



## **Agricultural Credit Guarantee in Nigeria and the Uncertainties of the Macroeconomic Environment**

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**Received:** 12 December 2019

**Accepted:** 05 February 2020

**DOI:** <https://doi.org/10.32479/ijefi.9101>

### **ABSTRACT**

Efforts to revitalize agricultural credit delivery became a reality in 1977 with the establishing of the Agricultural Credit Guarantee Scheme (ACGS) Fund. This study assesses the ACGS under the Nigerian macroeconomic environment. It assesses the real value of loans guaranteed overtime; analyzes agricultural output in agriculture credit guarantee scheme, analyses the effect of changes in interest rate and other variables on the volume of loans guaranteed. Data obtained were analyzed using both descriptive and inferential statistics. This study suggests that the macroeconomic environment has not been friendly with ACGS operations. Credit guarantee contributes positively to increased agricultural output, but the number and value of loans guarantee as well as the performance of loans and agricultural sector output would be greatly enhance by policies that make interest rates, inflation, stock market capitalization, nominal exchange rates and other variables of the macroeconomic environment agricultural sector friendly and supportive.

**Keywords:** Credit Guarantee, Agricultural Sector, Macroeconomic Environment, Nigeria

**JEL Classification:** H 81

### **1. INTRODUCTION**

The provision of institutional credit to farmers has been the policy thrust of successive governments in Nigeria. To attain agricultural sector goals, several policies were formulated and implemented during the years following independence. Over time, five main types of interventions have been tried, namely; lending requirements and quotas imposed on banks refinance schemes, loans at preferential interest rates, lending by development finance institutions and credit guarantees. These actions were intended to increase lending by reducing the costs and risks to lenders of making loans to preferred clients and sectors. In the agricultural sector, government introduced the agricultural credit guarantee fund scheme in to improve credit access of farmers, particularly the small farmers. Like other public credit guarantee schemes, the purpose of the establishment of the Agricultural Credit Guarantee Scheme (ACGS) was to serve as an inducement to banks (commercial and merchant) to increase and sustain lending to agriculture so as to reduce demand and supply gap in financing

micro firms in agriculture. In Nigeria, the scheme has achieved this feat. The increase in the number and nominal amount of loans guaranteed under the ACGS fund (ACGSF) scheme, overtime has been as a result of key changes made in the original design of the scheme. First, there was the waiving of tangible collateral security for small-scale farmers who borrow five thousand Naira (5000.00) and below. Second, there was the introduction of the Self-Help Groups linkage with banks was introduced in 1991, in year 2000, loan limits to various categories of borrows were reviewed upwards, the interest drawback programme introduced in 2002 and the trust fund model introduced in 2009 (Igben and Eyo, 2002).

Credit guarantee is known to influence long term debt financing, allows greater debt capacity for firms, creates confidence among stake holders, overcome collateral constraints, provides stable finance, affect risk of lending, address the problem of information asymmetry, compensate for low profit, modify intrinsic characteristics of small business, induce learning as well as additionality (Gudger, 1996; Duarte and Rodriguez, 2018).

Unfortunately, despite efforts to strengthen the scheme in Nigeria, several authors (Gudger, 1996; Nwosu et al., 2010; Umoren et al., 2014), agree that loan default by farmers is a persistent and major problem facing the ACGS. In fact Central Bank of Nigeria (CBN) (2000) agree that repayment performance between 1998 and December 2000 was unsatisfactory in number (77%) and value (70%) and in 2018, the CBN (2018) reports that as many as 240 number of loans were non performing. The ACGS operates a loan guarantee ratio of 75%. The persisting default problem points to the fact that the loan guarantee ratio is not optimal. For effectiveness and sustainability of public credit guarantee schemes, there is need to specify an optimal credit guarantee ratio that will fulfill government goal of reducing nonperforming loans, among other benefits and this depends on government policies on the minimization of non performance of loans, bank behavior and the macroeconomic environment (Yoshinco and Taghizadeh-Hesary, 2019).

The macroeconomic environment is an important variable to consider in trying to specify an optimal credit guarantee ratio. The macroeconomic environment is created by the macroeconomic policies, may be volatile or otherwise. High economic volatility has meant that the economic environment exerts pressure on government programmes, and complicates goal attainment. Several variables like exchange rate, Fiscal policy strategies and macroeconomic reforms can exert macroeconomic pressures on the performance of credit guarantees. This is particularly true for Nigeria that has tried such exchange rate strategies as pegging of Naira to the dollar, the dual exchange rate regime between 1995 and 1999 and allowing exchange rate to be determined by forces of demand and supply; such fiscal policy strategies as the value added tax, abolition of excise duties, regulation of custom and excise tariff, and the reforms of the structural adjustment program (SAP). During SAP special interest on agricultural loan was abolished and subsidy on agricultural inputs was deemphasized. The new policies of SAP came with the introduction of microcredit programmes, government merged the Nigerian Agric Cooperative Bank, the Family economic advancement programme to form the Nigeria Agric Cooperative and rural development bank in the year 2000 to make it strong and more functional to address the credit needs of the farmers. By 2004 there was bank consolidation. In fact, the experience of Nigeria can be separated into two distinct periods. The 1970s witnessed very low interest rates that could not encourage the development of money or capital markets. No lender was willing to raise money from existing capital markets and lend under the prevailing low lending rates. Inflation rates during those years were mostly in double digits per annum. Before the introduction of the SAP in 1986, agricultural lending rates were largely concessional or subsidized. Although lending rates for agricultural purposes were deregulated in 1987, the high rates of inflation that accompanied the macroeconomic reforms, in excess of 40% per year in the early- to mid-1990s contributed to negative real agricultural lending rates (CBN, 2010). In short, the concessional lending rates to agriculture before the introduction of SAP and the prevailing high domestic inflation resulting from SAP sent mixed market signals to creditors during this period. On the whole, some macroeconomic and sectoral policies implemented from 1970 to 1985 promoted economic distortions.

