IMPACT OF AGRICULTURAL CROPS FINANCING ON AGRICULTURAL OUTPUT IN NIGERIA

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Abstract
This study investigated the impact of crops financing on agricultural output in Nigeria from 1981 to 2021. The Autoregressive distributed lag (ARDL) model was employed in the analysis of time series data from the Central Bank of Nigeria statistical bulletin. The results unveiled that crop production and grains had positively and significantly affected agricultural output in both the short-run and the long-run. Since the agricultural credit guaranteed funding of crops and grains farming had positively and significantly affected agricultural output, the study recommends for sustenance or continues to implement the crops financing scheme by the government. In so doing, the progress achieved will be sustained with food security achieved in the economy.

Keywords: Agriculture, Crops, Financing, Impact, Output, Nigeria

1. Introduction

Agricultural sector if adequately harnessed could promote productivity, food security, agro-based industrial inputs, and generate employment opportunities in an economy. Agricultural financing according to Duong and Izumida (2002), plays a critical role in agricultural development. Theoretically, agricultural credit is one of the major inputs in the development of agricultural sector. This goes to confirm the Cobb-Douglas production function, which captures labour and capital as major factors responsible for agricultural productivity in an economy.

In Nigeria, about 88 percent of agricultural activities comprise smallholder farmers who undoubtedly live below USD1.9 poverty line (Duong & Izumida, 2002). The agricultural sector activity in Nigeria consists of cash crops, livestocks, fishery and food crops. Cash crops include oil palm, rubber, cocoa, cotton and groundnut/ginger; while that of livestocks comprise poultry, cattle, and sheep, among others. On the other hand, food crops production involves grains, roots and tubers, beans and soya beans and vegetables.

Agricultural sector in 1960 was the main economic fulcrum of the Nigeria, contributing largely to the total GDP, employment level, revenue generation, etc of the nation (Odili, 2022). But with the emergence of crude oil sector in large quantities and its associated oil boom in the 1970s, the pendulum shifted in oil sector favour; leading to agricultural sector neglect, and consequently, dwarfing agricultural sector productivity in the country. To re-direct the economy and put it back on the track of prosperity with agricultural sector taking eminent lead, successful governments of Nigeria enunciated agricultural credit and other related policies. Some of these which include agricultural credit guarantee scheme funds established in 1977; commercial agriculture credit scheme enunciated in 2009, etc. This becomes

imperative in order to stimulate small scale farming activities and hence, improve agricultural productivity in the economy.

Despite the above efforts, the agricultural sector performance still remains unimpressive. For instance, the agricultural credit guaranteed for cocoa, poultry, cattle rearing, grains, oil palm, crops in 1990 were -78.5%, -33.1%, -40.%, -15.8, -83.5%, and 858.5%, respectively while agricultural sector contribution to GDP stood at 4.2%. In 2000, poultry, cattle rearing, grains, oil palm, and crops growth rates improved to -43.5%, 155.7%, 32.5%, -6.4%, 177.5%, 44.9% respectively, whereas agricultural sector contribution to GDP decreased to 2.92%. In the same vein, the growth rate of poultry, and crops rose to -7.4%, and 473.5% respectively with cocoa, cattle rearing, grains, and oil palm decreasing to -78%, -50.1%, -7.8%, and -56.3%, respectively while agricultural sector contribution to GDP increased to 5.8%. By 2021, cocoa, poultry, cattle rearing, grains, and oil palm rose again to -2.4%, 9.8%, -13.3%, 14.4%, and 41.6% with crops alone declining to -66.4% in 2021; but the growth rate of agricultural sector contribution to GDP fell to 2.1% (CBN statistical bulletin, 2021).

