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**Research Paper**

# An Econometric Analysis of Food Security and Agricultural Funding In Nigeria

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***ABSTRACT***
*This paper investigated the nexus between food security and agricultural funding in Nigeria from the first quarter of 1981 to the fourth quarter of 2018. The objectives of this study were to examine the relationship between agricultural funding – government expenditure on agriculture(LNGOEA), commercial bank loans and advances on agriculture (LNCOBLA), ACGSF loans and advances (LNACGSLO), and ACGSF granted to number of farmers (LNACGSN) on food security (ACAP) in Nigeria; and to determine the causal movement between agricultural funding (LNGOEA, LNCOBLA, LNACGSLO, and LNACGSN) andACAP in Nigeria. Theoretical foundation for this study is on food availability and entitlement approach. This study used secondary data fromCentral Bank of Nigeria statistical bulletin. The statistical techniques used include descriptive statistics, unit root, ARDL test,Granger Casualty technique and error correction model which were tested at the 5% level of significance. The result of the study showed that LNGOEA and LNACGSN were negatively and statisticallyinsignificantly to ACAP. Also LNCOBLA and LNACGSLO were positively but only LNACGSLO was statistically significant to ACAP. Causality did not move from LNGOEA, LNCOBLA, and LNACGSN to ACAP and vice versa.However, causality movesLNACGSLO to ACAP and not vice versa. We concludedthat food availability and entitlement affects food security in Nigeria. The study recommended that there should be physical access by agricultural credit guarantee scheme fund agency to determine that farmers in need of loans and advances own and operate viable farm(s).*

***KEYWORDS:****loans, advances, food security, agricultural funding, commercial banks.*

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## I. INTRODUCTION

The agricultural sector of any nation is of immense significant as it acts as the livewire that sustain, improve and promote the lives of populace. The Nigerian agricultural sector is of immense important not only as livewire of the nation in terms of provision of foods for the populace but it provision of employment opportunities for more than two-third of the Gross Domestic Product (GDP). Also, it provides approximately 75% of rural employment opportunities and hence, contributes about 35% to the reduction of poverty (Osabohien, Osabuhien and Urhie, 2018; Osabohien and Osuagwu, 2017). Therefore, there is need for the extension of credit facilities to support the agricultural sector so as to boost its ability to provide the needed food to support lives. Agricultural funding can be defined as the provision of monetary and non-monetary credit facilities to farmers and agro-allied firms in order to boost the production of foods. Warren (2001) sees agricultural credits as agricultural funding and hence defined it as the economic study of the acquisition and use of capital in agriculture. Agricultural funding could be in the form of funds provided to farmers to aid them buy farm inputs like pesticides, herbicides, quality seeds, and fertilizers; and also to aid them buy capital equipment like hoes, cutlasses, water pumps, tractors and others (Matthew, Osabohien and Fasina, 2018; Abdul-Jahil, 2015). The availability of these credit facilities to farmers will tend to aid the provision of enough food to sustain the populace and consequently avert food insecurity. Duong and Izumida (2002) opted that agricultural credit is expected to play a vital role in agricultural development.FAO (2002) defined food security in terms of individuals as the phenomenon that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life. The four components of food security are availability, access, utilization and stability.

Malthus (1789) theory on the availability of food approach postulated that there is a disequilibrium between population and food. This disequilibriumexists as a result of the geometrical increase in population whereas that of food production grows arithmetically. This disequilibrium results in food insecurity which characterized many African countries of which Nigeria is part of. However, in order to curb this disequilibrium, there is need to have access to funds by farmers in order to support the production of more foods. The availability of adequate funds to farmers will help in the production of more food to avert food insecurity. Therefore, access to credit facilities has a positive impact on food security. In addition, authors like Fomyol and Tata (2019), Osabohien, Osabuohien, and Urhie (2018), Awolabi, Ashaolu and Twumasi-Ankrah (2016), and Omale and Omede (2016) found positive relationship between food security and agricultural finding. Whereas author like Adetiloye (2012) found negative relationship between food security and agricultural funding.

Several authors like Osabohien, Afolabi and Godwin (2018), Fomyol and Tata (2019), Osabohien, Osabuohien, and Urhie (2018), Awolabi, Ashaolu and Twumasi-Ankrah (2016), and Omale and Omede (2016) have studied on food security and agricultural funding. Osabohien *et al* (2018) made use of kilocalories per day as an index for measuring food security whereas others made use of questionnaires in collecting data on food security and agricultural funding.This study differs from others as it made use of per capita of agricultural production as an index for measuring food security and quarterly data from the period of 1981 to 2018. Therefore, this paper investigates the nexus between food security and agricultural funding in Nigeria.

## II. LITERATURE REVIEW

### 2.1 Conceptual Framework

#### 2.1.1 Agricultural Funding

Agricultural funding can be defined as the provision of monetary and non-monetary credit facilities to farmers and agro-allied firms in order to boost the production of foods. Warren (2001) sees agricultural credits as agricultural funding and hence defined it as the economic study of the acquisition and use of capital in agriculture. Therefore, to this end without agricultural credits it might be a herculean task in the production of the required amount of agricultural produce needed to feed the entire populace at any point in time.The various sources of agricultural funding include the following, although not limited to: concessionary funds (international donor funds, government budgeted funds, central bank funds, and compulsory deposits), and commercial funds (savings and deposits, equity and self-financing).

#### 2.1.2 Food Security

Food and Agriculture Organization (2002) described food security as phenomenon relating to individuals. The ultimate focus is the nutritional status of the individual household members, and the riskiness of the adequate status not being achieved or becoming undermined. The latter risk describes the vulnerability of individuals in this context. Vulnerability may occur both as a transitory and chronic phenomenon. Thus, food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life. However, foodinsecurityexists when individuals/households do not have adequate physical, social or economic access to food. The concept of food security is generally understood to incorporate four main components: *availability, access, utilization, and stability*; although some see stability as a separate cross cutting factor. For a state of food security to exist, all of these components must be sufficiently present.

### 2.2 Theoretical Literature

#### 2.2.1 Food availability approach

Food availability approach was first conceptualized by the Venetian thinker Giovanni Botero in 1588 and thenpopularized by Malthus (1789) as the Malthusian approach. This approach emphasis on the (dis)equilibrium that exist between population and food. It emphasized that for equilibrium to occur the rate at which food availability grows should be higher than the rate of growth of the population at any given point in time in a country; otherwise disequilibrium will occur. Therefore, food security is viewed as merely a matter of aggregate (per capita) food availability. In a closed economy, this depends mainly on food production and stocks, while in an open economy also food trade can play a relevant role.

Prior to the early part of 1970s, this was the reference approach for the international community, both in terms of politics and academy level. This is better captured on the definition of food security given at the World Food Conference of 1975: "*Availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices"* (UN 1975). The food availability approach can be segregated in two manifold: firstly, on the "demand side" as it aims at reducing the growth rate of population in terms of fertility – through well-cultured policies. Secondly, on the "supply side" as it aimed at boosting the (per capita) food production through agricultural production.

**2.2.2Entitlement approach**

At the beginning of 1980s Amartya Sen's *entitlement approach* contributed to challenge the perspective of food availability approach and shifted the focus to people's *access* to food. "The entitlement approach concentrates on each person's entitlements to commodity bundles including food, and views starvation as resulting from a failure to be entitled to any bundle with enough food" (Sen, 1981). Thus, entitlements depend greatly on two elements which are the personal endowments which involves the resources legally own by a person such as house, livestock, land, and nontangible goods (Osmani, 1995), and the set of commodities in which the person can have access to as result of trade and production, that is "exchange entitlement mapping" (Sen 1981).

**2.3 Empirical Literature Review**

Fomyol and Tata (2019) examined the performance of National Special Programme for Food Security (NSPFS) Programme in Plateau state using qualitative data (questionnaires) for the seventeen local government areas in the state. They employed the use of descriptive statistics, production function, net farm income and resource use efficiency. The authors found that NSPFS beneficiary farmers achieved significant increases in crop production and productivity as a result of use of the available inputs and crop production techniques provide by the programme.

Osabohien, Osabuohien, and Urhie (2018) evaluated the potential of agricultural credit facilities in terms of commercial bank credit to agriculture and agricultural credit guarantee scheme fund (ACGSF) over the periods of 1990 to 2016. They employed the use of Autoregressive Distribution Lag (ARDL) model and found that Agricultural credit guarantee scheme fund was positively related to food security whilst population has a negative relationship with food security.

Ibeogu, Ogechukwu and Abah (2016) studied the role of government in strengthening food security towards rural development between the period of 2011 to 2015 in Ebonyi State, Nigeria.The authors employed the use ofdiffusion model and found that not less than 80% of the rural areas of Ebonyi State and Nigeria are still underdeveloped; and farmers also lack access to credit facilities which has resulted to low productivity in Ebonyi State.

Awolabi, Ashaolu and Twumasi-Ankrah (2016)evaluated the new Nigerian agricultural policy that was launched in 2001 on its efficient for food security. The authors made use of evaluations on the influence of some indicators of agricultural production in the country and components of food security. They found that the fore mentioned components positively impacted on food security with exceptions on food stability and access to sanitation facilities.

