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# IMPACT OF AGRICULTURAL CREDIT GUARANTEE SCHEME FUND (ACGSF) ON LIVESTOCK PRODUCTION IN NIGERIA: EVIDENCE FROM HISTORICAL DATA

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## ABSTRACT

This study examined the causal relationship between Agricultural Credit Guarantee Scheme Fund (ACGSF) and total livestock production in Nigeria, using annual time series data on annual amount of ACGSF guaranteed and total livestock output spanning from 1981 to 2014. Augmented Dickey-Fuller (ADF) test, Johansen cointegration test, vector error correction model (VECM), granger causality test and variance decomposition were employed for data analysis. The results from ADF test showed that the series are integrated of order one, *I(1).* Johansen cointegration test showed that there is a long-run relationship between the variables. The estimates of the VECM showed that ACGSF had a positive and significant effect on livestock production at 1 percent level in the first lag with a coefficient of 0. 271. It was also found to be significant at 5 percent level in the second and third lags with a coefficient of 0.189 and 0.171 respectively in the short-run. Also the variance decomposition analyses showed that over time, ACGSF contributed about 31 percent to the improvement in livestock production in Nigeria. Further, based on Granger causality test, there was a unidirectional causality from ACGSF to livestock production. This study affirms that ACGSF remains relevant for the purpose for which it was established. Given that ACGSF had significant and positive effects on Livestock production in Nigeria, to further enhance its impact, government should ensure that more funds to the sector is quaranteed to enhance increase productivity of the sector.

**Keywords:** ACGSF; Livestock production; VECM; Granger Causality

## INTRODUCTION

Agriculture provides work for about 60-70 per cent of the population and contributes between 30-40 per cent of the nation's Gross Domestic Product (Akintunde *et al.*, 2013). Meeting the needs of the rising population lies to a great extent in increasing the level of food crop and livestock production. Inadequate access to agricultural credit has been reported as one of the impediments to the growth and productivity of the agricultural sector in Nigeria. Agricultural credit is defined as a type of financing used to provide funding for agricultural producers (Investopedia, 2016). Provision of agricultural credit is expected to

play a critical role in agricultural development (Duong and Izumida, 2002). Lack of credit has long been identified as one of the major problems facing the development of the agricultural sector in Nigeria (Ammani *et al*, 2010). Since the availability of credit is directly linked to other problems facing agriculture, absence of agricultural credit would impact negatively on production, processing, transportation and storage.

Although the government encourages commercial and merchant banks to increase lending to agriculture, most banks have failed to do so because of the risks confronting agricultural production in Nigeria (Omonona, 2013).Typically, the loan amounts required by small farmers are usually lower than the sums that commercial banks prefer to lend. Even when the banks grant these loans, processing costs are usually high relative to the size of the loan (Omonona, 2013). In recognition of this challenge, the Nigerian Government established the ACGSF in 1977. The ACGSF became operational in 1978 with an initial capital base of ₦100 million distributed between the federal government (60% equity) and the Central Bank of Nigeria (40%). The fund was set up with the single purpose of providing guarantee in respect of loans granted by any bank for agricultural purposes (Central Bank of Nigeria, 1990). The main objective of ACGSF was to encourage financial institutions to lend funds to those engaged in agricultural production and agro processing with the aim of enhancing export capacity of the nation as well as for local consumption (Nwosu *et al.,* 2010). ACGSF is one of the worthy programmes put in place by the Federal Government of Nigeria to boost agricultural production, generate revenue for the farmers, alleviate poverty and earn foreign exchange for the country (Enenche *et al*., 2014),ensure food security, rural transportation and improved nutritional health status of the citizens (ACGSF manual, 2005).

The Agricultural purposes in respect of which loans can be guaranteed by the fund are those connected with: (a) establishment or management of plantation for the production of rubber, oil palm, cocoa, coffee, tea and similar crops; (b) The cultivation or production of cereal crops, tubers, fruits of all kinds, cotton, beans, groundnuts, sheanuts, benniseed, vegetables, pine-apples, bananas and plantains; (c) Animal husbandry, such as poultry, piggery, cattle rearing and the like, fish farming and fish capture; (d) Processing in general where it is integrated with a least 50 per cent of farm output for instance, cassava to garri, oil palm fruit to oil and kernel, groundnut to groundnut oil and (e) Farm machinery and hire services (Central Bank of Nigeria, 1990).

Nigeria's large population provides a great platform for exploiting its agricultural potentials especially livestock sector. The livestock sector had over the years continued to provide sustainable livelihoods, nutrition and food security, and had served as a basis for social relations and empire building (Turkur, 2015). Livestock production is an integrated economic activity which currently contributes a mere 5-6 per cent of the Gross Domestic Product (GDP) and 20 per cent of the agricultural component of the Gross Domestic Product (Anosike *et al.,* 2015). Livestock production provides food products such as meat, milk, eggs and other dairy products throughout the year. It provides employment and income to millions of people in rural areas and generates draught power and organic manure for arable farming mainly in the savanna ecological zones of the country. Nigeria is endowed with an estimated 19.5 million cattle, 72.5 million goats, 41.3 million sheep, 7.1 million pigs, 278,840 Camel, 145 million chickens, 11.6 million ducks, 2.1 million turkeys, and 974,499 donkeys (Agricultural Sample Survey, 2011). Notwithstanding this vast and robust livestock population in Nigeria, the gap between supply and demand continues to widen.

Despite the establishment of the ACGSF in 1977, to encourage commercial and other deposit banks to participate in increasing the productive capacity of farmers through a credit lending programme that will meet farmer's needs. There has been growing apprehension that the credit flow from the financial institutions under the scheme to livestock farmers is deplorable. As a result, local supplies have been inadequate resulting in importation of livestock products over the years. Consequently, inadequate production and high prices for livestock products in the country is the order of the day. To enhance livestock sector's contribution to Nigeria's economic growth and sustained development, there is the need to assess the impact of ACGSF on livestock sector. It is in line with this, that this study examined the relationship between ACGSF and livestock production in Nigeria from 1981 to 2014

## MATERIALS AND METHODS

### Study Area

This study was conducted in Nigeria. Nigeria lies between latitude $4^{o}$and $14^{o}$ north of the equator and longitudes $3^{o}$ and $14o^{e}$ ast of the Greenwich Meridian. It occupies about 923 773 $km^2$.To the north the country is bordered with the Niger Republic and Chad, to the west by the Benin Republic, in the East by the Cameroon Republic and to the south by the Atlantic Ocean (Aregheore, 2005). Nigeria comprises thirty six states excluding Abuja, which is the Federal Capital Territory.

### Data Sources

This study employed annual time series data on value of loan guaranteed under the Agricultural Credit Guarantee Scheme Fund (ACGSF) operation and total livestock output spanning from 1981 to 2014. These were collected from Statistical Bulletin of the Central Bank of Nigeria (CBN). The data on livestock production (LSP) is in ₦' Billion, measured as GDP at current basic prices. GDP for livestock sub sector was taken as proxy for the output of livestock. Data on value of loan guaranteed under the Agricultural Credit Guarantee Scheme Fund (ACGSF) operation is in ₦' Thousand. For this study, the following assumptions were made (a) Credit is the only variable input for livestock production, all other factors of production remains constant. (b) ACGSF guaranteed loans are the only source of agricultural credit available to livestock farmers. In addition, the variables were transformed into logarithm and used in the analysis.

### Analytical methods

This study employed a combination of Augmented Dickey-Fuller (ADF) test, co-integration test, vector error correction model (VECM), variance decomposition analysis and Granger causality test. The underlying principle for carrying out cointegration test is to find out whether there is long-run equilibrium relationship between variables. A set of variables are cointegrated when there exist a stable long-run relationship between them. Granger causality merely shows how one variable can help to predict the other. According to Iwayemi and Fowowe (2010), variance decomposition shows the proportion of the forecast error variance of a variable that can be attributed to its own innovations and that of

other variables. It give you an idea about the percentage error in one variable due to one standard deviation shock of the variable itself (own shocks or variations) and other variables in the system (Alege, 2010). It is primarily used for the purpose of making logical forecasts of variables in the model over a particular time period.

**Unit Root Test**

A preliminary analysis of the unit root properties of the variables was investigated to avoid spurious regression. The Augmented Dickey Fuller (ADF) test for the presence of unit root (confirmation of non-stationarity) was employed. According to Nkang *et al*.(2007),the benefit of the method lies on its strength to handle both first order and higher order auto regressive processes. The ADF test is based on the following regression given in equation 1:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} \sum_{i-1}^{m} \lambda_i \Delta Y_{t-1} + \varepsilon_t \quad (1)$$

Where $\varepsilon_t$ is a pure white noise error term and where $\Delta Y_{t-1} = \left(Y_{t-1} - Y_{t-2}\right)$. The number of lagged difference terms to include is often determined empirically.The ADF test that the series is not stationary is shown by the null hypothesis ($H_0 : \beta = 0$) whereas the alternative hypothesis ($H_1 : \beta < 0$) shows that the series is stationary. The rule is that if the computed ADF statistics is greater than the critical at the specified level of significance, then the hull hypothesis of unit root is accepted otherwise it is rejected.

**Co-integration Test**

In order to examine the long-run relationship between ACGSF and LSP, the Johansen (1991, 1995) co-integration techniques were used. The preliminary point for Johansen co-integration test is the vector auto regression (VAR). Assume a vector Zt, and assume that the vector has a VAR representation as specified in equation 2:

$$Z_t = \sum_{i=1}^{p} A_i Z_{t-1} + Bx_t + \varepsilon_t \quad (2)$$

Where *Zt* is a vector of non-stationary *I*(1) variables. For this study *Zt* includes ACGSF and LSP. *Xt* is a*n* x 1vector of deterministic variables, *εt* is a *n* x 1 vector of white noise error terms. This VAR can be re-written as shown in equation 3:

$$\Delta Z_t = \lambda + \sum_{i=1}^{n} \Gamma_i \Delta Z_{t-1} + \Pi Z_{t-1} + \varepsilon_t$$

Where, $\Pi = \sum_{i=1}^{p} A_i - I, \Gamma_i = -\sum_{j=i+1}^{p} A_j$ and $Z_t$ is a (n x 1) vector of *l(1)* variables in the study defined above, $\lambda$ is a (n x 1) vector of parameters (intercepts), Δ indicates the first difference operator, $\varepsilon_t$ is an kx1 vector of innovations or random shocks. $\Gamma_i$ and $\Pi$ are (n x n) matrices of parameters, were $\Gamma_i$ is a (n x 1) vector of coefficients of lagged $Z_t$

variables. The $\Pi$ is a *(n x 1)* is a long-run impact matrix which is product of two *(n x 1)* matrices whose rank determines the number of cointegrating relationships. A set of variables are cointegrated when there exist a long-run relationship between them. If there is no long-run relationship between the variables, then the short-run analysis will be conducted using the vector auto regression (VAR) framework.

**Vector Error Correction Model (VECM)**

Vector Error correction Model (VECM) is used to model causal influence among non-stationary *I(1)*variables with evidence of long run relationship. It is a means of reconciling the short-run behaviour of an economic variable with its long-run behaviour (Gujarati, 2003). The advantage of this method lies in the fact that together the long run and short run effects of the endogenous variables in model can be determined. The VECM has co-integrating relations built into the model to make sure that it restricts the long-run behaviors of the explanatory variables to congregate to their co-integrating relations at the same time allowing for short run adjustment dynamics (Boansi, 2014). The VECM is a restricted vector auto regression (VAR) proposed for use with non-stationary series that are known to be co-integrated. The vector error correction model is helpful for the estimation of a short term adjustment which regulate towards the long run stability in each time period and allows an equilibrium interpretation of the estimates. If the variables are found to be co-integrated, a vector error correction model (VECM) is estimated because a cointegrating connection deals only with long-run relationship without considering the short-run dynamics. Consequently, if the series *lnLSP* and *lnACGSF* are found to be *I(1)* and co-integrated, then the ECM model is represented by the following equations in 4 and 5 below:

$$\Delta \ln LSP_t = \varphi_1 + \sum_{i=1}^{n} \beta_{1i} \Delta \ln LSP_{t-1} + \sum_{i=1}^{n} \sigma_{1i} \Delta \ln ACGSF_{t=1} + \alpha ECT_{t-1} + \varepsilon_t \quad (4)$$

$$\Delta \ln ACGSF_t = \varphi_1 + \sum_{i=1}^{n} \beta_{1i} \Delta \ln LSP_{t-1} + \sum_{i=1}^{n} \sigma_{1i} \Delta \ln ACGSF_{t=1} + \alpha ECT_{t-1} + \varepsilon_t \quad (5)$$

Where *lnLSP* is logarithm of livestock production proxied by livestock GDP and *lnACGSF* is the amount of loan guaranteed to the livestock sector, ECT is the error correction term, $\Delta$ is the difference operator and $\varepsilon_t$ is the error term which takes care of other variables that might have influence on livestock production but not specified in the model and while *n* is the optimal lag length order of the variables.

**The Granger Causality Test**

This study also employs the Granger (1969) causality approach for testing the causal relationship between LSP and ACGSF in Nigeria The Granger causality test assumes that the information relevant to the prediction of the respective variables, livestock production and ACGSF is contained exclusively in the historical times series data on these variables. The test involves estimating bivariate regressions. For the causal relationship between livestock production and ACGSF the empirical bivariate regressions are given in equations 6 and 7 as:

$$\Delta \ln LSP_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta \ln ACGSF_{t-1} + \sum_{i=1}^{p} \beta_i \Delta \ln LSP_{t-1} + \varepsilon_{1t} \quad (6)$$

$$\Delta \ln ACGSF_t = \delta_0 + \sum_{i=1}^{p} \delta_1 \Delta \ln ACGSF_{t-1} + \sum_{i=1}^{p} \lambda_i \Delta \ln LSP_{t-1} + \varepsilon_{2t} \quad (7)$$

Where LSP is total livestock production and ACGSF is agricultural credit guaranteed scheme fund. The error terms, $\varepsilon_{1t}$ and $\varepsilon_{2t}$ are assumedto be uncorrelated. $\alpha$, $\beta$, $\delta$ *and* $\lambda$ are parameters to be estimated. Equation (6) postulates that current LSP is related to past values of itself as well as that of ACGSF and Equation (7) represents a similar behavior for ACGSF. Granger (1969) causality test requires that all variables are stationary, for this reason the test was conducted using the first differenced series.

## RESULTS AND DISCUSSION

### Augmented Dickey and Fuller (ADF) Unit Root Test

To verify the unit root properties of the data, the Augmented Dickey Fuller (ADF) unit root test was employed. The result of this test is presented in Table 1. For the two variables in levels and based on the ADF unit root test, the null hypothesis of existence of unit root cannot be rejected as evidenced by small *t*-statistic and large *p*-values. This means that LSP and ACGSF have unit roots and therefore are non-stationary. Based on this, the unit root tests were performed again on the first differences of these variables. The null hypothesis in ADF tests is rejected at 1 per cent for the two variables. This implies that the series are stationary in their first difference. Hence, it is concluded that LSP and ACGSF are integrated of order one, *I*(1).

Table 1: ADF Test of Livestock Production and ACGSF

| Variables | Levels | | First Difference | | Decision |
|---|---|---|---|---|---|
| | *t*-statistic | Probability | *t*-statistic | Probability | |
| *lnLSP* | 0.086046 | 0.9596 | -6.156223*** | 0.0000 | I(1) |
| *lnACGSF* | 0.231221 | 0.9706 | 4.880849*** | 0.0004 | I(1) |

***Indicates significance at 1 percent level. Lag length selection was automatic based on Schwarz information criterion (SIC).

### Co-integration test

The Johansen co-integration test results are presented in Table 2.Both the Trace statistics and Eigenvalue statistics show that there is a unique long-run relationship among the variables at 5 percent level of significance. This implies that the variables are co-integrated. For that reason, the test statistics strongly reject the null hypothesis of zero co-integrating vectors in support of the alternative hypothesis that there are at least one co-integrating vectors.

Table 2: Johasen Cointegration Test

| Hypothesized Number of cointegrating Equations | Statistics | 5% critical value | Probability** |
|---|---|---|---|
| Trace test | | | |
| None * | 14.301 | 14.413 | 0.043 |
| At most 1 | 0.897 | 3.137 | 0.382 |
| Maximum Eigen value test | | | |
| None * | 13.213 | 12.302 | 0.042 |
| At most 1 | 0.897 | 3.137 | 0.382 |

Trace test and Max-eigenvalue test indicates 1 cointegrating equation(s) at the 0.05 level; * denotes rejection of the hypothesis at the 0.05 level; **MacKinnon-Haug-Michelis (1999) p-values

**VECM Estimates**

A VECM with one co-integrating equation and four lags in each equation was estimated, having established that the variables in the model are *I(1)* and co-integrated (Table 3).The result of VECM (Tables 3) revealed that the maximum lag length that minimizes Akaike information criterion was four. Results showed that in the long-run, ACGSF was positively and significantly related to LSP in Nigeria during the period under study holding other factors constant. Results also revealed that the coefficient (-0.89) of the error correction term (ECT) of LSP carries the correct negative sign and is statistically significant at 1 percent level, with speed of adjustment to equilibrium of 89 percent. This implies that in the short-run, livestock production is adjusted by 89 percent of the past year's deviation from equilibrium. This confirms the stability of the system. The reason for this is that large absolute values of the coefficient of the ECT show that equilibrium agent remove a large percentage of the disequilibrium in each period, that is speed of adjustment is very quick. The estimates of the VECM showed that ACGSF has a positive and significant effect on livestock production at 1 percent level in the first lag and significant at 5 percent level in the second and third lags respectively in the short-run. This implies that there is a short-run relationship between ACGSF and livestock production in Nigeria. This result is in agreement with Ammani (2012) and Ihegboro (2014) who found positive and significant effect of ACGSF on livestock production.

Table 3: VECM Estimates of LSP and ACGSF in Nigeria

| Long-run | | |
|---|---|---|
| Cointegrating Eq: | CointEq1 | |
| DLNLSP(-1) | 1.000 | |
| DLNACGSF(-1) | 0.247 | |
| | (0.115) | |
| | [ 2.143]** | |
| C | -0.233 | |
| Short-run | | |
| Error Correction: | D(DLNLSP) | D(DLNACGSF) |
| CointEq1 | -0.893 | -1.447 |

| | | |
|---|---|---|
| | (0.266) | (1.316) |
| | [-3.360]*** | [-1.099] |
| D(DLNLSP(-1)) | 0.118 | 1.271 |
| | (0.234) | (1.158) |
| | [ 0.504] | [ 1.097] |
| D(DLNLSP(-2)) | 0.121 | 1.125 |
| | (0.232) | (1.146) |
| | [ 0.523] | [ 0.982] |
| D(DLNLSP(-3)) | 0.327 | 1.634 |
| | (0.218) | (1.080) |
| | [ 1.496] | [ 1.512]* |
| D(DLNLSP(-4)) | 0.145 | 0.466 |
| | (0.215) | (1.064) |
| | [ 0.677] | [ 0.438] |
| D(DLNACGSF(-1)) | 0.271 | -0.378 |
| | (0.071) | (0.349) |
| | [ 3.839]*** | [-1.0813] |
| D(DLNACGSF(-2)) | 0.189 | -0.424 |
| | (0.076) | (0.375) |
| | [ 2.507]** | [-1.131] |
| D(DLNACGSF(-3)) | 0.171 | -0.279 |
| | (0.061) | (0.304) |
| | [ 2.782]** | [-0.919] |
| D(DLNACG(-4)) | 0.063 | -0.057 |
| | (0.053) | (0.259) |
| | [ 1.199] | [-0.219] |
| C | 0.017 | 0.012 |
| | (0.026) | (0.127) |
| | [ 0.675] | [ 0.097] |
| R-squared | 0.564 | 0.476 |
| Adj. R-squared | 0.346 | 0.214 |
| Sum sq. resids | 0.327 | 8.008 |
| S.E. equation | 0.135 | 0.667 |
| F-statistic | 2.589 | 1.816 |
| Log likelihood | 22.567 | -22.206 |
| Akaike AIC | -0.898 | 2.300 |
| Schwarz SC | -0.422 | 2.776 |
| Mean dependent | 0.018 | -0.014 |
| S.D. dependent | 0.167 | 0.752 |