From the facts above, the trend analyses unveiled that agricultural sector variables appear to contradict economic postulation, which indicated that increase in agricultural financing brings about improvement in agricultural sector contribution to GDP. As a result, it can be observed that even when the agricultural variables increases, agricultural contribution to GDP decreases and vice-versa. Such economic scenario has been argued as being unhealthy for agricultural development in any economy. This can be seen in food insecurity, low productivity, high importation of consumable goods, low exports, and persistent exchange rate depreciation, among others as characterized by the Nigerian economy. It is against this background, that this study is poised to answer the research question of "What is the degree of effect of crops farming credits on agricultural sector output in Nigeria? Hence, the objective of the study is mainly to empirically estimate if there is a significant impact of crops farming financing on agricultural output in Nigeria.

2. Literature Review

2.1 Theoretical Framework

The theoretical underpinning of this study is anchored on the Cobb-Douglas production function and Joseph Schumpeter theory of finance and growth published in 1911. The theories provide adequate explanation on the relationship between agricultural credit and agricultural growth.

2.1.1 Cobb-Douglas Production Function

The Cobb-Douglas production function relates to agricultural households and tries to adopt household production function in the production processes. The function upheld that household only consumes goods it produces, and the production of each goods requires the input of household members' time and other purchased inputs (Becker, 1965). Thus, the Cobb-Douglas production function is one aspect of the household production theory. In that, the production function is specified as:

$$Q = AL^{\beta} K^{\alpha} \qquad 1$$

Where; Q is the quantity of output produced, L is the quantity of labour force employed in production, K is the capital input utilized in production, A is the innovation employed in the production process in terms of technology, which also referred to as multi-factor productivity, and it captures variables that account for effects in total farm output not caused by traditionally measured inputs of labour and capital; β is the output elasticities of labour while α output elasticities of capital. The above values are fixed and are

determined by available technology. The Cobb-Douglas production function unravel that farm output in an economy is a function of factors of production such as labour and capital combined in production processes.

This theoretical framework is very relevant for this research as it adequately explains how agricultural productivity in an economy depends on effective combination of labour, capital and technological progress. In Nigeria, agricultural activities are dominated by smallholder farmers with government providing financial aid for greater improvement.

2.1.2 Schumpeter Theory of Finance and Growth

Schumpeter (1911) in the theory of finance and growth explained that financial system is a critical factor in propelling productivity and growth of output, agricultural productivity inclusive by allocating savings, encouraging innovation, and funding productive investments in the economy. It further asserts that funds from the credit market are also essential in supporting output development by encouraging specialization in entrepreneurship and the adoption of new technology (Greenwood & Smith, 1997). Hence, both credit and stock market development improve production growth of a country. In 1911, Joseph Schumpeter argued that the services provided by financial intermediaries in mobilizing savings, evaluating projects, managing risk, monitoring managers and facilitating transactions are very critical for technological innovation and economic development.

The Schumpeterian growth model is based on three main ideas. These include long-run growth outcome from innovations; innovations result from entrepreneurial investments that are internally motivated by the prospects of monopoly rents; and new innovations replace old technologies (Philippe, Ufuk & Peter, 2015). In other words, growth involves creative destruction. The model is expressed as:

$$Y = Ay^{a}, \qquad 2$$

Where, A denotes the current quality of the input, which is multiplied by a factor $\Upsilon > 1$ each time a new innovation occurs. Innovations arrive at Poisson rate λz, where z is the amount of labor devoted to R&D. The intermediate is itself using labor one for one; thus, y also denotes the amount of labor working in manufacturing the intermediate input (Aghion & Howitt, 1992). Thus, from the theories reviewed, it is observed that the theoretical models vehemently support the direct relationship between credit markets and output growth including agriculture.

