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What role do banks play in diversifying the economic base from monolithic structure to agriculture? Parsimonious Error-Correction Model Approach

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ABSTRACT

This paper aims to investigate the significance of banks credit on the performance of agricultural production in Nigeria using time series data for the period 1970 to 2015. Estimated results, which are based on the Johansen multivariate co-integration method and Parsimonious Error Correction Model of the Ordinary Least Squares Methodology reveals inconsistency with economic theory with different levels of statistical significance in the model established. Co-integration test result indicated a long run relationship between agriculture output, banks credit, interest rate and demand deposits. The parsimonious error-correction model indicated that banks credit, interest rate and demand deposits affected agriculture output negatively. The policy framework guiding the sector needs to be sharpened and carefully regimented towards stimulating agricultural production for sustained growth and development. This study calls for diversification of the economic base from oil to non-oil, particularly agriculture production.

Keywords: Banks, Agriculture, Interest rate, