Original Research Article

BANK CREDIT AND AGRICULTURAL OUTPUT IN NIGERIA (1970 – 2013)

: AN ERROR CORRECTION MODEL (ECM) APPROACH

Abstract

This work investigated the effect of Bank Credit on Agricultural Output in Nigeria using the Error Correction Mode (ECM). A yearly data (1970- 2013) obtained from the Central Bank of Nigeria was used for the analysis. The analysis showed that all the variables were integrated of order one I (1) and long-run relationship existed among them. However, following the empirical findings in this study, it showed that, in the long-run bank credit and industrial output contributed a lot to agricultural output in Nigeria, while; only industrial output influenced agricultural output in the short-run.

Keywords: Error Correction Model, Bank Credit, Agricultural Output and Credit Channel Theory

1.0 Introduction

Agriculture is the first and most thriven occupation of mankind. From its early form of wild fruits, leaf, root, snail and insect gathering, fishing and hunting, to its present mechanized and almost automated form, it has undergone a lot of development. Agriculture is conceived as the cultivation of land, raising animals for the purpose of production of food for man, feed for animals, and raw materials for our industries. It also consists of crop production, forestry, livestock and fishing. It is also essential for expansion of employment opportunity, reduction of poverty and improvement of income distribution, speeding up industrialization and easing the pressure of balance of payments disequilibrium (Ugochukwu, 1999; Okah (2007).

The role of agriculture in transforming both the social and economic frame work of an economy cannot be over emphasized. Anyanwu (1997) posits that “agriculture has been the main source of

gainful employment from which Nigeria nation can feed its population, providing the nation's industries with local raw materials and as a reliable source of government revenue.

The major agricultural export commodities in Nigeria include cocoa, coffee, cotton, groundnut, groundnut oil, palm kernel, soya beans, ginger, rubber, benign seed and chili pepper (Ijere, 2014). There are other commodities that are being demanded in the world market such as cassava and cassava products, banana, plantain and so on. The Nigerian economy, until today is still dependent on primary products both as foreign exchange earner and contributor to gross domestic product.

Agriculture is of two types, the subsistence agriculture and commercial agriculture-: the subsistence agriculture is the type of farming which involves the farmer and his family, that is, the farmer produces for himself and his family with little or none to sell in the market, it is practiced in small scale system. It involves only a little amount of money to practice unlike commercial farming that involves huge amount of money to practice. It does not involve the use of machine to carry out, since the land is very small and fragmented (Amaechi, 2004). The second type is commercial agriculture, and this is where a farmer produces his crops and sells them in the market. It is carried out in large scale with enough land and machines. These machines are used in cultivating crops. It involves a lot of capital and time, and also increases the farmers' income. Commercial farming helps farmers to engage in the cultivation of different varieties of crops, since the money, land and equipment could easily be used.

In agriculture, fund is needed to enable the farmer purchase more land, buy his inputs at the appropriate time and to pay for hired labor or farm machinery. Unfortunately, credits are not easily available for most of the farmers because of collateral and other documentation that are usually required by the commercial banks and other credit institutions. This makes it impossible for most of the farmers in Nigeria to access the required capital for investment in large scale agriculture, hence the reason for the recent low agricultural productivity.

With the recent move by the leading economies of the world to diversify their economy and Nigeria in a bid to join the rest of the developed economies is conscious of the danger signals observed both within and outside the country that underscores the need to move away from total reliance on petroleum related revenues. These signals according to Soludo (2009) include the on-

going global economic crisis that is threatening the growth and development agenda of the present administration, the current decline in crude oil prices, and the frightening revelation that the united states of America, the highest buyer of Nigeria crude oil, Brazil and several other countries have seriously engaged in alternative source of energy. Hence, the need to diversify Nigerian economy, especially through agricultural sector that has for long, been neglected.

Nigeria is endowed with huge expanse of fertile arable land, and graze land, as well as a large active population that can sustain a high productive and profitable agricultural sector. Adubi (2000) admits that this enormous resource base if well managed could support a vibrant agricultural sector capable of ensuring self- sufficiency in food and raw materials for the industrial sector as well as, providing gainful employment for the teeming population and generating foreign exchange through exports.