2.2 Empirical Review

Considering the foregoing discussion, several studies have been conducted to ascertain the impact of agricultural financing on agricultural output but with divergent results and findings. For example, some studies conducted across countries of the world using different modeling and econometric techniques and reviewed by this study indicated that agricultural financing had significant and positive impacts on agricultural output; these studies include Odili (2022); Abbas (2021); Egwu (2016); Abdulrafiu and Abigail (2022); Anthony, Jonathan, Jennifer and Onyinye (2021); Mu'azu and Lawal (2017); Okore and Anthony (2022); Olorunsola, Adeyemi, Valli, Kufre and Ochoche (2017); Romanus, Ngozi and Tyrone (2020); Agu and Agu (2018); Adewale, Lawal, Aberu and Toriola (2022); Unal and Semih (2020); Evans (2017); and Abdul, Saheed, Abraham, Bernard and Yakubu (2022). On the other hand, some studies such as Anthony, Jonathan, Onyinye and Jennifer (2020); Mohammed and Yogesh (2022), among others not included in this empirical review found that agricultural financing do not significantly impacted on agricultural output in the Nigerian economy.

Thematically, based on the objectives of the study, Balogun and Obi-Egbedi (2012) and Adebayo, Yusuf, Adeniran and Adeagbo (2020) investigated the effect of resource-use efficiency on small scale cocoa

farmers in Idanre Local Government Area of Ondo state for the period 1970-2006, using descriptive statistics and regression analysis. The variables used in the study include total income from cocoa, number of family members engaged in farming, farm size in hectares, cost of non-durable capital input, amount spent on labour, and Percentage of labour hired. The result showed that farm size or land input had positive and significant effect on cocoa output; whereas labour input had a negative and significant influence on cocoa output in Nigeria. On the other hand, Oyakhilomen, Omadachi and Zibah (2012); and Kouadio, Anani, Faye and Fan (2023) examined the impact of agricultural guaranteed fund scheme on cocoa production in Nigeria and found an insignificant impact of agricultural credit on cocoa production in the economy.

Ewubare and Ozar (2018) examined the effect of poultry production on agricultural output in Nigeria from 1975 to 2016, using unit root test, co-integration test, error correction model. The study was tailored on exploring the effect of poultry birds' production, eggs production and its meat production on agricultural output. The results showed birds' productions negatively influence agricultural GDP. Poultry eggs production had an insignificant effect on agricultural GDP, while poultry meat production exerts a positive and significant effect on agricultural GDP.

Eke-Okoro, Njoku, Mbe, Awah, Amanze and Eke-Okoro (2014) investigated the contributions of roots and tubers to agricultural transformation agenda in Nigeria using analytical method. The results showed that the potential demand of 250,000 tons per year for high quality cassava flour by local and foreign companies, and replacement of bread flour by 40% cassava flour could only be met with root and tuber crops resources in the economy.

2.1 Gap in Literature

In attempt to evaluate the effect of agricultural sector financing on agricultural sector output, scholars often focused on government agricultural financing, commercial agricultural financing, and agricultural credit guarantee scheme funds. However, this study differs from other studies reviewed by disaggregating agricultural sector financing into cocoa, poultry, crops, cattle, grains, and oil palm sub-sectors farming credits in order to empirically investigate their impacts on agricultural sector output in Nigeria.

3 Methods

3.1 Model Specification

The model specification follows the Cobb-Douglas production function. The Cobb-Douglas production model recognizes productivity growth of agricultural sector as a function of labour, capital and technological progress combination in production processes in the economy. Thus, the Cobb-Douglas production function is specified as:

$$Q = AL^{\beta} K^{\alpha} \quad 3$$

Where; Q = quantity of output produced, L = quantity of labour force employed in production, K = capital input used in production A = technological progress, and it captures variables that account for effects in total farm output not excluded in the traditionally measured inputs of labour and capital; β is the output elasticities of labour while α output elasticities of capital. This model was used with modification by Abbas (2021) in his study. In modifying the function, the study specified the total factor productivity function thus:

$$A = f(FI, \pi) \quad 4$$

Where; FI = financial inclusion while π deals with the effect of household, individual and farm characteristics on productivity. In the same way, the Cobb-Douglas production function corresponding to equation 3 is expressed as:

$$Q = f(FI, AL^{\beta}, K^{\alpha}) \quad 5$$

In order to capture the objective of this study, the equation 4 above is further modified in functional form as follows:

$$ASCGDP = f(COA, POUT, CAT, GRA, OP, TR) \quad 6$$

In linear function, the model is specified thus:

$$ASCGDP_t = \emptyset_0 + \emptyset_1 COAP_t + \emptyset_2 POUT_t + \emptyset_3 CAT_t + \emptyset_4 GRA_t + \emptyset_5 OP_t + \emptyset_6 RT_t + \mu_t \quad 7$$