Nwose (2013) investigated on agricultural education for sustainable development in Nigeria which sought to establish the relationship between food security and education and development. He established that there are many complex factors that influence sustainable development and food security. He employed the use of primary data through designed questionnaires which made it clear that education in agriculture plays an important role in preparing farmers, researchers, educators, extension staff, members of agric-business, among others to make productive contributions towards agricultural development.

Adetiloye (2012) examined the provision of credit to agricultural sector on the performance of the ACGSF while at the same time evaluating the food security status of Nigeria over the periods of 1978 to 2006. The research adopted the use of t-test and paired t-test on the one hand and GrangerCausality test. The author found that though credit to the agricultural sector is significant but it has not been growing relative to the economy. The ACGSF settled claims are negatively significant and the tardiness is observed in the claims process.

Jerome (2012) studied the Nigeria's food security programs as implications for MDG's goal of extreme hunger eradication at the period of 1990. He employed the use of growth rate of variables such as staple food production, population growth rates, inflationary rate, and minimum rediscount rate, values of the agricultural guarantee loans, food import bill, total import bill and Real GDP. The study found out amongst others that constraints militating against agricultural productivity in Nigeria are structured along sector wide constraints and commodity specific constraints. That in Nigeria staple food production is experiencing a downward trend, with Adhoc agricultural polices counteracted by government monetary and fiscal policies.

Obayelu (2010) investigated the classification of households into food security status in the north-central Nigeria and employed the Radimer/Cornell hunger scale and the Childhood Hunger Identification Project scale Measurement Model. He found that only 23.7% of the households in the study area were food secure; thus more than 66 percent of the households are food insecure.

Fakayode, Rahji, Oni and Adeyemi (2009) examined the food security situations of the Nigerian's major farm households using Ekiti State, Nigeria. The USDA approach for the analysis of farm household food security was used to measure the intensity of food severity among the farm households. They found that only 12.2% of the farm households were food secure, 43.6% were food insecure without Hunger, 35.9% were food insecure with Hunger (moderate) and 8.3% were food insecure with Hunger (severe).

Orewa and Iyangbe (2009) assessed the degree of food insecurity in Nigeria by examining the food insecurity profile among the rural and low-income urban population in the country. The authors made use of a 48-hour recall method. Each household member was asked about the type and quantity of food he/she consumed the previous day and a day after per meal and per day. The study identified three classes of persons, the pre-scholars (less than 6 years), the male inhabitants and the low income urban households are more severely affected by food insecurity.

Omonona and Adetokunbo (2007) analyzed food security situation among urban households in Lagos, Nigeria. The households were segregated into food secure and food insecure households using food security index. The food insecurity incidence for the study area was found to be 0.49. Food insecurity incidence increases with increase in age of household heads. It is highest when household heads are within the range of 61 – 70 years at 0.58 and least within range 21 –30 years at 0.30. Food insecurity incidence is higher in female headed households at 0.49 than in male-headed households at 0.38. Food insecurity incidence decreases with increase in level of education.

Babatunde, Omotesho and Sholotan (2007) investigated the socio-economic characteristics and determinants of the food security status of rural farming households in Kwara State of Nigeria. The authors employed the use of logit regression model made up of eight regressors'. The study revealed that 36% and 64% of the households were food secure and food insecure respectively.

## III. RESEARCH METHODOLOGY

This section assesses the methods and techniques as well as the material employed in conducting the research analysis. The *ex post facto* research design was adopted in this study as it gives no room for the manipulation of data collected for the study. The study utilized quarterly time series that spanned through the first quarter of 1981 to the fourth quarter of 2018 for agricultural sector in Nigeria. The data collected for the study were secondary as they were sourced from Central Bank of Nigeria (CBN) statistical bulletin. The authors employed the following techniques: descriptive statistics, unit root test, Autoregressive Distributed Lag (ARDL) Model, ARDL bound test, Vector Error Correction Model (VECM), and granger causality test to analyzed the data.

To succinctly carry out this research the model specification of Oshabohien, Afolabi and Godwin (2018) was adopted with some modifications

DFD = f(POP, ACGSF, BCRED, LINTR) …….. 3.1

Where,DFD = Depth of food deficit, POP = Total population, ACGSF = Agricultural credit guarantee scheme fund, BCRED = Commercial bank credits to the agricultural sector, LINTR = Lending interest rate

Equation 3.1 is being modified as thus:

ACAP = f(LNGOEA, LNACGSN, LNACGSLO, LNCOBLA)

This can be written mathematically as follows:

$ACAP = \beta_0 + \beta_1 LNGOEA + \beta_2 LNACGSN + \beta_3 LNACGSLO + \beta_4 LNCOBLA$ … 3.2

The econometric form of the model can be written as thus:

$ACAP = \beta_0 + \beta_1 LNGOEA + \beta_2 LNACGSN + \beta_3 LNACGSLO + \beta_4 LNCOBLA + U_t$ … 3.3

Where, ACAP = Per capita agricultural production, LNGOEA = Government expenditure on agriculture, LNACGLO = Agricultural credit guarantee scheme fund loan granted, LNACGSN = Agricultural credit guarantee scheme fund loan granted in terms of numbers of farmers, LNCOBLA = Ccommercial banks loans and advances to agricultural sector, $\beta_1$, $\beta_2$, $\beta_3$, and $\beta_4$ = Estimation parameter, $\beta_0$ = Constant parameter, $U_t$ = Error term

$\beta_1$, $\beta_2$, $\beta_3$, and $\beta_4 > 0$

The use of per capita agricultural production was necessitated from the work of Funk and Brown (2019) who made use of per capita cereal production in measuring the extent of food security in terms of cereals.

The ARDL model specification for testing the long run relationship in the model is presented below:

$$\Delta ACAP_t = \beta_0 + \beta_1 \Delta ACAP_{t-i} + \beta_2 \Delta LNGOEA_{t-i} + \beta_3 \Delta LNACGSN_{t-i} + \beta_4 \Delta LNACGSLO_{t-i} + \beta_5 \Delta LNCOBLA_{t-i} + U_t \quad \ldots 3.4$$

The Error Correction Model (ECM) for testing the speed of adjustment to equilibrium after a change

$$\Delta ACAP_t = \beta_1 + \sum_{i=1}^{p} \beta_2 \Delta ACAP_{t-i} + \sum_{i=1}^{q} \beta_3 \Delta LNGOEA_{t-i} + \sum_{i=1}^{q} \beta_4 \Delta LNACGSN_{t-i} + \sum_{i=1}^{q} \beta_5 \Delta LNACGSLO_{t-i} + \sum_{i=1}^{q} \beta_6 \Delta LNCOBLA_{t-i} + \alpha ECT_{t-i} + e_t \ldots\ldots\ldots\ldots 3.5$$

The Granger Causality model for testing the cause and effect between the dependent and independent variable is specified below:

$Y_t = \alpha + \sum_{k=1}^{k} \beta_k Y_{t-1} + \sum_{k=1}^{i} \delta_k X_{t-1} + \epsilon_t$ ..... 3.6

## IV. DATA PRESENTATION AND ANALYSIS

**4.1** Behaviour of Data

The behaviour of the data shows the specific features of the statistical data of each variable.

**4.1.1 Summary Statistics**

Table 4.1 shows the descriptive characteristics of the study variables. The statistics for the descriptive features include the mean, standard deviation, skewness, kurtosis, and the jarque-bera normality test.

**Table 4.1: Summary of Descriptive Statistics**

| | ACAP | ACGSLO | ACGSN | COBLA | GOEA |
|---|---|---|---|---|---|
| Mean | 56.45554 | 3101257. | 29604.92 | 203.1028 | 16.55447 |
| Median | 40.66356 | 301738.7 | 23992.00 | 37.14650 | 6.700162 |
| Maximum | 91.04807 | 12456251 | 72322.00 | 2226.680 | 65.39901 |
| Minimum | 30.19051 | 24654.90 | 1076.000 | 0.590600 | 0.013028 |
| Std. Dev. | 22.71614 | 4023347. | 19939.81 | 480.0407 | 20.06066 |
| Skewness | 0.393291 | 0.925661 | 0.387396 | 3.496386 | 0.944025 |
| Kurtosis | 1.393191 | 2.295148 | 2.173040 | 14.39225 | 2.566753 |
| | | | | | |
| Jarque-Bera | 5.067534 | 6.213326 | 2.033265 | 282.9135 | 5.941361 |
| Probability | 0.079359 | 0.044750 | 0.361811 | 0.000000 | 0.051268 |

***Source:*** **Authors' computation using E-views 10.0**

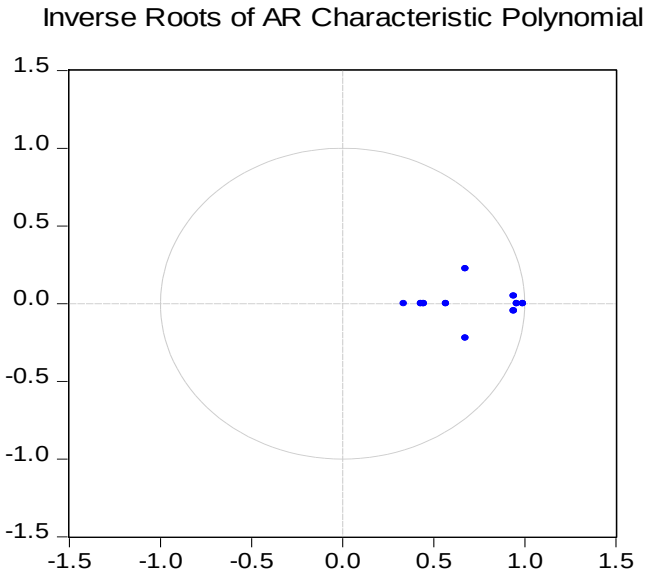
Table 4.1 presents the summary of descriptive statistics for the variables under study for agricultural funding and food security. It shows that the average value of ACAP is approximately 56.45554per capita of agricultural productionwith a standard deviation of 22.71614%and it ranges between 30.19051 and 91.04807 per capita of agricultural production. ACGSLO has an average value of ₦3101257 thousands with a standard deviation of 4023347% and ranges between ₦24654.90 thousands to ₦12456251 thousands. Similarly, ACGSN have an average value of 29604.92 farmers with a standard deviation of 19939.81% and it ranges between 1076 to 72322 farmers. Additionally, COBLA has an average value of ₦203.1028 billion and with a standard deviation of 480.0407% and it ranges between ₦0.590600 billion and ₦2226.680 billion. Whereas GOEA has an average value of ₦16.55447 billion with a standard deviation of 20.06066% ranging from ₦ 0.013028to ₦65.39901 billion

To test for the normality of the distribution, the Jarque-Bera Chi-square probability value must be greater than 0.05 level of significance in order to reject the null hypothesis that states that the variables are not normally distributed and vice versa.From table 4.1 it can be seen that the null hypothesis of the variables (ACAP, ACGSN, and GOEA) were rejected as the Jarque-Bera Chi-square p-values were greater than the 5% level of significance; therefore, they are normally distributed. Whereas, the null hypothesis of the variables (ACGSLO and COBLA) were accepted as the Jarque-Bera Chi-square probability values were less than the 5% level of significance; hence, they are not normally distributed. The skewness coefficient indicates that GOEA, ACAP, ACGSN, ACGSLO and COBLA are positively skewed. Imperatively, kurtosis shows the degree of peakedness of the distribution. The variables (GOEA and COBLA) showing an average kurtosis greater than 3, this means that the variables are platykurtic and the variables (ACAP, ACGSN, and ACGSLO) showing an average kurtosis less than 3, this means that the variable is leptokurtic.

**4.1.2 AR Roots Graph**

The AR roots graph explains the inverse roots of the characteristics AR polynomials. It explains the stability and non-stability of the estimated VAR. This is dependent on the roots modulus being less than one and at the same time lies inside the circle.

**Fig 4.1: Inverse Roots of AR Characteristic Polynomial Test**




**Source: Authors' computation using E-views 10.0**

Fig 4.1 shows that the inverse roots of AR Characteristic Polynomial modulus lie below one and at the same time inside the circle. This signifies that the estimated VAR is stable.

### 4.1.3 Unit Root Test

The study employed the ADF unit root analysis to determine the stationarity of variables and as the same time determine the order of integration.

**Table 4.2: Unit Root Test**

| Variables | ADF Test Statistics | T-CRITICAL AT 5% | P-value | Order of Integration |
|---|---|---|---|---|
| ACAP | -5.101677 | -2.881685 | 0.0000 | I(1) |
| LNGOEA | -8.707187 | -2.880722 | 0.0000 | I(1) |
| LNACGSN | -3.410807 | -2.881260 | 0.0121 | I(0) |
| LNACGSLO | -6.929983 | -2.881123 | 0.0000 | I(1) |
| LNCOBLA | -8.322888 | -2.881123 | 0.0000 | I(1) |

**Source: Authors' computation using E-views 10.0**

Table 4.2 shows that at 5% level of significance four out of the five variables were stationary at first differences while the remaining one was stationary at level. The ADF test statistics have most negative than the critical values at 5% level of significance for each of the variable and their respective p-values are less than 5% which is the chosen region for acceptance and rejection. Based on this, the ARDL Bound Co-integration test was used to determine if there is any form of co-integration among the variables.

### 4.2 Relationship Between the Variables

The test for the relationship existing between the dependent and the independent variables was carried out using the ARDL test, Granger Casualty, and the Vector Error Correction model will be used. This also includes the post estimation test.

### 4.2.1 ARDL Estimation and Analysis

Based on the result of the stationarity test, it was shown that four out of the five variables were stationary at first difference while the remaining variable was stationary at level. Pesaran, Shin and Smith (2001) opined that the ARDL Bound test should be used to test for co-integration among variables when its order of stationarity is mixed that is at level and first difference.

**Table 4.3: ARDL Bound Test for Co-integration**

| F-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| | | | | |
| Test Statistic | Value | Signif. | I(0) | I(1) |
| | | | | |
| | | | Asymptotic: n=1000 | |

| | | | | |
|---|---|---|---|---|
| F-statistic | 4.279078 | 10% | 2.45 | 3.52 |
| K | 4 | 5% | 2.86 | 4.01 |
| | | 2.5% | 3.25 | 4.49 |
| | | 1% | 3.74 | 5.06 |
| | | | | |

**Source: Authors' computation using E-views 10.0**

The ARDL bound test of co-integration was tested based on the decision rule that the F-statistics critical value must be greater than the F-statistics values in absolute terms of I(0) and I(1) bound for there to be co-integration among the variables.

Table 4.3 shows the F-statistics value as 4.279078 which is greater than the I(0) and I(1) bound values of 2.86 and 4.01 respectively at 5% level of significance. Thus, the alternate hypothesis is being accepted that there is co-integrating relationship between the variables; and the null hypothesis is rejected.

#### 4.2.1.1 Autoregressive Distributed Lag (ARDL) Model Estimation

Table 4.4 shows the results of the autoregressive distributed lag model for the dynamic relationships under study. The estimation of the dynamic process of the ARDL is based on Schwarz criterion (SIC) lag length criteria.

**Table 4.4: Autoregressive Distributed Lag (ARDL) Model (Long-run Form)**

| REGRESSOR | COEFFICIENT | T-STATISTICS | P-VALUE |
|---|---|---|---|
| LNGOEA | -0.797663 | -0.511415 | 0.6098 |
| LNCOBLA | 1.088867 | 0.488466 | 0.6260 |
| LNACGSLO | 12.72154 | 7.227675 | 0.0000 |
| LNACGSN | -3.398880 | -1.496142 | 0.1368 |
| R-squared 0.998191 | | F-statistic 13150.38 | |
| Adjusted R-squared 0.998115 | | Prob(F-statistic) 0.000000 | |
| Durbin-Watson stat 2.117950 | | | |

**Source: Author's E-view 10.0 Computation**

Table 4.4 shows the relationship existing between food security and agricultural funding in Nigeria. The coefficients of -0.797663 and-3.398880with their corresponding p-values of 0.6098 and 0.1368 indicated that government expenditure on agriculture and agricultural credit guarantee scheme fund to number of farmersare negatively and statistically insignificant to per capita of agricultural production respectively. A 1% increase in government expenditure on agriculture and agricultural credit guarantee scheme fund to number of farmers would concurrently lead to a decrease in per capita agricultural production by approximately 0.797663% and 3.398880% respectively. Also, commercial banks loans to agricultural sector and agricultural credit guarantee scheme loans and advances to farmer are both positively related to per capita agricultural production with coefficients of 1.088867 and 12.72154 respectively but only agricultural credit guarantee scheme loans and advances to farmer is statistically significant with p-value of 0.0000 whereas commercial banks loans to agricultural sectoris statistically insignificant with p-value of 0.6260. A 1% increase in commercial banks loans to agricultural sector and agricultural credit guarantee scheme loans and advances to farmer would concurrently lead to anincrease in per capita agricultural production by approximately 1.088867% and 12.72154% respectively.

The R-Squared and Adjusted R-Squared of 0.998191 and 0.998115 respectively showed the model is of good fit. This indicated that the explanatory variables (LNGOEA, LNACGSLO, LNACGSN and LNCOBLA) were able to explain changes in the exogenous variables (ACAP) by 99.8191% and 99.8115% respectively. The F-statistics gives details of the overall significance of the model. The F-statistics p-value is 0.00000 shows that the model is significant. The Durbin Watson of approximately 2 showed the absence of autocorrelation in the data used in the study.

#### 4.2.1.2 Error Correction Model (ECM)

Table 4.4 shows the result of the error correction model at which error in the short-run will be corrected in the long-run. Specifically, it shows the speed of adjustment of error in the long run

**Table 4.5: Error Correction Model**

| REGRESSOR | COEFFICIENT | T-STATISTICS | P-VALUE |
|---|---|---|---|
| C | -5.190130 | -4.359588 | 0.0000 |
| CointEq(-1)* | -0.067066 | -4.688881 | 0.0000 |
| Durbin-Watson stat 2.117950 | | F-statistic 21.98561 | |
| | | Prob(F-statistic) 0.000006 | |

**Source: Author's E-view 10.0 Computation**

Table 4.5 shows that any disequilibrium which occurs at the short-run are corrected at a speed of adjustment to long-run equilibrium of -0.067066. Thus, this shows that 6.7066% of disequilibrium which occurs in the previous quarter are corrected in the current quarter. Also, the p-value of 0.0000 shows that it is statistically significant at 5% level. The F-statistics gives details of the overall significance of the model. The F-statistics p-value is 0.00000 shows that the model is significant. The Durbin Watson of approximately 2 showed the absence of autocorrelation in the data used in the study.