In spite of these endowments, the sector has continued to record a declining productivity. The capacity of the sector to fulfill its traditional role in the Nigerian economy has been constrained by various social-economic and structural problems. These include unavailability of credits to local farmers, discovery of oil, high interest rates on loans to farmers, rural- urban migration and ineffective institutions charged with policy implementations.

Not until recently, government has seriously developed a policy to mobilize potential credits for the rural farmers. Commercial banks themselves have given little attention to the approval of loans to farmers for fear of defaults. Where credits are received from other sources apart from government and commercial lending, the interest rates have been too high. These reported high interest rates are blunt realities to the peasant farmers. The question deducible from the above is how have the credit institutions, especially commercial banks credits, been able to impact on the level of agricultural output in Nigeria? The broad objective of the study is to investigate the extent to which bank credit had supported agricultural output in Nigeria. This study is delineated to the impact of bank credit on agricultural output in Nigeria, investigating bank credit, bank lending rate and industrial output and, their roles on agricultural output in Nigeria. This study covered the period, 1970 to 2013

2.0 Literature Review

2.0.1 The Quantity Theory of Credit

Werner in his work towards a quantity theory of disaggregated credit and international capital flows presented the Quantity Theory of Credit with a central focus on different equation of exchange distinguishing between money used for GDP-transactions and money used for non GDP-transaction. He further stressed that money should not be defined as bank deposits or other aggregates of private sector savings. More so, that bank should not be seen as not being financial intermediaries that lend existing money, rather creators of new money through the process of lending. In addition, growth of GDP requires increased transaction in economic activities, which in turn require larger amount of money to be used for such transactions; therefore, the money used for transactions can only rise if banks create more credits. The bank credit can be disaggregated into credit for GDP transactions and credit for non-GDP transactions. The former drives nominal GDP and the latter assets transaction values. Consequently, the effect of bank credit depends on its quantity and quality which is defined as whether it is used for unproductive transactions (credit for consumption or asset transactions, producing unsustainable consumer or asset inflation, respectively) or productive transactions (delivering non-inflationary growth). Credit used for productive transactions aims at income growth and is sustainable; credit for asset transactions aims at capital gains and is unsustainable (Werner, 1993).

2.0.2 The Credit Channel Theory

Bernanke and Gertler (1995) postulated the credit channel theory. This theory emphasized that the direct effects of monetary policy on interest rates are amplified by endogenous changes in the external finance premium. They described external finance premium as the difference between in the cost between funds raised externally and funds raised internally by the borrower. More so, the imperfection of credit market depends on the size of the finance premium and a change that in monetary policy that raises or lowers open market interest rates tends to change external finance in the same direction. In addition, they linked the monetary policy and external finance premium through “Balance Sheet Credit Channel” and “Bank Lending Credit Channel”.

2.0.3 The Balance Sheet Credit Channel Theory

This theory stressed that the external finance premium facing a borrower depends on borrower's financial position. Therefore, the greater is the borrower's net worth, the lower the external finance premium and overall terms of credit. The theory further stated that the quality of borrower's sheet similarly affects their investment and spending decisions. This balance sheet channel arose due to shifts to shifts from central bank's policy not only affects market interest rate but also the financial positions of borrowers (Bernanke and Gertler, 1995).

2.0.4 The Bank Lending Credit Channel Theory

The banking lending channel stated that monetary policy also affects the external finance premium by shifting the supply of the intermediated credit, especially loans from commercial banks. It indicated that if supply of bank loans is disrupted for some reason, bank dependent borrower may not be necessarily shut off but incur cost of finding lenders. Therefore, a reduction in the supply, relative to other forms of credit is most likely to increase external finance premium and reduce real activity (Bernanke and Gertler, 1995).

2.3 Empirical Framework

Obilor (2013), in his work the impact of commercial banks' credit to agriculture on agricultural development in Nigeria using an econometric approach, the result revealed that agricultural credit guarantee fund and government fund allocation to agriculture produced a significant positive effect on agricultural productivity, while other variables used in the work produced a significant negative effect . He recommended that farmer should be encouraged to be applying for loans from the participating banks to enhance their agricultural activities and productivity.