For example, domestic prices and exchange rates were largely dictated by the government, generating large deviation between them and their market-determined equivalents. Appreciation of exchange rates cheapened imports, hurt exports, implicitly taxed farmers' incomes, and subsidized consumers. Government also directly participated in the provision of many farm inputs and services, and in the production, processing, and marketing of farm commodities. After SAP was introduced, there was general improvement in agricultural production and external trade from 1986 to 1989. Thereafter, growth indices of agricultural production fluctuated between stagnation and decline, a situation blamed mainly on three policy reversals and inconsistencies. First, the devaluation of the Naira which led to higher domestic prices of imported goods, including farm inputs (principally agrochemicals and fertilizers). Second, neither the interest-rate nor the exchange-rate liberalization was implemented to its logical conclusion such that agriculture could not sustainably derive the inflow of credit that it so badly needed. Third, the agricultural trade reforms were interrupted by import and export restrictions or outright bans or both. All of these factors limited long-term private-investment decisions in agriculture.

The 2004-2008 period, marked by a more successful phase of fiscal, monetary, and exchange rate policy coordination with limited aggregate demand pressures and falling inflation; and the 2008 and beyond where coordination of fiscal, monetary and exchange rate policy was challenged by the aftermath of the global financial crisis and oil price shock.

The large default rate exerts pressure on the scheme to settle default claims. The ability of the scheme to settle claims is important for the success of the scheme. The ACGS has a loan guarantee ratio of 75%. The inability of the scheme to overcome the problem of nonperforming loans implies that there is a considerable level of information asymmetry not resolved and these imply that the loan guarantee ratio of 75% is not optimal. The consequence of this is that the guarantee agency although able to increase (through their intervention) the number of firms that access the capital markets, bear excessive level risk and depress the efforts of both borrowers and the lender to contain the risk in investment.

The macro-economic environment affects production at the farm level, making it difficult for the guarantee scheme to minimize non performing loans. In Nigeria, Eyo (2008) reports that favorable exchange rate, low interest credit, low rate of inflation increased foreign private investment in agriculture where important variables that affected agricultural sector growth. Elsewhere, Zecchini and Ventura (2006) observed that higher real GDP growth translates into more income which improves the debt servicing capacity of borrowers and when there is a slowdown in the economy unemployment increases, default risk is bound to increase with unemployment, borrowers have difficulty in paying their debt. Also, Yoshinco et al. (2015) asserts that loan default risk ratio depends on macroeconomic factors – stock prices, GDP and money supply. The public credit Guarantee scheme is a tool to reduce the supply – demand gap in SME finance.

Optimal credit guarantee ratio is needed for effectiveness and sustainability credit guarantee schemes, (Yoshinco and Taghizadeh-

Hersary, 2016; 2019). In Nigeria, available evidence suggest that the macroeconomic environment is hostile to the ACGS, instead of being friendly. To ameliorate the problem an optimal guarantee ratio has to be specified for the ACGS that presents a product suited to the macroeconomic environment. To specify an optimal credit guarantee ratio for the ACGS, we must first analyse how the ACGS has fared under the past macroeconomic environment.

The general objective of the study is to evaluate the ACGSF under the Nigerian macroeconomic environment.

Specific objectives:

1. To assess the real value of loans guaranteed overtime
2. Analyze the agricultural output in agriculture credit guarantee scheme
3. Assess the effect of changes in interest rate and other variables on the volume of loans guaranteed.

### 1.1. Theoretical Issues and Review of Empirical Studies

Option pricing theory of loan guarantees. This is a theory on how options are valued in a market. An option that gives the right to purchase (call option) and an option that gives the right to sell (put option). Black and Myron (1973) used the option pricing model to determine the fair price or theoretical value for a call or a put option based on volatility, type of option, underlying stock price, time, strike price and risk free rate and concludes that proper pricing of option eliminate the opportunity for any arbitrage. Credit Guarantee Scheme provides third parties credit risk mitigation. They are like traders who buy sell and option. The guarantor will be compensated, the guaranteed pays a fee for the warranty, there is a risk reduction for the lender. Fabio and Calo (2015) used the option pricing theory to analysis security loan guarantees and interpretes them, as put option on the cash flow of secured debt, highlights that the value of guarantees are always. By acquiring the guarantee, the creditor acquires the right to overcome the debtors' insolvency by recouping the residual credit on collateral or on the guarantor's properties.