In logarithm function, the model is expressed as:

$$\ln ASCGDP_t = \emptyset_0 + \emptyset_1 \ln COAP_t + \emptyset_3 \ln POUT_t + \emptyset_3 \ln CAT_t + \emptyset_4 \ln GRA_t + \emptyset_5 \ln OP_t + \emptyset_6 \ln CP_t + \mu_t \quad 8$$

Where, ASCGDP = Agricultural sector contribution to gross domestic product, COA = Cocoa, POUT = Poultry, CAT =Cattle, GRA = Grains, OP = Oil palms, CP = Crops, $\emptyset_0$ = constant term, ut = error term and $\emptyset_{is}$ = parameters of the regression equations.

3.2.1 A Priori Expectation

Theoretically, the study expects all the independent variables to have positive relationship with agricultural sector contribution to gross domestic product (ASCGDP). The a priori expectation behavior expressed as: φ1>0, φ2>0, φ3>0> φ4>0, φ5>0, φ6>0.

3.3 Estimation Procedure

The estimation procedure utilized in this study includes:

3.3.1 Unit root test

The unit root test is used to determine the order of integration of the time series by applying the Augmented Dickey-Fuller (ADF) stationarity test. The ADF test focuses on rejecting a null hypothesis of non-stationary and accepting the alternative hypothesis of stationarity, if the ADF statistic is greater than the 5%critical value. The test would be conducted with or without a deterministic trend (t). The generalized model of the ADF unit root test is specified below.

$$\Delta yt = \alpha_0 + \alpha_1 y_{t-1} + \sum_{n=1}^{n} \alpha \Delta y; + et \quad 8$$

$$\Delta yt = \alpha_0 + \alpha_1 y_{t-1} + \sum_{n=1}^{n} \alpha \Delta y; + \delta t + et \quad 9$$

Where; Y is a time series, t = linear time trend, Δ = first difference operator in a manner that Δyt-1 =yt - yt-1, α_0 = constant term, n = is the optimum number of lags, and et is the stochastic variable.

3.3.2 Auto regressive distributed lag (ARDL) model

The autoregressive distributed lag model is used to estimate the short-run and long-run coefficients of the variables employed in the study. It becomes necessary as the stationarity test indicated mixed order of integration among the variables, that is, order one and order two, as recommended by Pesaran and Smith (2001), among others. The model of the ARDL in generic form is specified thus:

$$\Delta GDP_t = \beta_0 + \Sigma \beta_i \Delta GDP_{t-i} + \Sigma \gamma_j \Delta COA_{1t-j} + \Sigma \delta_k \Delta POUT_{2t-k} + \theta_0 GDP_{t-1} + \ldots + \theta_{nCP2t-n} + e_t \quad 10$$

In the equation 10, the generic ARDL model showed that the equation is characterized by lags of the dependent variable and as well lags perhaps the current value of the regressors.

4. Results and Discussions

The results are estimated from the econometric techniques are presented and subsequent discussed below.

4.1 Unit Root Test

To determine the order of integration among the variables, the unit root test is conducted through the application of the Augmented Dickey-Fuller (ADF) unit root test. The results are as shown in Table 1 below.

Table 1: ADF Unit Root Estimation

Trend and Intercept

Level			First Difference			
Variables	**ADF Statistic**	**5% CV**	**ADF Statistic**	**5% CV**	**Remarks**	**Rank**
LNASCGDP	-1.821726	-3.526609	-5.926939	-3.529758	Stationary	I(1)
LNCP	-2.239659	-3.526609	-11.00740	-3.529758	Stationary	I(1)
LNGRA	-0.980556	-3.526609	-5.751322	-3.529758	Stationary	I(1)
LNCOA	-3.947293	-3.526609	--------	-3.529758	Stationary	I(0)
LNPOUT	-1.826843	-3.526609	-5.590418	-3.529758	Stationary	I(1)
LNCAT	-2.359054	-3.526609	-7.157396	-3.529758	Stationary	I(1)
LNOP	-3.710701	-3.526609	--------	-3.529758	Stationary	I(0)

Sources: Computation from E-view 10

The results showed in the Table 1 represent the Augmented Dickey-Fuller (ADF) unit root test. The test reveals that all the variables engaged in the research except cocoa and oil palm were non-stationary at levels; but at first differencing, the non-stationarity variables became stationary at a 5% significance level. These claims are evidenced by the ADF statistics and p-values of the corresponding variables. The above results in Table 1, imply that all the variables for this study possess long-run properties; indicating that their covariance, variance and mean are constant over time.

4.2 Autoregressive Distributed Lag (ARDL) Estimate

The autoregressive distributed lag bounds co-integration test is a test of coefficients and long-run equilibrium relationships among the variables under investigation. The test is motivated given the mixed order of integration outcome of the stationarity test, conducted using the Augmented Dickey-Fuller (ADF) unit root test. The ARDL model estimation results are presented in the tables below.

Table 2: ARDL Bounds Test

F-Bounds Test			Null Hypothesis: No levels of relationship	
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	4.532074	10%	2.12	3.23
K	6	5%	2.45	3.61
		2.5%	2.75	3.99
		1%	3.15	4.43

			Finite Sample:	
Actual Sample Size	39		n=40	
		10%	2.353	3.599
		5%	2.797	4.211
		1%	3.8	5.643

Sources: Computation from E-view 10

The result in Table 2 shows the results of the test of equilibrium long-run relationship among the variables utilized in this study. From the estimation, the F-statistic has a value of 4.532074 while the critical upper bound value at a 5 per cent (0.05) level of significance is 3.61. Since the F-statistic value of 4.532074 is greater than 3.61, the study infers that evidence of co-integrating equations is found among the variables.

Table 3: ARDL Long-run Test: LNASCGDP

Levels Equation
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNCP	0.160934	0.031570	5.097679	0.0000
LNGRA	0.198007	0.068362	2.896429	0.0074
LNCOA	0.060524	0.056520	-1.070842	0.2937
LNPOUT	0.004898	0.056256	0.087069	0.9313
LNCAT	0.151574	0.056244	-2.694953	0.0120
LNOP	0.111491	0.054703	2.038126	0.0514

Sources: Computation from E-view 10

Represented in table 3 above, is the coefficients test results of the ARDL long-run relationship between agricultural financing variables such as LNCOA, LNPOUT, LNCAT, LNGRA, LNOP and LNRT and agricultural sector contribution to gross domestic product (LASCGDP). From the results, agricultural credit guarantee scheme funds guaranteed on cattle rearing (LNCAT), grains (LNGRA), and roots and tubers (LNCP) have a positive and significant influence on the agricultural sector contribution to GDP. On the other hand, it was disclosed in the results that agricultural credit guarantee scheme funds on cocoa (LNCOA), poultry (LNPOUT) and oil palm (LNOP) have positive but insignificant effects on the agricultural sector contribution to GDP in Nigeria. By implication, the study estimated on average that 1% rises in financing of agriculture variables such as cocoa, poultry, cattle rearing, roots and tubers, grains, and oil palm will result in 0.1%, 0.05%, 0.2%, 0.2%, 0.2% and 0.11% increases in agricultural sector output, respectively in Nigeria.