### 4.2.2 Pairwise Granger Causality Test

The granger causality test was used to test the causal effect movement between the dependent and the independent variables. The decision criteria for accepting or rejecting the null hypothesis was based on the 5% level of significance. Therefore, given the p-value of the F-statistics to be less than the 5% level of significance chosen, the null hypothesis is rejected stating that there is causal movement from one variable to another.

**Table 4.6: Pairwise Granger Causality Tests**

| Pairwise Granger Causality Tests | | | |
|---|---|---|---|
| Sample: 1981Q1 2018Q4 | | | |
| Lags: 2 | | | |
| Null Hypothesis: | Obs | F-Statistic | Prob. |
| LNGOEA does not Granger Cause ACAP | 150 | 1.89910 | 0.1534 |
| ACAP does not Granger Cause LNGOEA | | 0.38787 | 0.6792 |
| | | | |
| LNCOBLA does not Granger Cause ACAP | 150 | 1.35692 | 0.2607 |
| ACAP does not Granger Cause LNCOBLA | | 0.86565 | 0.4229 |
| | | | |
| LNACGSLO does not Granger Cause ACAP | 150 | 6.35725 | 0.0023 |
| ACAP does not Granger Cause LNACGSLO | | 0.05171 | 0.9496 |
| | | | |
| LNACGSN does not Granger Cause ACAP | 150 | 0.53452 | 0.5871 |
| ACAP does not Granger Cause LNACGSN | | 0.09667 | 0.9079 |

**Source: Authors' E-view 10.0 Computation**

Table 4.6 shows that the granger causality test was carried out at a lag of 2 which was chosen based on the lag length criteria of Schwarz Criterion. From the result it was seen that neither LNGOEA, LNCOBLA, and LNACGSN supports ACAPnor ACAP supports LNGOEA, LNCOBLA, and LNACGSN. However, LNACGSLO granger cause (supports) ACAP but ACAP does not supports LNACGSLO.

### 4.3 Post Estimation

The post estimation test was carried out to determine the global utility of the analysis carried out. This involves the serial correlation test and CUSUM recursive stability test.

### 4.3.1 Serial Correlation Test

In order to test the presence of autocorrelation, the Breusch-Godfrey serial correlation test was adopted. The null hypothesis states that there is no presence of serial correlation. The decision criteria for the acceptance of the null hypothesis is that the p-value of the F-statistics must be greater than the 5% chosen level of significance; otherwise, the alternate hypothesis is accepted.

**Table 4.7: Serial Correlation Test**

| Breusch-Godfrey Serial Correlation LM Test: | | | |
|---|---|---|---|
| | | | |
| F-statistic | 0.178430 | Prob. F(2,125) | 0.8368 |
| Obs*R-squared | 0.404238 | Prob. Chi-Square(2) | 0.8170 |

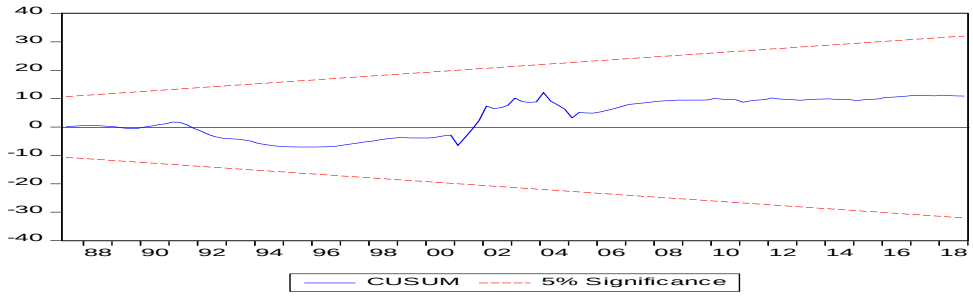
**Source: Authors' E-view 10.0 Computation**

Table 4.7 shows that the p-value of the F-statistics (0.8368) is greater than the 5% chosen level of significance. Therefore, the null hypothesis is accepted that there is no presence of autocorrelation among the variables.

### 4.3.2 Stability Test

In order to test the stability of the estimation, the CUSUM recursive test was carried out at 5% level of significance – chosen. It states that for the null hypothesis (that the analysis is stable) to be accepted, the blue line must lie in-between the two red lines; otherwise, the alternate hypothesis is accepted.

**Table 4.8: CUSUM Recursive Test**




**Source: Authors' E-view 10.0 Computation**

Table 4.8 shows that the blue line of the estimation lines in-between the two red lines, and hence there is the present of stability of the analysis carried out.