Fabio and Calo (2015) analysed security loans based on the option pricing theory and interprets loan guarantees as a put option on the cash flow of secured debt, and argues that the value of guarantee are positive before loan before loan maturities, concluded that inefficiencies of the financial markets justifies their existence. Sosin (1980) has also used the option pricing model to develop a theoretical option pricing model to value debt guarantees.

Credit guarantee is a form of protection of the creditor against default and to the lender a warrantee to recoup the asset from the guarantor in case of default. The intervention of the guarantee scheme gives the lenders the right to give credit and to the farmers the right to obtain credit. The existence and proliferation of loan guarantees is justified by the presence of market imperfections – information asymmetry, refusing to granting loans. If markets are not efficient those applying for funds could face huge difficulties in offering assets as collateral or finding 3<sup>rd</sup> parties to act as guarantees. From a theoretical point of view, it is believed that the intervention of a guarantor who has informational advantage

compared to the lender may permit problems of asymmetric information to be mitigated and a better quality screening to be conducted. Public guarantee does not lead to reduction of the risk that rest on the lender but rather transfers the risk to the guarantee agency.

Feintein et al. (2004) used the optimal pricing model to develop a theoretical value of the guarantee associated with loan guarantees and argues that credit guarantee is a contingent liability to the guarantor and a valuable asset to the borrower.

Credit Guarantee Scheme provides third parties credit risk mitigation. By acquiring the guarantee, the creditor acquires the right to overcome the debtors in solvency by recouping this residual credit on collateral or on the guarantors properties. Sosin, 1980 used an option pricing model to develop a theoretical option pricing model to value debt guarantees.

Loan guarantee are important in many countries particularly government guarantee funds for firms in financial distress. Several authors have analyzed loan guarantees in many countries Sosin, 1980; Phillip and Mason (1980); Selby et al. (1988). Most of those work center on how to value credit guarantees and the properties of loan guarantees.

Credit guarantee are financial product that a farmer can acquire/buy as a substitute for collateral. Credit Guarantee Scheme are set up to distribute credit guarantees. It involves three parties namely, the borrower, guarantor and the lender. In Italy, credit guarantee scheme is known. To ease SME financing difficulties and raises the amount of credit SMEs receive from the banking system and lower SMEs borrowing cost, (Zecchini and Ventura, 2006).

This study benefits from the credit channel theory which suggest that policy may have an effect on credit supply and demand in an economy. Dobrinsky and Markov (2003) noted that the recently advanced “credit channel view” implies that monetary policy shocks affect real economic performance through the supply of credit by financial intermediaries due to shifts in the supply schedule of the latter. The literature makes a distinction between a “bank lending channel” and a “broad credit channel” which treats the supply of external funds to firms by all financial intermediaries. The credit channel view is also consistent with the assumption of the existence of market imperfections, in particular, information asymmetries between borrowers and lenders which give rise to the relevance of credit guarantees. One implication of the existence of a credit channel in the monetary transmission mechanism is that it induces a heterogeneous response both of the credit market and of the firms due to which the increase in the cost premium for external finance will not be uniformly distributed across firms. In particular, the credit channel view is consistent with the empirical finding that the effect of a monetary shock should be more severe for small firms (that are more likely to face information costs) than for large firms (Oliner and Rudebusch, 1996) or that the negative effect of a monetary contraction on investment is greater for highly leveraged firms (which are more likely to suffer a reduction in their collateralizable net worth due to the monetary shock) than for less leveraged firms (Rondi et al., 1998; Hu, 1999). It is worth

noting that Nigerian agricultural sector is largely dominated by small-scale farms (or firms) and going by the foregoing empirical findings it would not be out of place to expect monetary policies having some effects on their collateralizable net worth and hence their credit requirements which banks tend to respond to when they supply credit to the agricultural sector.

Impact of ACGSF on farm output: Ammani (2012) investigated the relationship between agricultural production and formal credit supply in Nigeria. Data were obtained from secondary source and analysed using simple regression models. The study revealed that formal credit was positively and significantly related to the productivity of the crop, livestock and fishing sectors of Nigerian agriculture. Olagunju and Adeyemo (2008) examined the impact of credit use on resource productivity of sweet potatoes farmers in Osun-State, Nigeria. A multistage sampling technique was used. Data obtained were analyzed by Marginal Value Product and Multiple Regression Technique. Results indicated that farmers that produced with credit use resources efficiently than those without credit. The study further revealed that sweet potato output, on the average, was smaller for farmers without credit than for those with credit. Sial et al. (2011) assessed the role of institutional credit in agricultural production. Times series data was used for the study and the data obtained was analysed using ordinary least square (OLS) method. The study revealed that agricultural credit was positive and significantly related to agricultural production. The study concludes that agricultural credit is very important in agriculture production because availability of credit removes financial constraints relating to cash inputs, secondly technical efficiency of farmers will increase and thirdly agricultural credit will increase resource allocation and profitability. Bashir et al. (2010) studied impact of agricultural credit on productivity of wheat crop. Primary data were collected through a well structured questionnaire. Multiple regression was used to analysis the data. The study showed that agricultural credit plays an important role in facilitating the transformation of agriculture and raising the participation of farmers in production process.

Kareem et al. (2013) examined the factors influencing agricultural output in Nigeria: Macro-economic perspectives. The study sort to determine the factors influencing agricultural production in Nigeria, and also determine the causality between Agricultural outputs and macro-economic variables. The study adopts regression analysis, descriptive statistics and the Granger causality tests on macroeconomic variables (i.e. Food import value, interest rate, commercial bank loans on agriculture, GDP growth rate and Foreign direct investment) to find the significant relationship between the different variables chosen. The result showed fluctuations in the trend of variables considered (i.e. Interest rate, commercial bank loans to agriculture, GDP growth rate and foreign direct investment) in relation to the period under review. The result further showed that foreign direct investment, commercial bank loan, interest rate and food import value have positive relationship with agricultural output.

Saheed (2014) reviewed the impact of ACGSF on domestic food supply in Nigeria. The study was carried out between the period 1988 and 2011. The study used secondary data which included:

annual agricultural credits guarantee funds and the total domestic food output obtained from CBN's statistical bulletin, the population data obtained from the NBS's reports and the average annual rainfall for the country, calculated from the annual rainfall in each state of the federation obtained from the Nigerian Meteorological Agency. The data were analyzed using OLS method. The results show a robust adjusted R-square of about 86.3%. The value of t-statistics of each of the explanatory variables shows 3.0323 for ACGSF, 6.8480 for rural population and 2.5418 for average annual rainfall, indicating that the explanatory variables are statistically significant in explaining domestic food supply in Nigeria. The study observed that there has been an increase in trend of agricultural growth of 573.8% compared to the average growth of 59.25% in the domestic food supply in Nigeria and the changes in the agricultural credit guarantee fund to the farmers has a significant impact on the domestic food supply. Based on the findings, it was recommended that government should encourage agri-business and youths especially fresh graduates to go into scientific farming. This would greatly improve agricultural production and hence increase food supply in Nigeria.

Obasi (2015) evaluated the performance of agricultural lending schemes in Nigeria for the period 2009-2012. The study was carried out in Benue, Kwara, Kaduna, Abia, Anambra, Rivers and Ogun states respectively. The method of proportionate random sampling technique was used in selecting 185 borrowers who were registered with their state development programmes. Data collected were analyzed using frequencies, percentages, means, and multiple linear regression analysis. Results of the analysis showed that during the period 2009-2012, a total of 27,987 farmers applied for bank loan in Nigeria totaling N13, 704, 965, 000.00 while 21,490 farmers were granted loan facility during the same period totaling N7, 188, 575, 000.00 leaving a credit supply gap of N6, 516, 390, 000.00. The total amount of loan repaid by borrowers during the same period was N3, 523,018,005.00 giving a repayment rate of 49% and a default rate of 51%. The loan granted to borrowers increased national output by 20.33%, and impacted positively on the income of borrowers. It was recommended that the government should continue to encourage increased funding to the agricultural sector for accelerated food production in Nigeria by small and medium scale farmers through the provision of institutional loans to these categories of farmers.

Obilor (2013) examined the impact of ACGSF, agricultural product prices, government fund allocation and commercial banks' credit to agricultural sector on agricultural productivity. The result revealed that ACGSF and Government fund allocation to agriculture produced a significant positive effect on agricultural productivity, while the other variables produced a significant negative effect.

Effect of Interest Rate, Inflation and other variables: Babalola et al. (2015) examined the effect of inflation and interest rate on economic growth and went further to determine the corrective measures to inflation and interest rate trend in Nigeria between 1981 and 2014. Secondary data sourced from World Bank databank and CBN was used in the study. The study adopted OLS method of analysis. The long-run relationship of the variables was analyzed using the Johansen integrated test. However, the augmented

Dickey Fuller (ADF) test performed showed that only inflation is not stationary at first difference. The direction of causality and trend analysis was also performed on variables. It was found out that inflation and interest rate has a negative effect on economic growth. The work concluded that policy makers should focus on maintaining inflation at a low rate (single digit) and ensuring interest rate stability.

Okoye and Eze (2013) examined the impact of bank lending rate on the performance of Nigerian Deposit Money Banks between 2000 and 2010. They specifically determined the effects of lending rate and monetary policy rate (MPR) on the performance of Nigerian Deposit Money Banks and analysed how bank lending rate policy affected the performance of Nigerian deposit money banks. The study utilized secondary data econometrics in a regression, where time-series and quantitative design were combined and estimated. The result confirmed that the lending rate and MPR had significant and positive effects on the performance of Nigerian deposit money banks. Thus, it was estimated from the result that increase in the bank lending rate by 1%, on the average, resulted to 1.31% increase in Bank Earning (BE). Should there be more and higher lending rate, bank performance will be enhanced. The computed coefficient of determination (0.856474) showed a high proportion of variation in the dependent variable (LR). Thus, 85.65% of the total changes in the BE was explained by LR. It was also found from the result that 1% increase in MPR, will bring about an approximate 0.30% increase in BE. It was observed from the result that when government increases her MPR, bank performance will be enhanced and this will eventually lead to economic growth in Nigeria. They therefore recommended that government should adopt policies that will help Nigeria deposit money banks to improve on their performance and there is need to strengthen bank lending rate policy through effective and efficient regulation and supervisory framework.