Determinant resid covariance =0.01, Log likelihood = 0.432, Akaike information criterion = 1.54, Schwarz criterion = 2.58, *** and ** Significant at 1% and 5% levels, Standard errors in ( ) & t-statistics in [ ]

**Variance Decomposition**

The variance decomposition analysis was conducted for ten horizons (i.e. ten years). The results for year 1, 5, and 10 are presented in Table 4 for briefness. From the first

section of Table 4, it can be seen that 100 percent of changes in LSP is explained by changes in own shock or innovations in the first year, but in the fifth and tenth period the proportion explained by LSP declined to 68.99 and 50.07 per cent, respectively. Also, the results reveal that only about 31 percent of changes in LSP are explained by changes in ACGSF in the 5th year, with an increase of 49.92 percent in the tenth year. This implies that LSP is mainly influenced by changes in its own shock and not changes in ACGSF. Consequently, suitable approval of appropriate policy by government is required. Table 4also shows that 99.49 percent of changes in ACGSF are explained by changes in its own shock. However, by the fifth and tenth periods LSP explained about 3.89 and 7.12 percent of changes in ACGSF, respectively. Overall, the variance decomposition results showed that ACGSF had greater influence on LSP during the period of study.

Table 4: Variance Decomposition

| Period | LSP | ACGSF |
|---|---|---|
| Variance Decomposition of Livestock production (LSP) | | |
| 1 | 100.000 | 0.000 |
| 5 | 68.993 | 31.007 |
| 10 | 50.072 | 49.928 |
| Variance Decomposition of Agricultural Credit Guaranteed Fund (ACGSF) | | |
| 1 | 0.509 | 99.491 |
| 5 | 3.862 | 96.138 |
| 10 | 7.125 | 92.875 |

**Causal Relationship between ACGSF and LSP**

Granger causality test was use to find out whether there is feedback or causation from one variable to another and the direction of such causality. The causality tests were done using the first differenced series. The Granger causality tests between LSP and ACGSF is presented in Table 5. The results show a unidirectional causality running from ACGSF to LSP, meaning that ACGSF Granger causes LSP. Therefore, the null hypothesis that there is no significant causal relationship between ACGSF and LSP in Nigeria is rejected at 5 per cent level. The Granger causality test result also showed that LSP does not Granger causes ACGSF. This implies that LSP has no predictive ability over ACGSF. This study therefore provides proof of the existence of unidirectional causality between ACGSF and LSP with direction running from ACGSF to LSP.

Table 5: Granger causality test between ACGSF and LSP

| Null Hypothesis | F-Statistic | P-value | Decision |
|---|---|---|---|
| DLNLSP does not Granger Cause DLN ACGSF | 0.29542 | 0.9462 | Accept |
| DLN ACGSF does not Granger Cause DLNLSP | 4.86277 | 0.0432 | Reject |

## CONCLUSION

This study examined the causal relations between agricultural credit guarantee scheme fund (ACGSF) and livestock production (LSP) in Nigeria. Results revealed that

there was a positive and significant long-run and short-run relationship between LSP and ACGSF in Nigeria. Further, there was a unidirectional causality between ACGSF and LSP, with causality running from ACGSF to LSP but not the other way for the period under study. This implies that ACGSF had an influence on LSP. This study established that ACGSF remains significant for the purpose for which it was established in terms of LSP. Given that ACGSF had significant and positive effects on Livestock production in Nigeria, to further enhance its impact, government should ensure that more funds to the sector is guaranteed to enhance increase productivity in the sector.

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