Iganiga and Unemhilian (2011) investigated the impact t of federal government agricultural expenditure on agricultural output in Nigeria. The work examined the determinants of agricultural output, this includes, total commercial credit to agriculture, consumer price index, annual average rainfall, population growth rate, food importation and GDP growth rate. The Cobb-Douglas model was used to analyze the impacts of these variables on the value of agricultural output. It was found that federal government expenditure was positively related to agricultural output. The work further revealed that investment in agricultural sector is very

imperative and this should be complemented with monitored credit facilities, River basins and irrigation facilities should be provided for-all-year round agricultural output. He advised that food importation should be banned to encourage local producers and population control should be intensified in the rural areas.

Toby and Peterside (2014) analyzed the role of banks in financing the agriculture and manufacturing sectors in Nigeria from 1981 – 2010. Data used were generated from the Central Bank of Nigeria and analyzed using both descriptive and inferential techniques. The descriptive results showed that Nigeria's commercial and merchant banks lagged behind in financing agriculture when compared to manufacturing. The work showed that average bank credit to agriculture, within the period, ranged between 9.0% and 10.1%. in addition, average bank credit to the manufacturing sector ranged between 32.0% and 36.8%. Within the period, average contribution of agriculture to GDP was 33.5% while contribution of the manufacturing sector to GDP averaged 5.4%. The inferential results showed a significantly weak correlation between commercial bank lending and the contribution of agriculture to GDP. However, there was a significantly positive correlation between merchant bank lending and agricultural contribution to GDP. The beta coefficient showed that agricultural contribution to GDP increased significantly by 48.22% with a 100% increase in merchant bank lending to agriculture. With a 100% increase in commercial bank lending, the contribution of manufacturing to GDP declined by 27.32%. However, the contribution of the manufacturing sector to GDP increased by 40.08% as merchant bank lending to manufacturing increased by 100%. There was also a significantly inverse correlation between commercial bank lending and manufacturing contribution to GDP. The model R2 showed that 23.04% of the variation in agricultural contribution to GDP is explained by an increase in bank lending to the sector. It also showed that 18.75% of the variation in manufacturing contribution to GDP was explained by a change in aggregate lending. The results, however, indicated that the role of banks in facilitating the contribution of the agriculture and manufacturing sectors to economic growth was still significantly limited. The rise of numerous public intervention funding programs in these sectors was evidenced of the lagging banking intermediation. The growing risk aversion of Nigerian banks was indicative of the liquidity and funding shortages in the agriculture and manufacturing sectors. He counseled that monetary policy should, therefore, emphasize mandatory sectorial allocation of credit with appropriate incentives to boost the flow of bank credit to these sectors.

Okulegu et'al (2014) examined Banking sector credit and the performance of the Agricultural sector in Nigeria. The study adopted time series econometrics analysis and descriptive statistics to estimate the banking sector agricultural credit effects on agricultural product performance in Nigeria. The empirical analysis carried out use the econometric tests such as unit root, cointegration, Error correction model and Grange causality test, in which changes in AGDP was regressed on commercial bank credit to agriculture, agricultural credit guarantee scheme, and government expenditure on agriculture-using annual series data for the period 1981-2011, and the data was mainly from CBN statistical bulletin. The result of our analysis showed that the total money stated as Government Expenditure on agriculture in Nigeria was not statistically significant and not theoretical in line. The study also found that Commercial bank credit to agriculture (CBCA) granger caused Agricultural sector contribution to Gross Domestic Product since the Commercial bank credit to agriculture (CBCA) estimated F-coefficient showed (51.1429) greater than the f-critical value (3.034) at 5% level. Based on the findings above, the study recommended that one or other rural saving institutions (post office savings banks, cooperative banks etc) should be established in every autonomous community in Nigeria. The study equally recommended that a clear-cut credit policy which ensures a long-term financing of agriculture. Short-term, discriminating policies cause confusion and prevent farmers from investing in agriculture.