## 2. RESEARCH METHODOLOGY

### 2.1. Study Area

The study area is Nigeria. Nigeria has a total geographical area of 923,768 square kilometers, a North-South length of about 1450 km and West-East breath of about 800 km. Its total boundary is 4047 km, while the coastline is 853 km and a population estimate of about 167 million (NPC, 2006). Nigeria is located 4°16' and 13°53' north latitudes and 2°40' and 14°41' east longitudes. It comprises 36 states and the Federal Capital Territory is located in Abuja. Nigeria is located in the tropics, which is characterized by high temperatures, high humidity and intense heat. Its rainfall ranges between 2000 and 3000 mm. Nigeria encompasses (6) major agro-ecological zones with rainfall diminishing along a South-North gradient. Agriculture is the largest single sector of the economy, providing employment for a significant segment of the work force and constituting the main stay of Nigeria's large rural community which accounts for nearly two-third of the population. The population of the GDP attributed to agriculture hovers between 30 and 40%. Nigeria is distinguished by the diversity of its ecosystems, an advantage for growing a broad range of crops. The main staple food crops produced are yam, cassava, rice, maize and beans.

### 2.2. Sources and Method Data Collection

Data for the study were obtained from secondary sources. Secondary data were obtained from CBN Statistical bulletin, CBN annual report, federal budget allocation report, annual reports and used for the study.

### 2.3. Analytical Techniques

Data were analyzed using descriptive and inferential statistics.

### 2.4. The Empirical Models

The first empirical model hypothesises that agricultural output is a function of the number value of loans guaranteed as well as the number of participating commercial banks. Consequently:

$$AGDP_t = \beta_0 + \beta_1 NL_t + \beta_2 AL_t + \beta_3 NCBK_t + \varepsilon_t \quad (1)$$

Where,

AGDP = Agricultural gross domestic product in Naira

NL = Number of loans guaranteed

AL = Amount of loans guaranteed in Naira

NCBK = Number of commercial banks

$\varepsilon_t$  = Error term.

The second empirical model hypothesizes the relationship between volume of credit guaranteed under the ACGS and the macroeconomic environment as created by inflation, interest rate, exchange rate and other variables. The estimation of the long-run dynamic relationship between changes in interest rate and volume of credit sourced by farmers and other variables was executed through employment of the autoregressive distributed lag (ARDL) bound approach. The ARDL approach proposed by Pesaran and Shin (1995) and Pesaran et al. (2001) has significant advantages. The approach can be employed even when the time series data are non-stationary and still, allow for conduct of inferences which is not possible under the alternative co-integration approach. This advantage offers a wide range of opportunities to conduct the estimation regardless of whether the time-series regressors are stationary at 1(0), 1(1) or both. Further, ARDL is associated with good small sample properties implying that ARDL still provides quality results when the sample size is small and lastly, even if the series variables are fractionally integrated.

The empirical application of the ARDL methodology involves three steps: (i) Identifying the order of integration of variables using the unit root tests; (ii) testing for the existence of a unique co-integrating relationship (long-run) using the bounds testing procedures; and (iii) estimation of an error correction model (ECM) to capture short-run dynamics of the system.

**Table 1: Summary characteristics on Agricultural Credit Guarantee Scheme by category of beneficiaries (1981-2016)**

Category	Portion of loans guaranteed (%)
Individual	93.00
Informal groups	2.00
Cooperative societies	3.00
Agricultural companies	2.00
Total	100

Source: Computed from Central Bank of Nigeria Statistical Bulletin 2018

The ARDL co-integration model (Onoja et al., 2011), is

$$\begin{aligned} \ln Y = & \beta_0 + \beta_1 \ln X_{1t} + \beta_2 \ln X_{2t} + \beta_3 \ln X_{3t} \\ & + \beta_4 \ln X_{4t} + \beta_5 \ln X_{5t} + \beta_6 \ln X_{6t} + \beta_7 \ln X_{7t} + \mu_t \end{aligned} \quad (2)$$

**Table 2a: Index real value of loans guaranteed 1978-1994**

Year	Index of loans guaranteed	Growth rate (%)
1978	100.00	-
1979	267.65	62.64
1980	254.98	-4.97
1981	210.96	-20.87
1982	174.58	-24.65
1983	166.49	-4.86
1984	81.73	-03.71
1985	139.58	41.45
1986	196.04	28.80
1987	273.57	28.34
1988	206.51	-32.47
1989	149.58	-38.06
1990	105.98	-41.14
1991	78.28	-35.39
1992	60.55	-29.28
1993	33.92	-78.51
1994	35.49	4.42

Source: Computed from Central Bank of Nigeria Statistical Bulletin 2016

**Table 2b: Index of real value of loans guaranteed 1995-2018**

Year	Index of loans guaranteed	Growth rate (%)
1995	100	-
1996	106.25	5.88
1997	103.03	-3.13
1998	86.49	-19.12
1999	89.53	3.40
2000	125.14	28.46
2001	212.15	41.01
2002	271.17	21.76
2003	260.38	-4.14
2004	409.98	36.49
2005	506.85	19.11
2006	647.01	21.66
2007	100.85	-7.68
2008	852.27	29.50
2009	970.67	12.20
2010	803.39	-17.23
2011	927.27	13.36
2012	768.87	-20.60
2013	702.05	-9.52
2014	875.41	19.80
2015	699.97	-25.06
2016	437.92	-59.84
2017	279.79	-56.52
2018	186.80	-49.78

