IMPACT OF INTEREST RATE REFORM ON AGRICULTURAL FINANCE AND GROWTH IN NIGERIA

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ABSTRACT

The study examined the impact of interest rate reform on agricultural finance and growth in Nigeria. The study specifically ascertained the factors that determine the aggregate credit volume to agriculture within the periods of regulation and deregulation in the Nigerian economy; and determined the periodic effects of macroeconomic financial indicators on Agriculture's gross domestic product contribution to the Nigerian economy. Descriptive statistics, Ordinary Least Squares regression technique and Autoregressive Distributed Lag model were used for data analysis. The chow test showed that there was a significant differential impact on the aggregate credit volume to agricultural sector between the regulated and deregulated regimes. Interest rate was an important determinant of aggregate credit volume to the agricultural sector in Nigeria, especially during the deregulated period but monetary authorities should ensure appropriate determination of interest rate level that will break the double-edge effect of interest rates on savers and investors.

KEY WORDS

Interest rate; Economic reform; Agriculture; Finance; Growth; Nigeria.

One of the most topical issues in Nigeria today is that of agricultural development and its sustainability. Agriculture is important because it provides food and employment for the populace, raw materials for industries, and market for industrial goods. Eboh, Ujah and Nzeh (2009), observed that the contemporary economic significance of agricultural sector is even more remarkable. They opined that in the past half a decade, the impressive growth rate of the nation's economy has been driven by the non-oil sector, particularly the agricultural sector. This, in other words, according to them means that the growth rate of the overall economy is to a large extent dependent on the growth rate in agriculture GDP.

Recently, the relationship between financial development and economic growth has been the subject of a growing literature in both developed and developing countries (World Bank, 2008). To enhance the development of the financial system in the economy, interest rate reform, a policy under the financial sector liberalisation was formulated. The expectation of this reform was that it would encourage domestic savings and make loanable funds available in the banking institutions. Obute, Adyorough and Itodo (2012) defined interest rate deregulation as an economic term used to refer to a situation whereby forces of demand and supply are allowed to determine the value of interest rates rather than its value being administered directly by monetary authorities.

The Agricultural sector, one of the sources of economic growth, has been looked unto to pave the way for economic development because of its potentials. The realization of this fact led the Nigerian government to embark on several agricultural development programmes, many of which, unfortunately failed (Manyong et al. 2005; and Ogungbile, 2008). Among these agricultural programmes is the establishment of the Nigerian Agricultural Credit Guarantee Scheme Fund (ACGSF) in 1977 aimed at mobilizing funds from the banking sector for rural development by guaranteeing loans through the commercial banks for investment in agriculture, thereby minimizing the risks involved in financing the sector. The fluctuations in the financial sector appeared inseparable from the performance of the ACGSF in meeting up with its goals of mobilizing adequate credit for the agricultural sector (Onoja, Onu, and Ajodo-Ohiemi, 2012).

Recently, the sector had undergone significant changes in terms of the policy environment, number of institutions, ownership structure, depth and breadth of markets, as well as in the regulatory framework. These changes resulted in the mergers and acquisitions

in the banking system, which encouraged improvement in the capital base and capacity building of the banks as well as increases in the number of branch network. Although these reforms have been acclaimed to be necessary, it is however debatable if they yielded the anticipated results especially on agricultural lending growth in Nigeria that manifests itself in lending growth rate indicators. These indicators include, increase in the number of farmers that access bank loans, volume of credit to agriculture by banks, equal opportunity of credit accessibility by all classes of farm holders, increase in food security and sustainability, and change of paradigm from land mass based output increase to productivity based output increase. They are expected to facilitate the generation of ideas, define property rights and contracts, stimulate innovation, lower transaction costs and correct government failure. All these would culminate in the reduction of uncertainty and so foster efficiency and enhance strong economic growth (Sanusi, 2002).

This study is targeted at the commercial banks that their activities have direct effect on Nigerian economy. We recall that Nigeria banking sector in the recent time has undergone several monetary phases and different policies have been evolved to ensure it does not get worse. All these macroeconomic policies are designed to propel the Nigerian economy to stability, sustainability and self-reliance. Has Nigerian economy attained the above stated objective and to what extent has the government been able to achieve macroeconomic stability through the use the various monetary instruments, as it affects agricultural development and sustainability. Therefore, the question to be addressed in this research is whether financial adjustment policies that include among others, the interest rate deregulation are promoting the required resource inflow to enable agriculture to make its expected contributions to the economy.

