Bank Credit and Agricultural Sector Growth in Nigeria, 1990-2014: A Vector Error Correction Mechanism (VECM) Investigation.

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ABSTRACT

The study examined the relationship between bank credit and agricultural sector growth in Nigeria using time series data over the period, (1990-2014). The study adopted time series data obtained from Central Bank of Nigeria Statistical Bulletin and National Bureau of Statistics. Five variables were employed for this study. These are Agricultural Sector Growth as the dependent variable; whereas, Broad Money Supply, Credit to the Private Sector, Interest Rate and Inflation Rate as the explanatory variables. The study reveals that all the variables of the study are stationary at level, first and second differences. The study shows the existence of at least one co-integrating relationship at 5% level of significance. The study reveals a short-run equilibrium significant relationship between bank credit and agricultural sector growth in Nigeria. There is no causal relationship between bank credit and agricultural sector growth in Nigeria. The study concludes that bank credit has not significantly contributed to agricultural sector growth in Nigeria. The study recommends that for the economy to grow, the private sector should be encouraged in form of concessional and reduced interest rate. The study suggests that regulatory authorities should stabilize the interest rate which is capable of ensuring price stability and maintaining inflation to a single digit. This may build confidence in the banking institutions and will enable them to introduce innovations to boost agricultural sector output in the economy. CBN and policy makers should adopt vibrant economic policies such as interest rate stability, flexible exchange rate, indigenization and economic diversification which will encourage the banks in financing the sector.

Key Words: Bank, credit, agricultural, sector, growth and Nigeria.

INTRODUCTION

The importance of financial institutions and growth relationship had occupied central position in the financial economics literature in recent decades. Bank credit and agricultural sector growth link had been identified as one of the areas in the financial economics literature that can quicken the pace of growth and development in an economy such as Nigeria. This is supported by the empirical works of Ijaija and Abdulraheem (2000), Ogbanje, Yahaya and Kolawole (2012) and Sunny (2013) on bank credit and agricultural sector growth in Nigeria. They conclude that bank credit contributes to agricultural sector growth in Nigeria. This can be achieved through consistent and aggressive deposit mobilization and efficient allocation of loanable funds to the sector. The effect of this need to be examined from time to time, especially for the private sector-led economy in Nigeria; because, a vibrant private sector is a catalyst for growth and development.

The growth and development of the agricultural sector in any modern economy greatly depends on the efficient and effective performance of the banking system (Nwakoby (2004). This is consistent with the financial intermediation theory by Gurley and Shaw (1967), which explains the role of bank credit in an economy. The theory is supported by the empirical work of Obiandu and Mentu (2014) who established a positive significant relationship between that bank credit and private sector growth in Nigeria. This can be achieved through efficient and effective savings mobilization from the surplus units to the deficit units of the sector. Banking institutions are to perform the complementary role to render intermediation services; thus, by extending loan facility to the real sector in Nigeria (Aniekan & Bablola, 2009).

Historically, the agricultural sector has been the mainstay of the nation's economy, especially in the 1970s and the early 1980s (Busari & Olayiwola, 2001). The work of Oyeranti (2004) reveals that more than 70% of the population is engaged in agriculture in Nigeria. Hence, the study conducted by Lemo (2002) shows that before the discovery of

crude oil, agriculture remained the mainstay of the country's economy, contributing as much as 90% of its foreign earnings. Hence, the sector is still seen to be the most reliable one, even though it has been out-performed by the oil and gas sector. Empirical evidence as shown in their various studies conducted by Ijaija and Abdulraheem (2000), Ogbanje, Yahaya and Kolawole (2012) and Ayeni (2014) found a positive significant relationship between bank credit and agricultural sector output in Nigeria. This has also demonstrated the fact that agriculture is the dominant business in the Nigerian economy.

Theoretical Framework

This study is anchored on the financial intermediation theory by Gurley and Shaw (1967). The theory explains the role of bank credit in an economy. According to the theory, the business of financial intermediation in any modern economy is to provide a mechanism to draw financial flows from financially exceeding agents to those having a financial need in the economy. This means that banking institution can influence private sector growth by extending credit to the sector.

Recent studies such as Eyas and Abdelraheem (2014), Emecheta and Ibe (2014), Nwaru and Okorontah (2014) reveal that bank credit also promotes the function of financial intermediation in the private sector-led economy. They conclude that the function of financial services had enhanced private sector growth and development through an effective capital accumulation and investments in the sector. Their argument further corroborates the work of Chang, Jai and Zhicheng (2010) which state that financial institutions acts as a shock absorber to growth and development of productive sector. Eatzaz and Malik (2009) stated that the under-development of the financial sector is one of the reasons why, private sector investment in developing countries tend to produce lower output than that of advanced countries.

Lemo (2002) observed that the role of bank credit to private sector in stimulating economic growth and development cannot be over emphasized. As a result, this is one of the most important sources of financing firms; especially, in countries where capital markets are not fully developed. Nzotta (2014) posits that bank credit is one of the important aspects of financial intermediation that provide funds to economic entities that can put them to the most productive investment in an economy. They conclude that credit availability for consumption and investment are capable of raising the level of private sector output and create employment opportunities in the economy. Hence, banks should finance any positive net present value project if the cost of investment is below the expected returns. Based on these contributions, there is a justification for anchoring this study on endogenous growth model and financial intermediation theory.

Empirical Literature

Ogbanje, Yahaya and Kolawole (2012) evaluate the effect of commercial banks' loan on agricultural Gross Domestic Product (GDP) in Nigeria using time series spanning data (1981-2007). Ordinary Least Square (OLS) method was used for the analysis. Gross Domestic Product, Agricultural Bank Loan, Broad Money Supply, Interest Rate and Inflation Rate were used as variables. The study shows that commercial banks' loan to the agricultural sector significantly and positively affects agricultural Gross Domestic Product in Nigeria. It recommends that improvement in the agricultural sector will add value to the Gross Domestic Product in Nigeria.

Sunny (2013) uses a linear regression model to examine the impact of commercial banks' credit on agricultural development in Nigeria using spanning data for a period of 25 years, (1978-2002). Agricultural Production Index, Commercial Bank Credit to the Agricultural Sector, Agricultural Credit Guarantee Scheme and Agricultural Product Price were used as the variables. The study shows a positive relationship between government financial allocation to the agricultural sector and agricultural sector growth. It also found that government fund allocation to the agricultural sector has led to a significant positive growth in agricultural productivity.

Ijaija and Abdulraheem (2000) use regression analysis to investigate the effect of commercial bank credit on the agricultural sector growth in Nigeria using time series spanning data (1980-1996). Bank Credit to Agricultural Sector and Demand Deposit were used as variables for the study. The study shows a positive significant effect on commercial bank credit on the agricultural sector growth in Nigeria. Ogbonna and Osondu (2013) employ Two-Stage Least Square regression model to ascertain the determinants of supply of funds and agricultural sector growth in Nigeria for a period of 21 years (1992-2012). Minimum Rediscount Rate, Exchange Rate, Liquidity Rate and Index of Agricultural Gross Domestic Product were used as variables. The findings reveal inconsistent relationship between supply of bank funds and agricultural sector growth.

Obiandu and Mentu (2014) use a multiple regression analysis to ascertain the impact of private sector credit on the agricultural sector growth in Nigeria over the period of (1986-2010). Gross Domestic Product, Demand Deposit, Credit to the private sector and Lending Rate were used as the variables for the study. The study shows a positive significant impact of bank credit on agricultural sector growth in Nigeria. Oladapo and Adefemi (2015) determine the sectoral allocation of bank credit and private sector growth in Nigeria using time series spanning data (1986-2010). The study used six variables namely: Gross Domestic Product, Deposits, Investments, Advances, Profitability and Interest Earning. The study which employed multiple regression analysis shows that only credit allocated to government, personal and professional have significant positive effect on economic growth in Nigeria.

METHODOLOGY

The study applied *ex-post-facto* research design to source requisite information. An *ex-post-facto* research design is a systematic empirical inquiry that requires the use of variables which the researcher does not have the capacity to change its state or direction in the course of the study (Kerlinger, 1973 & Onwumere, 2009). Data for this study were sourced from the Central Bank of Nigeria Statistical Bulletin, 2014, Online Edition available in: www.cenbank.org and also from the National Bureau of Statistics (NBS, Nigeria). Data collected and used for the variables form the basis of this study which covered the period of 25 years (1990-2014). The variables classified in the model specification were drawn from the objective of the study. The variables used for this study are stated as follows: AGSG, CPS, INT, M_2 and INFL. Where: AGSG = Agricultural Sector Growth as the dependent variable of the study. Bank credit variables (explanatory variables) include: CPS= Credit to the Private Sector. INT=Prime Lending Rate. M_2=Broad Money Supply. INFL= Inflation Rate.