Source: Computed from Central Bank of Nigeria Statistical Bulletin 2018

**Table 3: Unit root tests: Impact of Agricultural Credit Guarantee Scheme Fund on farm output**

Variable L	ADF stat.	Critical V	Variable D	ADF stat.	Critical V	Decision
AGDP	-1.4657	-3.5443	ΔAGDP	-5.4007	-3.5485**	1 (1)
NL	-2.0226	-3.5443	ΔNL	-4.6275	-3.5485**	1 (1)
AL	2.8556	-3.5875	ΔAL	-0.1628	-3.595**	1 (1)
NCBK	-1.8599	-3.5443	ΔNCBK	-5.4540	-3.5485**	1 (1)

\*\*Denotes rejection of the null hypothesis at 5%

Where,

Y = Volume of loans guaranteed by the ACGSF in millions of Naira

X<sub>1</sub> = Price deflator for agricultural commodities (index)

X<sub>2</sub> = Interest rate (minimum lending rate in %)

X<sub>3</sub> = Stock market capitalization (millions of Naira)

X<sub>4</sub> = Nominal exchange rate of naira to dollar (Naira)

X<sub>5</sub> = Value of agricultural output as share of total real GDP (millions of Naira)

X<sub>6</sub> = Volume of credit advanced to the core private sector (in millions of Naira)

X<sub>7</sub> = Value of immediate past loans guaranteed by ACGSF (millions of Naira).

β<sub>1</sub>-β<sub>7</sub> = Coefficients of the respective variables

t = Period (year)

β<sub>0</sub> = Intercept of the model

u = Stochastic error term.

### 2.5. Unit Root Test

A unit roots test analysis of each of the time series of the chosen variables were undertaken to ascertain the order of integration. Here, the order of integration for all the variables must be known prior to co-integration analysis, at least to ensure that variable are not integrated of order greater than one (Abbott et al., 2000). To determine the order of the series, two different unit root tests were conducted viz; ADF test and Phillips and Perron. The test formula for the ADF is shown in equations (3)

$$\Delta Y_t = \alpha + \delta Y_{t-1} + \sum \gamma \Delta Y_{t-j} + e_t \quad (3)$$

Where:

Y = Series to be tested

ΔY<sub>t</sub> = First difference of Y<sub>t</sub>

δ = Test difference coefficient

j = Lag length chosen for ADF

e<sub>t</sub> = White noise

t = Time or trend variable.

Here the significance of δ would be tested against the null that δ=0. Thus if the hypothesis of non-stationarity cannot be rejected, the variables were differenced until they become stationary, that is until the existence of a unit root is rejected. We then proceed to test for co-integration.

### 2.6. Co-integration Analysis: ARDL Bounds Test

The ARDL co-integration test, otherwise called the Bounds Test developed by Pesaran et al. (2001) was used to test for the co-integration relationships among the series in the model (equation 2). This will be performed by conducting a Wald test (F-test version for bound-testing methodology) for

the joint significance of the lagged levels of the variables. Once co-integration is established the conditional ARDL (p, q1, q2, q3, q4), the long-run model for  $Y_t$  can be estimated.

### 3. RESULTS AND DISCUSSION

#### 3.1. The Real Value of Loans Guaranteed Overtime under the ACGS

The ACGS from inception guarantees loans to beneficiaries through partner banks who work hand in hand with the scheme to ensure that the scheme’s effort in the agricultural sector not only improve the agricultural sector by increasing agricultural productivity, but will also assist in improving the standard of living of these beneficiaries of the scheme. The ACGS operate through commercial and merchant banks.

The Table 1 shows that between 1981 and 2016, the bulk of the loan (93%) went to individual while the rest went to company with cooperatives and informal groups receiving a negligible amount.

Table 2a shows the index of real value of loans guaranteed at 1985 prices. According to this table, the index of real value off loans guaranteed under the ACGS of 210.96 in 1981 decline steadily to 81.73 in 1974 and increased steadily thereafter to 273.57 in 1987. This index declined again steadily to 33.92 in 1993 and 35.49 in 1994. There was no steady growth in the index of real value of loans in the period under review. In fact between 1981 and 1994 there was negative growth rate in the index of real value of loans guaranteed in ten out of the 14 years period.

Table 2b shows the index of real value of loans guaranteed at 2009 prices for 1995-2018. This table shows that the index of values of loans guaranteed decline steadily from 100 in 1995 to 86.49 in 1998 and then increased steadily to 647.01 in 2006, and the fluctuates to 186.80 in 2018.