The purpose of the study sought to: ascertain the factors that determine the aggregate credit volume to agriculture within the interest rate regulated and deregulated periods in the Nigerian economy; determine the effects of government finance interventions on agricultural sector performance in the Nigerian economy; determine the periodic effects of macroeconomic financial indicators on agriculture's GDP contribution to the Nigerian economy; and determine the level of real growth rate of agricultural finance in Nigeria.

Research Hypothesis. The null hypothesis below was tested for the study:

Ho: factors influencing aggregate credit volume to agricultural sector have no differential impact on both regimes

RESEARCH METHODOLOGY

Study Area. Nigeria is the study area. Nigeria has a total geographical area of 923,768 square kilometers and a population estimate of about 167 million (NBS 2011). The study focused on the agrarian sector, a sector where majority of the Nigerian population is domiciled. Nigeria is located $4^{\circ}16'$ and $13^{\circ}53'$ north latitudes and $2^{\circ}40'$ and $14^{\circ}41'$ east longitudes (NBS 2008). The study employed exploratory survey design which covered a period of 42 years made up of 25 years (1970-1986) before the deregulation and 17 years (1987-2011) after the deregulation.

Data Collection. Secondary data used for the study were computed from CBN Statistical bulletin 2011, CBN annual report 2011, federal budget allocation report, National Bureau of Statistics (NBS) annual reports 2011 and the like. Data collected were annual volume of credit to agricultural sector, average lending rates, volume of savings, inflation rate, and annual government budget allocation to agriculture and so on.

Analytical techniques. Data were analyzed using both descriptive and inferential statistics. Regression analysis was used to realize objectives one and two. Autoregressive Distributed Lag Models was used to achieve objective three while descriptive statistics such as percentage was used to realize objective four.

Multiple regression analysis:

Objective 1: Multiple regression analysis function is represented below:

$$Y_t = b_0 + b_1X_{1t} + b_2X_{2t} + b_3X_{3t} + b_4X_{4t} + b_5X_{5t} + b_6X_{6t} + b_7X_{7t} + b_8X_{8t} + b_9X_{9t} + e_t \quad (1),$$

where:

Y_t = Aggregate credit volume to agricultural sector in time t (₦)

X_{1t} = Average interest lending rate in time t (ratio/%)

X_{2t} = Average interest savings rate in time t (ratio/%)

X_{3t} = Savings mobilized by financial institutions in time t (₦)

X_{4t} = Average Inflation rate in time t (ratio/%)

X_{5t} = Number of rural bank branches in time t (Figure)

X_{6t} = Government budget allocation to agriculture in time t (₦)

X_{7t} = Credit to private sector (agric. & non agric) in time t (₦)

X_{8t} = Direct investment into Nigeria's economy in time t (₦)

X_{9t} = Average Exchange rate in time (ratio/%)

b_0 = Interception point

$b_1, b_2, b_3, b_4 \dots b_9$ = coefficients of the variables.

t = time in year (1, 2, 3, 4... t)

e_t = error term in time t

Objective 2: Multiple regression analysis function is represented below:

$$AGSGDP = Z_0 + (Z_1ACGSF + Z_2CACS + Z_3ACSS + Z_4LASACS) + e \quad (2),$$

where:

AGSGDP = Agricultural sector contribution to gross domestic product

ACGSF = volume of credit to agriculture from ACGSF in time t

CACS = volume of credit to agriculture from CACS in time t

ACSS = volume of credit to agriculture from Agricultural Credit Support Scheme in time t

LSACS = volume of credit to agriculture from Large Scale Agricultural Credit Scheme in time t

Z_0 = Interception point

Z_1, Z_2, Z_3, Z_4 = Coefficients of the variables

e = error term

Autoregressive Distributed Lag (ARDL) Model. Explicitly, the model is expressed thus:

$$Y_t = \alpha + \beta_0 X_t + \beta_1 X_{t-1} + \beta_2 X_{t-2} + \dots + \beta_k X_{t-k} + u_t \quad (3),$$

where:

Y_t = Agriculture's GDP contribution to Nigerian economy

α = constant or point of intercept

$\beta_0, \beta_1, \beta_2, \dots, \beta_k$ = the lags (that is multipliers at short/medium/long terms).