Awe (2013) investigated the mobilization of domestic financial resources for agricultural productivity in Nigeria with a view to identify the contributions of the various sources of finance to agricultural productivity in Nigeria. He employed Vector Auto Regressive Model (VAR) to analyze time series data from (1980 – 2009). The paper identified the various instruments and strategies used by the government for mobilizing resources for the agricultural sector in Nigeria to include subsidy and agricultural credit policies that were financed through Nigerian Agricultural Credit Bank (NACB), credit facilities from Nigerian Bank for Commerce and Industries at the state level, credit through Commercial and Merchant Banks and provision of agricultural credit to the defunct Commodity Board by the Central Bank of Nigeria. The result revealed positive relationships between the variables and the variance decomposition measured the proportion of forecast error. The paper therefore recommend that the Federal government recurrent expenditure on agriculture should be reviewed upward for enhanced agricultural productivity and that both the Federal government and the Commercial Banks should mobilize

more financial resources toward the agricultural sector to boost agricultural productivity which would guaranteed maximum agricultural productivity in Nigeria.

Idoko et'al (2012) examined the impact of Government Expenditure on Agriculture on Agricultural Output in Nigeria (1975-2010). Cob-Douglas Production Function was used as the theoretical framework. The methodology employed was the linearized Cob-Douglas function. The variables of the model include Government Expenditure on Agricultural sector, Commercial banks loans and advances to the Agricultural sector, foreign direct investment on the Agricultural sector, Annual rainfall and Agricultural credit guarantee scheme fund. Ordinary Least Squares econometric technique was used to estimate a multiple regression of Agricultural output against the explanatory variables. The result of the estimated model revealed a positive but insignificant relationship between Government expenditure to the agricultural sector and Agricultural output within the scope of this research. Based on this finding, the researcher made relevant recommendations.

Kolawole (2013) empirically investigated the impact of interest rates and some macroeconomic variables on agricultural performance in Nigeria by employing co-integration and an error correction mechanism (ECM) technique with annual time series data covering the period 1980 to 2011. The results revealed that there was a negative relationship between agricultural value added, interest rate spread, and inflation in the country. By implication, the study deduced that the higher the level of inflation and interest rate spread in the country, the lower the level of agricultural value added will be.

Adofu and Agama (2012) studied "Government Budgetary Allocation to the agricultural sector and its effect on agricultural output in Nigeria", using government budgetary allocation to the agricultural sector and commercial bank credit to the agricultural sector as our explanatory variables. They examined the effect of government budgetary allocation to the agricultural sector on the output of the agricultural sector. Data were obtained from CBN's Statistical Bulletin and NBS's Annual Abstract of Statistics. Employing the OLS regression technique, the results revealed that budgetary allocation to agricultural sector has significant effect on agricultural production in Nigeria and that the relationship between them was strong, positive and significant. Thus, the study recommends that budgetary allocation to the agricultural sector should be

increased and monitored, to guarantee food security, employment and overall economic growth and development in Nigeria.

Muftaudeen and Hussainatu (2014) empirically investigated the impact of macroeconomic policies on agricultural output specifically on crop production in Nigeria. The Multivariate Vector Error Correction approach was applied to examine both short run and long run relationship between the series over the period of 1978-2011. The research revealed a cointegrating relationship among agricultural output, government expenditure, agricultural credit, inflation, interest and exchange rates. The findings showed that in the long run, agricultural output was responsive to changes in government spending, agricultural credit, inflation rate, interest rate and exchange rate. The results of impulse response functions suggested that one standard deviation innovation on government expenditure and interest rate reduces the agricultural output thus threatening food security in the short, medium and long term. While results of the variance decomposition indicate that, a significant variation in Nigeria's agricultural food output was due to changes in exchange rate and government expenditure movements. That implied the imperative of the role played by both fiscal and monetary policy in an effort to ensure food security. They recommended that to achieve a sustainable food security, an expansionary fiscal policy that is not inflationary should be rigorously pursued along with a realistic exchange rate that takes account of the prevailing internal macroeconomic environment rather than the dynamics of international undertones.