**4.4 Discussion of Findings**

From the empirical findings, it can be seen that government expenditure on agriculture was negatively (-0.797663) and statistically insignificant to per capita agricultural production given the p-value of 0.6098. This signifies that a 1% increase in government expenditure on agriculture would concurrently lead to a decrease in per capita agricultural production by approximately 0.797663% all things being equal. This is in disagreement with apriori expectation and the findings of authors like Fomyol and Tata (2019), Osabohien et al (2018), and Ibeogu *et al* (2016) that government expenditure positively impact on food security. However, it agrees with the findings of Adetiloye (2012) based on the negative impact on food security. Also, neither government expenditure on agriculture supports per capita of agricultural production nor per capita of agricultural production granger causes government expenditure on agriculture. One can ascribe that the reason for the deviation from theoretical postulation are the high level of mismanagement by government officials, favouritism to a particular set of farmers, and farmers' inability to utilize the loan effectively based on the poor management of funds.

Also, it can be seen that agricultural credit guarantee scheme fund to number of farmers was negatively (-3.398880) and statistically insignificant to per capita agricultural production given the p-value of 0.1368. This signifies that a 1% increase in agricultural credit guarantee scheme fund to number of farmers would concurrently lead to a decrease in per capita agricultural production by approximately 3.398880% all things being equal. This is in disagreement with apriori expectation and the findings of authors like Fomyol and Tata (2019), Osabohien *et al* (2018), Awolabi *et al* (2016), and Ibeogu *et al* (2016) that expenditure positively impact on food security. However, it agrees with the findings of Adetiloye (2012) based on the negative impact on food security. Also, neither agricultural credit guarantee scheme fund to number of farmers supports per capita of agricultural production nor per capita of agricultural production granger causes agricultural credit guarantee scheme fund to number of farmers. Possible reason for deviation from theoretical postulation are that the number of farmers granted such loans and advances are infinitesimally when compared with the large number of farmers that cut across all the various part of the country.

Similarly, it can be seen that commercial banks loans to agriculture sector was positively (1.0888607) and statistically insignificant to per capita agricultural production given the p-value of 0.6260. This signifies that a 1% increase in commercial banks loans to agriculture sector would concurrently lead to an increase in per capita agricultural production by approximately 1.0888607% all things being equal. This is in agreement with apriori expectation and the findings of authors like Fomyol and Tata (2019), Osabohien et al (2018), and Ibeogu et al (2016) that expenditure on agricultural sector positively impact on food security. However, it disagrees with the findings of Adetiloye (2012) based on the negative impact on food security. Also, neither commercial banks loans to agriculture sector supports per capita of agricultural production nor per capita of agricultural production granger causes commercial banks loans to agriculture sector. One can ascribe that the reason for the support to theoretical postulation but insignificantis due to the reluctant nature of commercial banks to lend money to the agricultural sector based on the perceived high level of risk of such investment.

Furthermore, it can be seen that agricultural credit guarantee scheme fund loans and advances was positively (12.72154) and statistically significant to per capita agricultural production given the p-value of 0.0000. This signifies that a 1% increase in agricultural credit guarantee scheme fund loans and advances would concurrently lead to an increase in per capita agricultural production by approximately 12.72154% all things being equal. This is in agreement with apriori expectation and the findings of authors like Fomyol and Tata (2019), Osabohien *et al* (2018), Ibeogu *et al* (2016), and Awolabi *et al* (2016) that loans and advances on agriculture positively impact on food security. However, it disagrees with the findings of Adetiloye (2012)

based on the negative impact of agricultural credit guarantee scheme fund loans and advances on food security. Also, neither agricultural credit guarantee scheme fund loans and advances supports per capita of agricultural production nor per capita of agricultural production granger causes agricultural credit guarantee scheme fund loans and advances.

## V. CONCLUSION AND RECOMMENDATIONS

### 5.1 Conclusion

The authors concluded that despite the significance and positive impact of agricultural credit guarantee scheme fund loans and advances on food security, there is still need for more loans and advances from commercial banks and agricultural credit agricultural credit guarantee scheme fund as well as proper monitoring of government expenditure on agriculture. Also, increase in the number of farmers to which loans and advance are disburse to.

### 5.2 Recommendation

Based on the findings and conclusion drawn on food security and agricultural funding in Nigeria between the first quarter of 1981 to the fourth quarter of 2018, the following recommendations were proposed;

i. There should be physical access by agricultural credit guarantee scheme fund agency to determine that farmers in need of loans and advances own and operate viable farm(s).
ii. Central bank of Nigeria should the act of moral suasion to appeal to commercial banks to farmers and at the same time act as their guarantor in order to reduce the high level of perceived risk face by commercial banks.
iii. There should be proper monitoring of government officials and stringent penalties on mismanagement of funds meant for agricultural purposes.

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