$X_t, X_{t-1}, X_{t-2}, X_{t-k}$ = the variables (loan interest rate, inflation rate, exchange rate, and savings interest rate).

$t, t-1, t-2, t-k$ = the respective period between 1970 and 2011.

U_t = error term

Credit Growth rate:

Nominal credit growth rate. Gourinchas, Valdès and Landerretche (2001) expressed the model as below:

$$P_t = C_t Y_t \times 100 \quad (4),$$

where:

C_t denotes the volume of Loan in a year t ;

Y_t is the GDP in the year t

P_t is the credit growth rate in year t (%).

Real credit growth rate. Sa (2007) expressed the model as below:

$$P_t = 100 \left[\frac{C_t}{1 + \pi_t} - 1 \right] \quad (5),$$

where:

π_t denotes the inflation rate of a country in time t

C_{t-1} is the volume of loan in time $t-1$

Chow test Model. This test of significance was used to test for the differences in the coefficient between two estimated equations. The equations are represented in the models:

$$Y_r = \Phi_0 + \Phi_1 X_{1t} + \Phi_2 X_{2t} + \Phi_3 X_{3t} + \Phi_4 X_{4t} + \Phi_5 X_{5t} + \Phi_6 X_{6t} + \Phi_7 X_{7t} + \Phi_8 X_{8t} + \Phi_9 X_{9t} + e \quad (6)$$

$$Y_{dr} = B_0 + B_1 X_{1t} + B_2 X_{2t} + B_3 X_{3t} + B_4 X_{4t} + B_5 X_{5t} + B_6 X_{6t} + B_7 X_{7t} + B_8 X_{8t} + B_9 X_{9t} + e_t \quad (7),$$

where:

Y_r and Y_{dr} = credit volume to agriculture during the period of regulation and deregulation

In order to determine whether the estimated coefficients in two equations are different, chow test is applied.

$$F^* = \frac{RSSp - RSS1 - RSS2/K}{RSS1 + RSS2 / (n_1 + n_2 - 2K)} \quad (8),$$

where:

$RSSp$ = the residual sum of square for the pooled data.

$RSS1$ = the residual sum of square for the regression model for credit agriculture in the period of regulation

$RSS2$ = the residual sum of square for the regression model for credit agriculture in the period of deregulation

n_1 & n_2 = are number of observations in each model.

K = the total number of parameters (b 's)

The Unit root and Augmented Dickey and Fuller (ADF) statistical tools were employed to avoid the problems associated with co-integration among the variables, and non-stationary problems in time series data.

RESULTS AND DISCUSSION

Determinants of aggregate credit volume to agricultural sector during the regulated and deregulated regimes in Nigeria. The factors that determine the aggregate credit volume to agricultural sectors during the regulated and deregulated regimes in Nigeria are shown in tables 1 and 2.

From tables 1 and 2, R^2 for the estimated multiple regression analysis showed that about 61% and 71 % of the total variance on the aggregate credit volume to agriculture before and during deregulation in Nigeria was explained by joint action of some explanatory variables that were included in the model. The remaining 39% and 29% unexplained during the period of regulated and deregulated regimes respectively were due to the random variable (u). In addition, most of the explanatory variables met *a priori* expectation of the studies while some did not due to current and previous macroeconomic policy changes over time.

Average lending interest rate was positively signed on both regimes (regulated and deregulated), but statistically significant at 5% during the period of deregulation and statistically insignificant during the regulated regime. The *a priori* expectation during deregulated period was met because increase in lending interest rate was expected to increase the aggregate credit volume to agricultural sector. While the *a priori* expectation during the regulated regime was not met, because most of the financial institutions were not willing to lend to agriculture as at that period due to low interest lending rate. This is true, since most of the lending was not for productive purposes and banks concentrated on short-term consumer lending without bothering to finance productive sector like agriculture.

Average savings interest rate was found positive and statistically significant at 10% and 5% levels of probability during the period of regulation and deregulation regimes respectively. This implies that average savings rate is a major determinant to aggregate credit volume to agriculture in Nigeria, since loanable fund is a function of savings mobilized in the economy. However, the positive sign was not justifiable in Nigeria because the low deposit interest rate during the regulation regime made savings unattractive and a sizeable proportion of the income was spent on consumption as a result of the low per capita income in addition to high inflation rate in the country.

The co-efficient of average inflation rate showed negative sign and statistically significant at 1% and 5% level during regulated and deregulated regimes, respectively. The *a priori* expectation of the study was met, since increase in inflation rate will invariably decrease the aggregate credit volume to agriculture. The study was in conformity with the findings of Obamuyi (2009) who found that inflation rate has negative and statistically significant effect on economic growth, which means that the higher the rate of inflation, the lower the rate of economic growth. Also studies have shown that high inflation rate is detrimental to economic growth (Akinlo, 2005).

The positive sign on the co-efficient of average exchange rate during the two regimes was expected, since increase in exchange rate irrespective of the regimes would normally increase the aggregate credit volume to agriculture. This was so, because a higher Dollar/Naira exchange rate entails more inflow of credit to agriculture.

Effects of government finance interventions on agricultural sector performance in Nigerian economy. The effects of government intervention on agriculture sector finance performance in Nigerian economy are shown in table 3.

Results showed that about 51% of the total variation in agricultural sector performance was explained by variations in the explanatory variables used in the model. Table 3 showed that the results of ACGSF and CACS were in line with the *a priori* expectation. This indicated that ACGSF and CACS were major determinants of the government finance interventions on agricultural sector and its contribution to GDP of Nigerian economy. It also implied that the larger the volume of credit by ACGSF and CACS, the greater the amount of credit to agricultural sector.

The coefficients of ACSS and LSACS were negative and not statistically significant. The *a priori* expectations were not met. This implied that ACSS and LASCS though relevant in the Nigerian government finance interventions on agricultural sector, might not have been funded reasonably enough to make any impact on agricultural financing.

Determinants of periodic effects of macroeconomic financial indicators on agriculture GDP contribution to the Nigerian economy. The periodic effects of macro-economic financial indicators on agriculture GDP contribution to Nigerian economy are shown in table 4.

The multiplier effects (lags) of the macroeconomic financial indicators implied that average loan interest rate, and exchange rate affected the agriculture's GDP contribution at short term, medium term and long term periods, while average annual savings interest rate had short run and long run multiplier effect on the agriculture's GDP contributions to Nigerian economy. The inflation rate had no multiplier effect on the agriculture's GDP contribution within the period under study. The average savings interest rate showed positive coefficient at the short run and statistically significant of 1% level, negative coefficient at the long run and statistically significant at 5% level. This indicated that current savings interest rate affected the agricultural output production and agricultural GDP contribution within the short run and long run periods but negatively due to some changes in macroeconomic financial policies overtime. At short and long run, the exchange rate showed positive coefficient and statistically significant at 5% and 1% level respectively, while at medium run, it showed negative coefficient. This indicated that there existed relationship between exchange rate and agricultural GDP contribution to Nigerian economy at short run and long run periods indicating that the exchange rate policy would encourage high activities in agricultural sector with particular reference to agro-exports. This result was in conformity with the findings of Abiodun and Salau (2010) who revealed that real exchange rate jointly explained the variation in the Nigeria aggregate agricultural output in the short run and long run.

The level of real credit growth rate of agricultural finance in Nigeria. The level of real credit growth rate of agricultural finance in Nigeria is shown in table 5.

Results indicated that banks were not much concerned with the financing of economic production sectors like agriculture. This nominal increase in the agricultural credit growth was in agreement with the findings of Eboh (2011) who had observed in the past that agricultural credit grew at a nominal rate. More so, the finding showed that agricultural GDP contribution to Nigerian economy had positive relationship with credit volume to agriculture. This indicated that a 1% increase in agricultural credit would lead to 52.8% increase in agriculture's GDP contribution to Nigerian economy.

DISCUSSION OF RESEARCH HYPOTHESIS

Ho: factors influencing aggregate credit volume to agriculture sector have no differential effect on both regimes

According to Gujarati (2006), the chow test is a statistical and econometric test of whether the co-efficient in two linear regressions on different data set are equal. If F-calculated value is greater than F-tabulated value, the effect was due to factors influencing aggregate credit volume to agricultural sector on both regimes or otherwise.

F [*] Chow test	F [*] tabulated	Decision rule	Remark
18.518	7.012	If $F_{cal} > F_{tab}$, then there is a differential effect on the aggregate credit volume to agricultural sector on both regimes.	Reject the null hypothesis and conclude that there is a differential effect on aggregate credit volume to agricultural sector on both regimes.

Source: Computed from CBN statistical bulletin 2011, CBN annual report 2011, NBS annual report 2011 and Federal budget allocation report for various years (1970 – 2011).

The F-calculated value (18.518) was greater than the F-tabulated value (7.012) at 5% level of probability. Therefore, following the decision rule, there was a significant differential effect on the aggregate credit volume to agricultural sector between the regulated and deregulated regimes.

CONCLUSION AND RECOMMENDATIONS

The study examined the effects of interest rate deregulation on agricultural finance and growth in Nigeria from 1970-2011. Theory explaining interest rate deregulation suggests that this phenomenon will promote required resource inflow into agriculture to enable it make its expected contributions to national development. The study found that:

1. interest rate deregulation had significant and positive impact on agricultural finance and growth in Nigeria within the period under review;
2. the multiplier effects (lags) of the macroeconomic financial indicators implied that average loan interest rate and exchange rate affected the agriculture's GDP contribution to Nigeria economy at short term, medium term and long term periods while inflation rate had no multiplier effect;
3. there was low real credit growth rate indicating low accessibility of credit in agriculture.

Also, deregulation of interest rates in Nigeria may not optimally achieve its goals, if those factors, which do not meet the a priori expectations on aggregate credit volume to agriculture, are not tackled. Interest rate plays a significant role in enhancing economic activities and high interest rate attracts domestic savings but at the same time it discourages local investors and as such: monetary authorities should ensure appropriate determination of interest rate level that will break the double-edge effect of interest rate on savers and investors; government should improve macroeconomic indicators such as income level,

inflation, level of investment, etc; government should provide attractive and realistic incentives to financial institutions that lend to agriculture especially to small-scale farmers; and government should use necessary incentives to attract more foreign direct investment to agricultural sector.

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APPENDIX

Table 1 - Determinants of aggregate credit volume to agricultural sector during regulation regime

Variable	Co-efficient	Standard Error	Significance
Constant	2207.642	2185.5690.001	0.001***
Average interest lending rate	17.504	1381.1340.072	0.735
Average Savings interest rate	13318.900	3412.848	0.087*
Savings mobilized by financial institution	28.906	2124.227	0.974
Average inflation rate	-75.422	382.821	0.000***
Number of rural bank branches	1283.924	2657.526	0.630
Government budget allocation to agriculture	128.206	388.271	0.021**
Credit to private sector	2482.186	1693.954	0.881
Direct investment to the Nigeria economy	402.773	698.283	0.749
Average exchange rate	162.744	941.347	0.851
$R^2 = 0.614$			
Adjusted $R^2 = 0.430$			
F- Statistics = 18.518			

Source: Computed from CBN statistical bulletin 2011, CBN annual report 2011, NBS annual report 2011 and Federal budget allocation report for various years (1970 – 2011).

Table 2: Determinants of aggregate credit volume to agricultural sector during the deregulation period

Variable	Co-efficient	Standard Error	Significance
Constant	6774.347	18208344	0.021
Average lending interest rate	810.179	420.160	0.049**
Average savings interest rate	435.543	359.814	0.051**
Savings mobilized financial institution	101.977	624.441	0.048**
Average inflation rate	-82.005	-154.380	0.089*
Number of rural bank branches	1868.671	6576.089	0.082*
Government budget allocation to agriculture	101.515	96.404	0.534
Credit to private sector	234.962	650.407	0.045**
Foreign direct investment into Nigeria economy	70.031	307.857	0.349
Average exchange rate	810.179	420.160	0.721
$R^2 = 0.710$			
Adjusted $R^2 = 0.634$			
F- Statistics = 13.836			

Note: * and ** represent significant at 5% and 10%

Source: Computed from CBN statistical bulletin 2011, CBN annual report 2011, NBS annual report 2011 and Federal budget allocation report for various years (1970 – 2011).