These results followed the theoretical framework of this study. In the framework, the Cobb-Douglas production function argued that agricultural sector productivity growth is a function of two-factor inputs (labour and capital). Hence, an increase in labour and capital quantities used in the production process will result in an improvement in the productivity of the economy, agricultural sector productivity

inclusive. This is because labour and capital are the two major factors of production used in agricultural sector activities in any economy, especially in developing economies. Similarly, the results are in line with the findings of Odili (2022), Abbas (2021), James, Isaac, Joshua and Bukari (2020), Anthony, Jonathan, Onyinye and Jennifer (2020), Bright et al. (2021) and Egwu (2016) who investigated the effects of agricultural financing on agricultural output across countries and found a positive and significant relationship between the two variables.

Table 4: ARDL Error Correction Regression

ECM Regression
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.631094	0.254877	6.399521	0.0000
D(LNASCGDP(-1))	0.199783	0.116860	1.709588	0.0988
D(LNPOUT)	0.079647	0.018405	-4.327440	0.0002
D(LNPOUT(-1))	0.025732	0.016039	-1.604389	0.1203
D(LNCAT)	0.010084	0.010912	0.924102	0.3636
CointEq(-1)*	-0.291442	0.046804	-6.226910	0.0000

R-squared	0.602877	Mean dependent var	0.052419
Adjusted R-squared	0.542707	S.D. dependent var	0.072708
S.E. of regression	0.049168	Akaike info criterion	-3.046530
Sum squared resid	0.079776	Schwarz criterion	-2.790597
Log likelihood	65.40733	Hannan-Quinn criter.	-2.954703
F-statistic	10.01953	Durbin-Watson stat	2.014253
Prob(F-statistic)	0.000007		

Sources: Computation from E-view 10

Table 4 above depicts the result of ARDL error correction regression. From the estimation model, the results revealed that agricultural credit guarantee scheme funds guaranteed on poultry farming have a positive and significant impact on agricultural sector productivity while cattle-rearing activity exerts a positive and insignificant effect on the productivity of the sector in the short run. These claims are evidenced by the coefficients and the corresponding p-values of the variables. From the results, the coefficients and poultry (lnPOUT) and cattle-rearing (lnCAT) are 0.079647 and 0.010084, whereas the corresponding p-values include 0.0002 and 0.3636, respectively. Similarly, the result unveils an error correction term [ECT(-1)] statistic of -0.291442 with the associated p-value of 0.0000. The result shows

that the short-run disequilibrium that can be corrected as a way speed of adjustment towards long-run equilibrium relationship is 29.1% annually.

4.3 Diagnostic Tests

The diagnostic tests were carried out to test for structural serial correlation, validity and stability in the parameters of the model used in the research; through the applications of LM serial correlation test, ARCH heteroscedasticity and CUSUM test as proposed by Pesaran and Pesaran (1997). The results are shown in Table 5 and the figures below.

Table 5: Diagnostic Tests

S/N	Diagnostic test	Obs*R-squared	Prob. Chi-Square(2)	Remarks
1.	Serial Correlation LM Test	3.648883	0.1613	No evidence of serial correlation in the model
2.	Heteroskedasticity Test: ARCH	1.221391	0.2691	No evidence of heteroscedasticity in the model