3.0 Methodology

The method that will be employed to establish a relationship between bank credit and agricultural output is the ordinary least square method (OLS). Nevertheless, before estimating the model, the properties of the variables will be substantiated in terms stationarity and long term relationship. The econometric tools that will be used for these verifications are the Augmented Dickey-Fuller test for stationarity and Johansen co-integration test for long term relationship given that the variable are integrated of the same order, especially order one I(1). In addition, the direction of causality among these variables will be ascertained using the Granger Causality test. Secondary data was employed in this research. The data used in this study are time series yearly data spanning from 1970 to 2013. These data were sourced from the statistical bulletin of the Central Bank of Nigeria (CBN), 2014. These time series data include; Agricultural (GDP)

Output (AGO), Private Sector Credit as proxy for Bank Credit (PSC), Bank Lending Rate (BLR) and Industrial (GDP) Output (IDO).

3.1 Model Specification

Long-Run Model

In order to establish the long-run relationship between bank credit and agricultural output, the ordinary least square model will be applied

AGO = f(PSC, BLR, IDO)……(1)

This can be explicitly written as

$$AGO_t = \beta_0 + \beta_1 PSC_t + \beta_2 BLR_t + \beta_3 IDO_t + \mu_t \ldots\ldots\ldots (2)$$

Therefore, to avoid the problem of autocorrelation the equation can be transformed using the natural logarithm, and thus:

$$LNAGO_t = \beta_0 + \beta_1 LNPSC_t + \beta_2 LNBLR_t + \beta_3 LNIDO_t + \mu_t \ldots\ldots (3)$$

Short-Run Model

The short-run relationship will be established using the Error Correction Model (ECM). This can be stated specifically as:

$$\Delta LNAGO_t = \beta_0 + \sum_{i=0}^{k} \beta_1 \Delta LNAGO_{t-i} + \sum_{i=0}^{l} \beta_2 \Delta LNPSC_{t-i} + \sum_{i=0}^{m} \beta_3 \Delta LNBLR_{t-i} + \sum_{i=0}^{n} \beta_4 \Delta LNIDO_{t-i} + \lambda \ ECM_{t-1} + \nu_t$$

…….. (4)

The p-Value

It has become a standard practice to report the outcome of statistical hypothesis using the p-Value. The p-Value of a test can be determined by comparing the p-Value to the chosen level of significance α

P-Value Rule: Reject the null hypothesis when the p-Value is less than, or equal to, the level of significance α. That is, if $p \leq \alpha$ reject H_0, if $p > \alpha$ then do not reject H_0 .

Where:

LNAGO = Natural logarithm of agricultural output

LNPSC = Natural logarithm of bank credit

LNBLR = Natural logarithm of bank lending rate

LNIDO = Natural logarithm of industrial output

ECM = Error correction term

t = Current time

β_i = Parameters of the explanatory variables.

Δ = Change

∑ = Summation

For the long-run model, the expected signs of these parameters are $\beta_1 > 0, \beta_2 < 0, \beta_3 > 0, \beta_4 < 0$ while, for the short-run model the expected signs of the parameters are $\beta_1 > 0, \beta_2 > 0, \beta_3 < 0, \beta_4 > 0$ and $\lambda < 0$.

3.2 Unit Root Test

There are several tests that can be applied to test for the stationarity of these variables, but in this study, the Augmented Dickey-Fuller test will be applied and is given by the equation

$$\Delta Y_t = \beta_0 + \beta_1 t + \phi Y_{t-1} + \sum_{j=1}^{p} \alpha_j \Delta Y_{t-j} + \varepsilon_t \quad , t = p+1\ldots\ldots T$$

Where p lags of ΔY_{t-j} are added to remove serial correlation

Hypothesis

$H_0: \phi = 0$ (there is a unit root in the series)

$H_1: \phi < 0$ (there is no unit root in the series)

The hypothesis is tested on the basis of t-statistic of the coefficient of ϕ

Decision rule: Reject H_0 if test statistic is less than critical values, otherwise do not reject (Abdullahi et al, 2011)

3.3 Co-integration Test

If r = n and A is unrestricted, the maximized log likelihood is given by Banerjee et al. (1993) as:

$$\ln = K - \left(\frac{T}{2}\right) \sum_{i=1}^{n} \log\left(1 - \lambda_i\right)$$

Where $k = -(T/2)(n(1 + \log 2\pi) + \log|s_\infty|)$. For a given value of r < n, only the first r Eigen values should be positive, and the restricted log likelihood is

$$L(r) = K - (T/2) \sum_{i=1}^{r} \log(1 - \lambda_i)$$

A likelihood ratio test of the hypothesis that there are r cointegration vectors against the alternative that there are n is thus given by

$$n_r = 2\left(L\left(n\ \right) - L\left(r\ \right)\right) = -T \sum_{i=r+1}^{n} \log\left(1-\lambda_i\right)$$

This is known as the trace statistic, and testing proceeds in the sequence $n1, n2, \ldots\ldots\ldots n_{n-1}$. A cointegrating rank of r is selected if the last significant is n_{r-1}, which thereby rejects the hypothesis of n-r+1 unit roots in A. The trace statistic measures the importance of the adjustment coefficients β on the eigenvectors to be potentially omitted. An alternative test of the significance of the largest Eigen value is

$$\varsigma_r = -T\log\left(1-\lambda_{r+1}\right), r = 1,2,\ldots\ldots\ldots, n-1$$

This is known as the maximal-Eigen value or λ-max statistic (Terence and Raphael, 2008)

Decision Rule: Accept $H0$: (there is no significant cointegration relationship) if t-statistic is greater than the asymptotic critical – value or if the p-value is less than the level of significance otherwise accept $H1$: (there is a significant cointegration relationship) if test statistic is less than the asymptotic critical values or if the p – value is greater than the level of significance. Testing sequence terminates if the null hypothesis cannot be rejected for the first time. (Abdullahi et al, 2011)

3.4.4 Granger Causality

The directions of causality between these variables will be investigated using the pairwise Granger Causality test. Causality can be categorized into three; unidirectional causality, bidirectional causality and no causality in a bivariate model.

4.0 Results

4.1 Unit Root

The variables were verified for stationarity by subjecting them to unit root test using Augmented Dickey-Fuller test for stationarity test

Table 4.1: Stationarity test of the variables

At Level		**Critical values**		
ADF Stat.	Variables	1%	5%	10%
-1.782658	Lnago	-3.592462	-2.931404	-2.603944
-0.537311	Lnpsc	-3.592462	-2.931404	-2.603944
-2.035671	Lnblr	-3.592462	-2.931404	-2.603944
-3.129756	Lnido	-3.592462	-2.931404	-2.603944
At First Difference				
-6.239608	Lnago	-3.596616	-2.933158	-2.604867
-5.121500	Lnpsc	-3.596616	-2.933158	-2.604867
-9.375505	Lnblr	-3.596616	-2.933158	-2.604867
-6.217352	Lnido	-3.596616	-2.933158	-2.604867

Author's computation and Eviews 7.1 Output

In table 4.1, the variables at their level form showed unit root at 1%, 5% and 10% which mean that they not stationary. The first differenced series of the variables showed no unit root at 1%, 5% and 10%, which means, that they are stationary.

4.2 Co-integration Test

In order to ascertain if there was a long term relationship existing among these variables, a co-Integration test was carried out using the Johansen co-integration test

Table 4.2: Trace Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.598458	58.06175	47.85613	0.0041
At most 1	0.250368	19.73917	29.79707	0.4407
At most 2	0.161822	7.635934	15.49471	0.5051
At most 3	0.005270	0.221915	3.841466	0.6376

Author's computation and Eviews 7.1 Output

Table 4.3: Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.598458	38.32258	27.58434	0.0014
At most 1	0.250368	12.10324	21.13162	0.5375
At most 2	0.161822	7.414019	14.26460	0.4414
At most 3	0.005270	0.221915	3.841466	0.6376

Author's computation and Eviews 7.1 Output

The trace test in table 4.2 showed that the hypothesis of no cointegration among the variables can be rejected and at least one cointegrating equation at 5% exist. The maximum eigenvalue test in table 4.3, confirmed the presence long run relationship among the variables of interest with at least one cointegrating equation at 5%.

4.3 Granger Causality Test

Table 4.4: Granger Causality Test of the variables

Null Hypothesis:	Obs	F-Statistic	Prob.
LNPSC does not Granger Cause LNAGO	42	1.27306	0.2920
LNAGO does not Granger Cause LNPSC		0.30716	0.7374
LNBLR does not Granger Cause LNAGO	42	0.43320	0.6517
LNAGO does not Granger Cause LNBLR		2.24950	0.1197
LNIDO does not Granger Cause LNAGO	42	0.29435	0.7467
LNAGO does not Granger Cause LNIDO		0.70767	0.4993
LNBLR does not Granger Cause LNPSC	42	2.01082	0.1482
LNPSC does not Granger Cause LNBLR		1.07077	0.3531
LNIDO does not Granger Cause LNPSC	42	0.32597	0.7239
LNPSC does not Granger Cause LNIDO		0.20721	0.8138

LNIDO does not Granger Cause LNBLR	42	2.32060	0.1123
LNBLR does not Granger Cause LNIDO		0.12989	0.8786

Author's computation and Eviews 7.1 Output

The Granger causality analysis presented in table 4.4 showed that at 5% significance level that all the variables do not cause each other under pairwise Granger Causality test. It was equally interesting to find out that none of the variables Granger caused LNAGO.

4.4 Model Estimation

In estimating the model, ordinary least square method was used to identify the nature of relationship that existed between LNAGO and other variables using annual data of 1970 to 2013 extracted from the statistical bulletin of Central Bank of Nigeria.

Table 4.5: Long-Run Model Estimation Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.173732	0.295490	3.972156	0.0003
LNPSC	0.187067	0.020486	9.131443	0.0000
LNBLR	0.056351	0.133091	0.423403	0.6743
LNIDO	0.687837	0.041632	16.52195	0.0000

R-squared	0.981841	Mean dependent var	10.89600
Adjusted R-squared	0.980480	S.D. dependent var	1.633551
S.E. of regression	0.228233	Akaike info criterion	-0.030394
Sum squared resid	2.083607	Schwarz criterion	0.131805
Log likelihood	4.668666	Hannan-Quinn criter.	0.029757
F-statistic	720.9382	Durbin-Watson stat	0.604054
Prob(F-statistic)	0.000000		

Author's computation and Eviews 7.1 Output

The estimated long-run model equation from table 4.5 is given as:

$$LNAGO_t = 1.1737 + 0{,}1871 LNPSC_t + 0.0564 LNBLR_t + 0.6878 LNIDO_t$$

The interpretation of the model based on the selected economic variables as shown in table 4.5 above, the R^2 of 0.9818 which indicates 98% of total variation in the dependent variable can be explained by the explanatory variables. The adjusted R^2 of 0.9805 or 98%, showed that the explanatory variables were robust in explaining the variation in inflation within the period.

The Durbin-Watson statistic of 0.6041 which is far from 2.0 indicates presence of autocorrelation in the data. Nonetheless, the F-statistic has a value of 720.94 with probability value of 0.0000, which means, it is statistically significant at 5% and the model is a good fit. Therefore, the explanatory variables have a joint significant effect in determining the behavior of agricultural output in Nigeria within the period of interest

In addition, the estimated coefficient (0.187067) of bank credit showed the right sign and, is positive and statistically significant. This is in line with the works of Okulege (2014), Muftaudeen and Hussainatu (2014), Awe (2013) and, Obilor (2013) regarding the influence of this variable on agricultural output in Nigeria. This means that a 1% increase in bank credit will cause agricultural output to rise by 0.19%.

The coefficient of bank lending rate (0.056351) did not show the expected negative sign. The coefficient showed a positive sign and it is not statistically significant. This result did not agree with the work of Muftaudeen and Hussainatu (2014), Toby and Peterside and Kolawale (2013). The estimated coefficient of industrial ouput (0.687837) is rightly signed. It is positive and statistically significant. This by implication means that a 1% increase in industrial output will increase agricultural output by 0.69%.