**Table 4: OLS empirical result: Impact of Agricultural Credit Guarantee Scheme Fund on farm output**

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	1664.347	635.8823	2.617381	0.0134**
NC	22.76599	11.19038	2.034425	0.0503**
NL	0.068791	0.024556	2.801411	0.0086**
AL	0.000845	0.000137	6.152752	0.0000***
R <sup>2</sup>	0.937361	Durbin-Watson stat		1.185814
Adj. R <sup>2</sup>	0.931489	F-statistic		159.6220***

Author’s computation from E-views 9.0. \*\*Significant at 5%, \*\*\*significant at 1%

**Table 5: Results of ADF test**

Variable	ADF (stat)	Variable (1 <sup>st</sup> diff)	ADF (stat)	Order of integration
Y	-3.3512*	ΔY		I (0)
X1	-2.2981	ΔX1	-5.3887***	I (1)
X2	-2.7899	ΔX2	-6.1282***	I (1)
X3	-1.5139	ΔX3	-7.9042***	I (1)
X4	-2.2799	ΔX4	-5.7140***	I (1)
X5	-1.2169	ΔX5	-5.7057***	I (1)
X6	-7.5745***	ΔX6		I (0)

Results are based on author’s calculations. \*and \*\*\*is significant level at 10% and 1%

However, the real value of loan had negative growth rate in eleven out of the 23 year period. Absence of steady growth in the index of real value of loans guaranteed points to the fact that inflation rates varied overtime creating shocks that distorted operations of the ACGS.

#### 3.2. Analyses of Agricultural Output under Agriculture Credit Guarantee Scheme

Results on the Impact of ACGSF on farm output, analysed using the OLSs is presented in Tables 3-5. Table 3 shows the unit root test results, which confirm that all variables were stationary at first difference.

Table 4 presents the OLS estimates. The choice of the OLS multiple regression was due to the non co-integration of the data series. The result showed a coefficient of multiple determination of 93.15% and an F value of 159.6220. Consequently, the total variation in the farm output (AGDP) is accounted for by the explanatory variables while 6.85% of the total variation in AGDP is attributable to influence of other variables which are not included in the regression model; and the F test show that the model is a good fit. The result of the OLS shows that number of loans guaranteed, number of commercial banks and value of credit guarantee have significant effect on agricultural sector output. The number of commercial banks’ giving out ACGS has a significant positive impact on farm output. This means that a 1% increase in number of commercial banks will increase agricultural sector output by 22.7%. Also, the number of loans guaranteed is significant and positively related to the agricultural sector output. Unfortunately, a 1% increase in number of loans guaranteed increase farm output by 0.07%.

Loan guaranteed the ACGS was found to be significant (1%) and positive, but a 1% increase in amount of loan increase farm output by 0.00085%. On the whole the number and value of loans guaranteed contributes below 1% to the agricultural sector

**Table 6: Results of bound test for co-integration**

Critical value (%)	Upper bound	Lower bound
5	3.28	2.27
1	3.99	2.88

Computed F-statistic: 5.69, critical values at k=7-1=6

**Table 7: Long-run estimate showing the effect of changes in interest rate and other variables on the volume of loan sourced by farmers**

Regressor	Coefficient	SE	Z-ratio
LnX1	0.8312	0.6660	1.2480
LnX2	-2.0270	0.9177	-2.2089**
LnX3	0.2841	0.2876	0.9881
LnX4	0.2669	0.3342	0.7986
LnX5	2.2467	1.0139	2.2158**
LnX6	-0.3625	0.3904	-0.9285
C	6.4973	3.1447	2.0661**
R <sup>2</sup>	0.9448	Adj. R <sup>2</sup>	0.9156
DW	2.4639		

\*\*Denote the rejection of the null hypotheses at 5% level of significance. Results were obtained from Microfit 4.1

**Table 8: ARDL-VECM model diagnostic tests**

LM test statistic			
Serial correlation	$\chi^2(1)=1.8322(0.176)$	Normality	$\chi^2(2)=1.0998(0.577)$
Functional form	$\chi^2(1)=1.7641(0.184)$	Heteroscedasticity	$\chi^2(1)=0.5346(0.471)$

Source: Computed from microfit 4.1 result

output, with the worst contribution being from the value of loans guaranteed.

### 3.3. Effect of Changes in Interest Rate and Other Variables on the Volume of Loan Guaranteed

The first step in this analysis is to conduct a test for a unit root problem. Table 5 explains the summary statistics of ADF test. The results of the test indicate that some variables were stationary at level, while others were stationary at first difference. Specifically, price deflator for agricultural commodities (X1), interest rate (X2), stock market capitalization (X3), nominal exchange rate (X4) and value of agricultural output (X5) were stationary at first difference while the volume of credit advanced to private sector (X6) and volume of loan guaranteed by ACGSF (Y) was stationary at level. The findings of the study provide the justification of ARDL approach.

### 3.4. Bounds Test for Co-integration

Table 6 interprets the findings of Wald-test (F-statistics) for long-run relationship. As indicated on this table the calculated F-statistics (5.69) is significantly higher than the upper bound critical value at a 5 and 1% level of significance. This implies that the null hypothesis of no co-integration is rejected at 5 and 1% significance level. Therefore a co-integrating relationship among the variables is confirmed.

The long-run estimates showing the effect of changes in interest rate and other variables on the volume of agricultural loan guaranteed is presented in Table 7. The result shows a good coefficient of multiple determination of about 91% and a Durbin Watson statistic that is plausible. However, the coefficient of price deflator of agricultural commodities (X1), stock market capitalization (X3), nominal exchange rate (X4) and value of agricultural output (X5) were positive but only the value of agricultural output (X5) had a significant effect on volume of loan guaranteed by the ACGS at 5% level of significance.

