Fig. 1. The Cumulative Sum of Recursive (CUSUM) Test

Null Hypothesis:	Obs	F-Statistic	Prob.
BCR does not Granger Cause AGR	35	0.06583	0.7992
AGR does not Granger Cause BCR		0.43691	0.5133
EXR does not Granger Cause AGR	35	0.02431	0.8771
AGR does not Granger Cause EXR		0.14949	0.7016
INT does not Granger Cause AGR	35	2.32696	0.137
AGR does not Granger Cause INT		0.01424	0.9057
EXR does not Granger Cause BCR	35	0.01993	0.8886
BCR does not Granger Cause EXR		1.52675	0.2256
INT does not Granger Cause BCR	35	0.01523	0.9026
BCR does not Granger Cause INT		0.39943	0.5319
INT does not Granger Cause EXR	35	0.06514	0.8002
EXR does not Granger Cause INT		12.6137	0.0012

Table 6. Granger Causality Test

Source: authors' computation

Sequel to research finding, the study suggested the following recommendation for implementation which includes:

- i. The CBN as the monetary authority through the deposit money banks should provide substantial credit especially to the agricultural sector and ensure that the fund is rightly channel for the growth of agricultural output and the economy at large.
- ii. Interest rate should be reduced so as to encourage lending to the sector owing to its enormous potentials to contribute to growth.
- iii. Efforts should be made by the federal government with firms and agricultural ministry/agencies towards sourcing agricultural inputs (Implements, herbicides, etc) within the country so as to reduce the demand for foreign exchange while at the same time encourage export of agricultural products so as to boast foreign exchange earnings. This by implication will reduce the pressure as well as the cost of exchange rate.

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