Nevertheless, the estimated short-run model is given in table 4.6 below

Table 4.6: Short-Run (ECM) Model Estimation Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	0.033151	0.064330	0.515321	0.6098
D(LNAGO(-1))	-0.020052	0.169751	-0.118125	0.9067
D(LNPSC)	-0.010947	0.189610	-0.057732	0.9543
D(LNPSC(-1))	-0.060909	0.181961	-0.334736	0.7399
D(LNBLR)	0.005991	0.133437	0.044898	0.9645
D(LNBLR(-1))	-0.111984	0.128130	-0.873989	0.3884
D(LNIDO)	0.816722	0.070204	11.63352	0.0000
D(LNIDO(-1))	0.085815	0.163138	0.526030	0.6024
ECM(-1)	-0.296875	0.138312	-2.146410	0.0393

R-squared	0.852193	Mean dependent var	0.124165
Adjusted R-squared	0.816361	S.D. dependent var	0.367238
S.E. of regression	0.157373	Akaike info criterion	-0.672985
Sum squared resid	0.817288	Schwarz criterion	-0.300628
Log likelihood	23.13269	Hannan-Quinn criter.	-0.536501
F-statistic	23.78303	Durbin-Watson stat	2.002220
Prob(F-statistic)	0.000000		

Author's computation and Eviews 7.1 Output

$$\Delta LNAGO_t = 0.033151 - 0.020052\Delta LNAGO_{t-1} - 0.010947\Delta LNPSC_t - 0.060909\Delta LNPSC_{t-1} + 0.005991\Delta LNBLR_t - 0.111984\Delta LNBLR_{t-1} + 0.8816722\Delta LNIDO_t + 0.085815\Delta LNIDO_{t-1} - 0.296875ECM_{t-1}$$

The interpretation of the short-rum model shown in table 4.6 above, the R^2 of 0.852193 indicated that 85% of total variation in the dependent variable was explained by the explanatory variables. The adjusted R^2 of 0.816361 or 82%, revealed that the explanatory variables explained the variation in agricultural output.

The Durbin-Watson statistic of 2.002220 which is equal to 2.0 showed no presence of autocorrelation in the model. However, the F-statistic has a value of 23.13269 with probability value of 0.0000, which means, it is statistically significant at 5% and the model is a good fit in the short-run.

Furthermore, in the short-run the estimated coefficient (0.816722) of industrial output exhibited the right sign and, is positive and statistically significant. In addition, the estimated coefficient (-0.296875) of the error correction term showed the right negative sign and it is statistically significant. This means that 29% adjustment or correction is made from short-run to long-run annually.

5.0 Conclusion

5.1 Summary of Findings

The study examined the impact of banks credit on agricultural output in Nigeria over the period of 1970 – 2013. This work employed the Ordinary Least Square (OLS) method of estimation for the long-run model and the Error Correction Model (ECM) of estimation for the short-run model. Preliminary test of stationarity and co-integration of the variables using the Augmented Dickey Fuller (ADF) test and the Johansen co integration test respectively were conducted. The respective tests showed that all of the variables including the dependent variable were stationary at level. The accompanied co integration test provided evidence of long-run relationship existing among the variables.

However, following the empirical findings in this study, it showed that, in the long-run bank credit and industrial output contributed a lot to agricultural output in Nigeria, while; only industrial output influenced agricultural output in the short-run.

5.2 Conclusion and Recommendation

The study re-affirms the fact that one of the most important functions of banks and other financial institutions is to make credit available to the investors at affordable rate most especially to the agricultural sector. This is because low credit or high lending rate will amount to low level of investment which transmits to low agricultural output. The government through its relevant authorities should design a favourable policy that will enable banks to make credit more available to the agricultural sector for a massive development of that sector as this will help in job creation for the youths.

An enabling environment for the industrial development should be encouraged. This study has shown that the industrial sector contributes effectively towards the growth of the agricultural

sector. This is because the agricultural sector provides this sector the needed primary products in terms of raw materials. As the industrial sector expands more raw materials are needed from agricultural sector and this helps the agricultural sector to grow as well, therefore a direct relationship existing between the two sectors. This is confirmed in this study.

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