Sources: Researcher's computation from E-view 10

Stability Test

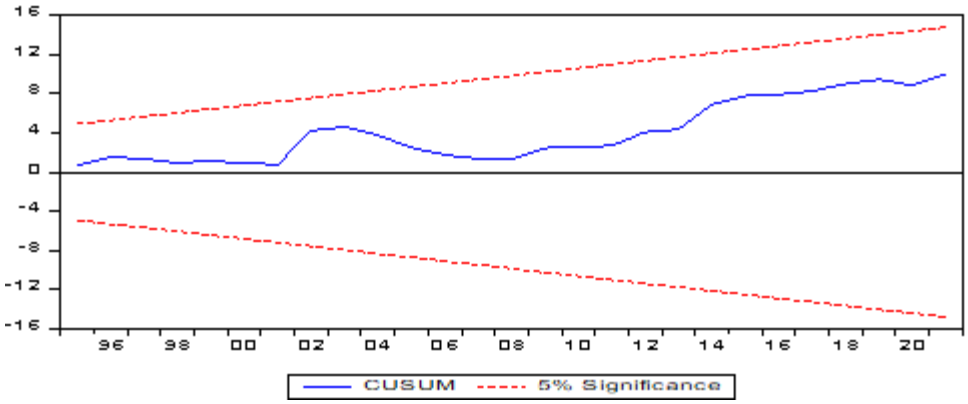

Figure 1: CUSUM of Residuals Test

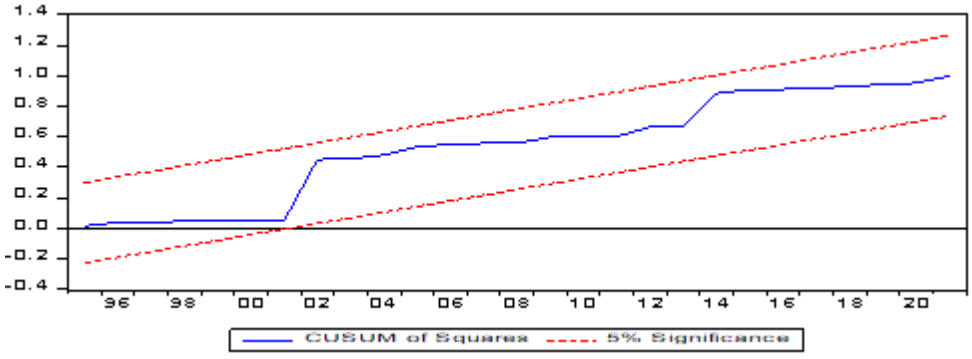

Figure 2: CUSUM of Square Test

CUSUM of residuals and CUSUM of square stability tests were employed to examine if there is stability in the parameters and constancy in the scholastic variables of the model. The CUSUM of residuals test is used to determine whether there are systematic changes in the parameters of the model, while the CUSUM of squares tests for sudden variations in the error terms. From the results, the presence of

stability is found among the parameters as the plots of the statistics both CUSUM residuals and CUSUMSQ fell within critical bands at a 5% significance level.

4.5 Policy Implications of the Results

The study focused on examining the effect of smallholder farmers' financing on the productivity of Nigeria's agricultural sector from 1981 to 20201, through the applications of the autoregressive distributed lag (ARDL) model. From the results, it was discovered that agricultural credit guarantee scheme funds on cattle rearing, grains, and roots and tubers exert a significant and positive impact on agricultural sector productivity in Nigeria. In the same way, the study revealed that agricultural credit guarantee scheme funds on cocoa, poultry and oil palm positively and insignificantly impacted agricultural sector productivity in the economy. Thus, it is estimated on average that a 1% increase in cocoa, poultry, cattle rearing, roots and tubers, grains, and oil palm farming financing will improve agricultural sector productivity growth by 0.1%, 0.05%, 0.2%, 0.2%, 0.2% and 0.11%, respectively in the economy.

5. Recommendations and Conclusion

Having indicated in the estimation results that crop production and grains affect agricultural out positively and significantly, the study recommends for sustenance or continues to implement the crops financing scheme by the government. In so doing, the progress achieved will be sustained with food security achieved in the economy. In contrast, since the agricultural credit guaranteed funding of cocoa, poultry and oil palm had positive but insignificant impact on agricultural output, it is recommended that government should re-strategize and re-format its policies on these sub-sectors by effectively monitoring funds approved and disbursed to the sub-sectors. As a result, cocoa, poultry and oil palm performance will improve, contributing significantly to agricultural output in the economy. The improvement will in turn, lead to increase in food security, supply of raw materials, income and reduce poverty in the country. In conclusion, if the above recommendations are strictly implemented, this study believes that agricultural sector performance will improve thereby standing the test of time, as food security, supply of raw materials, income and poverty reduction in the economy will be achieved.

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