Model Specification

Model specification is the determination of the endogenous and exogenous variables to be included in the model as well as the a priori expectation about the sign and size of the parameters of the function (Ibenta, 2012). Multivariate linear regression model is used to test the null hypotheses proposed for the study: **(i)** there is no long-run equilibrium relationship between bank credit and agricultural sector growth in Nigeria, **(ii) t**here is no causality between bank credit and agricultural sector growth in Nigeria.

Based on these hypotheses, a model is developed for this study as follows: The function is stated as: AGSG = *f*(CPS, M_2, INT, INFL).....(1)
The mathematical equation becomes:

$$Ln(AGSG) = b_0 + b_1LnCPS + b_2LnM_2 + b_3INT + b_4INFL + \mu_t \quad \ldots\ldots(2)$$

Where: **AGSG** = Agricultural Sector Growth as dependent variable. **CPS** = Credit to the Private Sector. **M_2** = Broad Money Supply. **INT** = Interest Rate (Prime Lending Rate). **INFL** = Inflation Rate. b_0 = intercept and b_1, b_2, b_3 and b_4 are the coefficients of the regression equation. μ is the stochastic or error term while Ln is the natural log of the variables. Log transformation is necessary to reduce the problem of heteroskedasticity because it compresses the scale in which the variables are measured, thereby reducing a tenfold difference between two values to a twofold difference (Gujarati, 2003).

DATA PRESENTATION AND DISCUSSION

An of observations 25 years of time series data for the period, 1990-2014 were collected from CBN Statistical Bulletin and National Bureau of Statistics and presented as follows: Time series econometrics techniques were used to test the hypotheses: **(i)** there is no long-run equilibrium relationship between bank credit and agricultural sector growth in Nigeria, **(ii) t**here is no causality between bank credit and agricultural sector growth in Nigeria

Unit Root Test

The Augmented Dickey-Fuller (ADF) and the Philips-Perron (PP) tests are conducted on the variables, to determine whether they are stationary or non-stationary series as presented in table 1.

Table 1: The Unit Root Test Results for the Selected Variables

Variables		Augmented Dickey-Fuller test	Phillips-Perron test	Order of Integration	Remark
AGSG	Level	-0.624513	2.637693	1(1)	Stationary at 2nd
	1st Difference	-5.982653*	-1.642428		difference
CPS	Level	0.3594163	0.323728	1(1)	Stationary at 1st
	1st Difference	-4.224177*	-4.041604*		difference
INFL	Level	-1.298462	-2.823710	1(1)	Stationary at 1st
	1st Difference	-4.772822*	-7.764415*		difference
M_2	Level	-0.438135	0.115207	1(1)	Stationary at 1st
	1st Difference	-3.306049**	-3.324700**		difference
INT	Level	-3.324502**	-3.283532**	1(0)	Stationary at level

Note: The critical values are -3.64, -2.95 and -2.61 at 1%, 5% and 10% significance levels respectively; Significance of coefficients are reported using p-values. * denotes significant at 1%, ** denotes significant at 5%.
Source: Author's computation from E-views 8.0

Decision rule: Reject the null hypothesis when the test statistical value is less than the critical value. Otherwise accept and test at higher difference (1 or 2). The significance level for the analysis is 5%. The results of the stationarity tests are shown in table 1, and reveals that the variables are stationary at level, first and second differences.

Co-integration Test

Having established that all the variables in the model are stationary, the study then moves on to test for long-run relationship between the dependent and the independent variables using the Johansen Co-integration test (Johansen, 1991).

Table 2: Co-integration among Test for AGSG, CPS, M_2, INT, INFL

Hypothesized	Max-Eigen		Trace	
No. of CE(s)	Statistic	Critical Value	Statistic	Critical Value
None	43.42728*	33.87687	92.04723*	69.81889
At most 1	25.84162	27.58434	48.61995*	47.85613
At most 2	13.13490	21.13162	22.77833	29.79707
At most 3	9.245470	14.26460	9.643427	15.49471
At most 4	0.397957	3.841466	0.397957	3.841466

Trace test indicates 2 co-integrating equation (s) at 5% significant level
Max-eigenvalue test indicates 1 co-integrating equation (s) at 5% significant level
* denotes rejection of the hypothesis at 5% significant level
Source: Author's computation from E-views 8.0

The result in table 2 examines the presence of long-run relationship among bank credit variables (CPS, M_2, INFL and INT) and agricultural sector growth. Based on the FPE and AIC lag selection criteria, the lag length adopted for the model is 1 to 2. From the results in table 2, Max-Eigen statistics and Trace Statistics shows one co-integrating equation and two co-integrating equations respectively. Based on both statistics, the study concludes that there is a co-integration among bank credit variables and agricultural sector growth in Nigeria. The co-integrating equation derived from the long-run relationship is shown below:

AGSG =	27.9058CPS	-0.4830INFL	-31.6791M_2	+ 0.8775INT +	14.9445
	(8.0057)	(0.0669)	(8.5607)	(0.2846)	
	[3.4857]	[-7.2109]	[-3.7005]	[3.0835]	

() is standard error and [] are the t-statistics

From the equation above, it is evident that CPS and INT have a positive significant long-run relationship with agricultural sector growth (AGSG). This indicates that a positive change in CPS and INT will lead to a positive change in AGSG and vice versa. This implies that a unit increase in CPS will lead to a unit increase in AGSG by 27.91; and, a unit increase in INT will lead to a unit increase in AGSG by 0.88. Following a rule of the thumb, the t-

statistics of the coefficients of CPS and INT are above 2. Thus, the study indicates that there is a positive significant long-run relationship between agricultural sector growth and CPS and INT respectively.

Furthermore, the coefficients of INFL and M_2 indicate a negative long-run relationship with AGSG. This means that a negative change in INFL and M_2 will lead to a negative change in AGSG and vice versa. This implies that a unit decrease in INFL will lead to a unit decrease in AGSG by 0.48; and a unit decrease in INT will lead to a unit decrease in AGSG by 31.68. Following a rule of the thumb, the t-statistics of the coefficients of CPS and INT are above 2. Thus, the study shows that there is a negative significant long-run relationship between agricultural sector growth and INFL and M_2 respectively. Hence, credit to the private sector and interest rate have a positive significant long-run relationship with the agricultural sector growth. While inflation rate and broad money supply have a negative significant long-run relationship with the agricultural sector growth. Hence, long-run relationship exists among the variables.

Vector Error Correction Mechanism

Given the existence of co-integrating equations in the model employed for this study, it becomes ideal to carry out Error Correction Mechanism (ECM) test in order to determine the short-run dynamics of the relationships. Thus, the Vector Error Correction Mechanism (VECM) was conducted to determine the speed of adjustment between bank credit and agricultural sector growth relationship in Nigeria. Hence, this is to find out whether short-run disequilibrium can be returned to long-run equilibrium trend.

Table 3: Vector Error Correction Mechanism Test for Bank Credit and AGSG

Error Correction:	D(AGSG)	D(CPS)	D(INFL)	D(M_2)	D(INT)
CointEq1	-0.012532	-0.002956	1.270582	0.000134	0.103480
	(0.00394)	(0.00513)	(1.25105)	(0.00409)	(0.38090)
	[-3.18087]	[-0.57658]	[1.01562]	[0.03277]	[0.27167]

() is standard error and [] are the t-statistics

Source: Author's computation from E-views 8.0

Table 3 shows the result of the short-run adjustment relationship between bank credit and agricultural sector growth in Nigeria. The error correction term coefficient is (-0.012532), which is negative and the magnitude lies between 0 and 1. This reveals about 1% of any short-run disequilibrium can be adjusted to long-run equilibrium within a year. Based on the rule of thumb, the t-statistics (-3.18087) is greater or equally to 2. This indicates that the error term is statistically significant. This implies that there is a significant short-run adjustment speed to long-run equilibrium. Thus, the study reveals that bank credit has significant short-run equilibrium relationship with agricultural sector growth in Nigeria.

Granger Causality Analysis

Granger causality test is used to examine the causal direction; that is, which of the variables (dependent and independent variable) influences the relationship between them. The null hypothesis is: Independent variable does not granger cause the dependent variable. The decision rule is to reject the null hypothesis, when the Chi-Square statistics and their corresponding probability values are less than (5%) level of significance. Otherwise, do not reject the null hypothesis.

Table 4: Granger Causality/Block Exogeneity Wald Test for Bank Credit and Agricultural Sector Growth

Variable	Chi-sq	Df	Prob.
CPS	3.834655	2	0.1470
INFL	9.920181	2	0.0070
M_2	2.647668	2	0.2661
INT	4.561202	2	0.1022
All	11.72935	8	0.1637

Note: Dependent variable: AGSO, * denotes significant at 1%, ** denotes significant at 5%; *** denote significant at 10%. **Source:** Author's computation from E-views 8.0

Table 4 shows the granger causality test for bank credit and agricultural sector growth (AGSG). The result reveals that inflation rate (INFL) has a causal relationship with agricultural sector growth. Credit to the private sector (CPS), broad money supply (M_2) and interest rate (INT), respectively, does not granger-cause agricultural sector growth in Nigeria. This can be seen from the values of the Chi-square statistics and their corresponding probability values. The total Chi-Square values and the causality among the exogenous variables in the AGSG model is insignificant as reported in table 4. This suggests that all the exogenous variables jointly do not granger causes agricultural sector growth (AGSG). Therefore, we conclude that bank credit does not have causal relationship with agricultural sector growth in Nigeria, but inflation rate has a causal relationship with agricultural sector growth.

CONCLUSION

This study indicates that bank credit has no significant relationship with agricultural sector growth in Nigeria. The study reveals a long-run equilibrium relationship between bank credit and agricultural sector growth in Nigeria. But, there is a positive significant short-run adjustment speed to long-run equilibrium. This means that economic policies that are geared to increase credit to the agricultural sector have significantly improved the agricultural sector growth within a short period in Nigeria. Hence, bank credit does not have a causal relationship with agricultural sector growth in Nigeria, but inflation rate granger causes agricultural sector growth. This implies that there is a bi-directional relationship between inflation rate and agricultural sector growth. This implies that bank credit variables are not statistically significant in explaining agricultural sector growth fluctuations in Nigeria. Therefore, this will discourage investments in the agricultural sector through private sector lending. Hence, this contradicts the work of Ijaija and Abdulraheem (2000), which reveals a positive significant link between commercial bank credit to the agricultural sectors and poverty reduction in Nigeria. They conclude that functional policies should be encouraged to re-engineer the agricultural sector in order to tackle poverty in Nigeria.

THE POLICY IMPLICATIONS AND RECOMMENDATIONS

The study recommends that government should formulate functional policies such as price stability, full employment, exchange rate stability, economic growth and favourable balance of payment in order to cushion short-run economic problems such as inflation rate, interest rate and exchange rate fluctuations in the private sector-led economy. The regulatory authorities should encourage the private sector through concessional and reduced interest rate. Though, low interest package for the private sector has been provided by the Bank of Industry (BOI); thus, efforts should be made by government at all levels to encourage investors in the sector to access these funds. The monetary authorities should stabilize the interest rate which is capable of ensuring price stability and maintaining inflation to a single digit. This may build confidence in the banking institutions and will enable them to introduce innovations to boost agricultural sector output in the economy. The study suggests that CBN and the policy makers should have a common ground in order to establish specialized banking institutions that will be responsible for financing the agricultural investments in the economy. CBN should reduce the legal reserve and liquidity ratios respectively in order to increase the flow of investable funds which may improve the capacity of banks to extend credit to the sector.