Table 3 - Effects of government finance intervention on agricultural sector performance in Nigerian economy

Variables	Co-efficient	Standard	Significance
ACGSF	2.117	1.082	0.003***
CACS	0.053	0.098	0.021**
ACSS	-0.072	0.135	0.735
LSACS	-0.158	0.145	0.914
$R^2 = 0.513$			
Adjusted $R^2 = 0.445$			
F- Statistics = 7.587			

Note: ACGSF = Agricultural Credit Guarantee Scheme Fund, CACS = Commercial Agricultural Credit Scheme, ACSS = Agricultural Credit Support Scheme, LSACS = Large Scale Agricultural Credit Scheme

***, ** and * represent significance at 1%, 5% and 10%.

Source: Computed from CBN statistical bulletin 2011, CBN annual report 2011, NBS annual report 2011 and Federal budget allocation report for various years (1970 – 2011).

Table 4 - Periodic effects of macroeconomic financial indicators on agricultural contribution to Nigerian economy

Variable	Coefficient	Std. Error	t-ratio	p-value	
Constant	-226544	77961	-2.9059	0.00874	***
Annual_Average_Loan_Interes_1	-32891.8	7315.44	-4.4962	0.00022	***
Annual_Average_Loan_Interes_2	29802.9	6597.39	4.5174	0.00021	***
Annual_Average_Loan_Interes_3	37676.9	9377.59	4.0178	0.00067	***
Annual_Average_Savings_Inte_1	60004.8	14908.7	4.0248	0.00066	***
Annual_Average_Savings_Inte_2	-26928.3	15618.3	-1.7242	0.10010	
Annual_Average_Savings_Inte_3	-53763.7	20955.9	-2.5656	0.01845	**
Annual_Average_Exchange_Rat_1	6222.29	2829.53	2.1991	0.03981	**
Annual_Average_Exchange_Rat_2	-19396.8	2767.72	-7.0082	0.00001	***
Annual_Average_Exchange_Rat_3	27860.3	2075.6	13.4228	0.00001	***
Annual_Average_Inflation_Ra_1	-7.72654	2186.35	-0.0035	0.99722	
Annual_Average_Inflation_Ra_2	-816.349	1902.13	-0.4292	0.67238	
Annual_Average_Inflation_Ra_3	-3426.65	2550.48	-1.3435	0.19415	
Agricultural_s_GDP_contribu_1	1.02031	0.0692442	14.7349	0.00001	***
Agricultural_s_GDP_contribu_2	0.00326591	0.0878557	0.0372	0.97072	
Agricultural_s_GDP_contribu_3	0.0593839	0.086103	0.6897	0.49832	
u(-3)	-3.60104	0.169726	-21.2168	0.00001	***

Statistics based on the rho-differenced data:

Mean dependent var	19453412	S.D. dependent var	33113221
Sum squared resid	2.89e+12	S.E. of regression	380275.7
R-squared	0.999207	Adjusted R-squared	0.998612
F(15, 20)	17690.90	P-value(F)	7.45e-38
Rho	-0.021780	Durbin-Watson	2.002167

Note: *** and ** represent significance at 1% and 5%.

Source: Computed from CBN statistical bulletin 2011, CBN annual report 2011, NBS annual report 2011 and Federal budget allocation report for various years (1970 – 2011).

Table 5 - Level of real credit growth rate in agricultural financing in Nigeria (1970-2011)

Items	Rate/Model
Nominal growth rate	2.11%
Real credit growth rate	0.01%
Agriculture Credit boom	-24.57%
Agriculture's GDP contribution and credit volume relationship model	$= 2.05 \times 10^6 + 52.8X$ <p>Where Y = Agriculture's GDP contribution to Nigerian economy X = Credit volume to agriculture.</p>

Source: Computed from CBN statistical bulletin 2011, CBN annual report 2011, NBS annual report 2011 and Federal budget allocation report for various years (1970 – 2011).