Also, interest rate (X2) and volume of credit advanced to core private sector had a negative effect on the volume of loan sourced by farmers. This implies that the volume of loan guaranteed increases with output whereas high interest rate (X2) reduces the value of loans guaranteed under the ACGS. The coefficient of interest rate,  $-2.0270$  suggest that a unit increase in interest rate reduces the volume of loans guaranteed by about 2.07%. The other variables, price deflator of agricultural commodities, stock market capitalization and nominal exchange rate, although positively related to loans guaranteed under the scheme have not been supportive to the activities of the ACGS.

### 3.5. Short-run Estimates of the Effect of Changes in Interest Rate and Other Variables on the Volume of Loan Sourced by Farmers

Table 8 shows the ARDL-VECM model diagnostic tests which confirms the underlying ARDL equation passes the diagnostic

**Table 9: Short -run estimates of the effect of changes in interest rate and other variables on the volume of loan sourced by farmers**

Regressor	Coefficient	SE	Z-ratio
$\Delta \ln X1$	0.8312	0.6660	1.2480
$\Delta \ln X2$	-0.8853	0.6059	-1.4612
$\Delta \ln X2(1)$	1.2825	0.5385	2.3816**
$\Delta \ln X3$	-0.4734	0.2765	-1.7120
$\Delta \ln X4$	0.2669	0.3342	0.7986
$\Delta \ln X5$	2.2467	1.0139	2.2158**
$\Delta \ln X6$	-0.3625	0.3904	-0.9285
C	6.4973	3.1447	2.0661**
ECM (-1)	-1.1300	0.1876	-6.0235***
R <sup>2</sup>	0.7167	Adj. R <sup>2</sup>	0.5667
DW	2.4639		

\*\*Denote the rejection of the null hypotheses at 5% level of significance. \*\*\*Denote the rejection of the null hypotheses at 1% level of significance results were obtained from Microfit 4.1

tests against, serial correlation, functional form misspecification, non-normal errors and heteroscedasticity.

The result of the effect of changes in interest rate and other variables on the volume of loan guaranteed for farmers is presented in Table 9. The regression for the underlying ARDL equation fits very well at  $R^2 = 95\%$ . According to Table 9, the coefficient of the error correction term ( $-1.1300$ ) is negative and statistically significant at the 1% level. The negative and significant coefficient is an indication of co-integrating relationship between volume of loan guaranteed for farmers and its explanatory variables. The magnitude of the coefficient implies that more than 113% of the disequilibrium caused by previous year's shocks converges back to the long-run equilibrium in the current year; implying that the adjustments is high, to correct to the long term equilibrium. However, the coefficient of price deflator of agricultural commodity (0.8312), previous year's interest rate (1.2825), nominal exchange rate (0.2669) and value of agricultural output (2.2467) were all positive. Both lag interest rate and value of agricultural output had a significant effect on volume of loan guaranteed. The coefficient for both variables was statistically significant at 5% level implying that a unit increase of lag interest rate and value of agricultural output will increase the volume of loan guaranteed by 1.2825 and 2.2467 respectively. Similarly, current year's interest rate ( $-0.8853$ ), stock market capitalization ( $-0.4734$ ) and volume of credit advanced to core private sector ( $-0.3625$ ) all had a negative but not significant effect on volume of loan guaranteed.

## 4. CONCLUSION

Efforts to revitalize agricultural credit delivery became a reality in 1977 with the establishing of the ACGS. The scheme appears to have been bedeviled by the problem of nonperforming loans over time and several efforts to correct the mess appear futile.

This study assesses the ACGS under the Nigerian macroeconomic environment with a view to ascertaining if variables of macroeconomic decent could be responsible for nonperformance of loans guaranteed under the scheme. From the results it is clearly established that there was complete absence of steady growth in the index of real value of loans in the period under review. In fact between 1981 and 1994 there was negative growth rate in the index of real value of loans guaranteed in ten out of the fourteen (14) years period and between 1995 and 2018 the real value of loan had negative growth rate in eleven out of the 23 year period. Absence of steady growth in the index of real value of loans guaranteed points to the fact that inflation rates varied overtime creating shocks that distorted operations of the ACGS.

The agricultural sector output did not do excellently well under the ACGS. The result of the OLS shows that number of loans guaranteed, number of commercial banks and value of credit guarantee have significant effect on agricultural sector output. Unfortunately, a 1% increased in number of loans guaranteed increase farm output by only 0.07% and a 1% increase in amount of loan guaranteed increased farm output by only 0.00085%. On the whole the number and value of loans guaranteed contributes below 1% to the agricultural sector output, with the worst contribution being from the value of loans guaranteed.

The result of this study suggests that the macroeconomic environment has not been friendly with ACGS operations. In the long run, price deflator of agricultural commodities, stock market capitalization and nominal exchange rate, although positively related to loans guaranteed under the scheme have not been supportive to the activities of the ACGS. In the short run, current year's interest rate (-0.8853), stock market capitalization (-0.4734) and volume of credit advanced to core private sector (-0.3625) all had a negative but not significant effect on volume of loan guaranteed.

Finally, this study confirms the relevance of credit guarantee to increased agricultural output, but the number and value of loans guarantee as well as the performance of loans would be greatly enhance by policies that make interest rates, inflation, stock market capitalization, nominal exchange rates and other variables of the macroeconomic environment agricultural sector friendly and supportive.

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