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Appendix 1: Aggregate Private Sector Growth (GDP) and Financial Development (1981-2014)

Years	Aggregate Private Sector Growth (N' Billions)	Lending Rates (Prime)%	Broad Money Supply (N' Billions)	Inflation Rate %	Credit to the Private Sector (N' Billions)
1990	253.9	25.50	52.86	3.6	33.55
1992	745.6	29.80	111.11	48.8	58.12
1993	896.4	18.32	165.34	61.3	127.12
1994	1,099.0	21.00	230.29	76.8	143.42
1995	2,417.3	20.18	289.09	51.6	180.00
1996	3,401.7	19.74	345.85	14.3	238.60
1997	3,474.6	13.54	413.28	10.2	316.21
1998	3,154.3	18.29	488.15	11.9	351.96
1999	3,727.0	21.32	628.95	0.2	431.17
2000	5,618.7	17.98	878.46	14.5	530.37
2001	5,353.4	18.29	1,269.32	16.5	764.96
2002	6,158.2	24.85	1,505.96	12.2	930.49
2003	7,946.8	20.71	1,952.92	23.8	1,096.54
2004	8,688.5	19.18	2,131.82	10	1,421.66
2005	11,069.5	17.95	2,637.91	11.6	1,838.39
2006	13,817.4	17.26	3,797.91	8.5	2,290.62
2007	15,321.9	16.94	5,127.40	6.6	3,668.66
2008	18,221.3	15.14	8,008.20	15.1	6,920.50
2009	17,820.4	18.99	9,419.92	13.9	9,110.86
2010	26,116.8	17.59	11,034.94	11.8	10,157.02
2011	28,324.0	16.02	12,172.49	10.3	10,660.07
2012	30,053.1	16.79	13,895.39	12	14,649.28
2013	30,278.2	16.72	15,158.62	8.0	15,778.31
2014	49,097.94	16.55	17,680.52	8	17,128.98

Sources: (i) Central Bank of Nigeria Statistical Bulletin (1990-2014).
(ii) National Bureau of Statistics (1990-2014)

Appendix 2: The Selected Sectors and Aggregate Private Sector Output Contribution to GDP in Nigeria (1981-2014)

Year	Agricultural Sector Growth (₦ Billion)	Oil & Gas Sector Growth (₦ Billion)	Manufacturing Sector Growth (₦ Billion)	Construction Sector Growth (₦ Billion)	Communication Sector Growth (₦ Billion)	Aggregate Private Sector Growth (N Billion)
1990	122.2	83.9	40.8	5.7	1.3	253.9
1991	144.7	198.9	98.6	9.5	2.2	453.9
1992	217.4	369.4	144.4	11.8	2.6	745.6
1993	350.0	361.9	165.9	15.5	3.1	896.4
1994	529.0	326.9	219.9	19.9	3.3	1,099.0
1995	940.3	1,150.7	295.8	26.6	3.9	2,417.3
1996	1,275.8	1,739.7	350.6	31.0	4.6	3,401.7
1997	1,445.1	1,605.5	382.6	36.2	5.2	3,474.6
1998	1,600.6	1,104.2	395.8	48.0	5.7	3,154.3
1999	1,704.8	1536.5	426.2	53.1	6.4	3,727.0
2000	1,801.5	3,282.9	468.0	59.1	7.2	5,618.7
2001	2,410.1	2,501.6	535.8	78.6	9.3	5,353.4
2002	2,847.1	2,695.9	507.8	94.4	12.9	6,158.1
2003	3,231.4	4,113.9	465.8	118.6	17.1	7,946.8
2004	3,903.8	4,247.7	349.3	166.1	21.6	8,688.5
2005	4,753.0	5,664.9	408.4	215.3	27.9	11,069.5
2006	5,940.2	6,982.9	478.5	250.3	165.5	13,817.4
2007	6,757.9	7,533.0	520.9	266.5	243.6	15,321.9
2008	7,981.4	9,097.8	585.6	306.6	249.9	18,221.3
2009	9,186.3	7,418.1	612.3	347.7	256.0	17,820.4
2010	10,310.7	14,505.8	643.1	394.7	262.6	26,116.8
2011	11,593.4	15,285.0	694.8	456.3	294.5	28,324.0
2012	13,413.8	15,004.6	761.5	539.7	333.7	30,053.3
2013	14,709.1	13,750.7	823.9	627.6	366.9	30,278.2
2014	18,018.61	9,616.5	8,685.43	3,188.82	9,588.58	49,097.94

Sources: i) Central Bank of Nigeria Statistical Bulletin (1990-2014).
ii) National Bureau of Statistics (1990-2014)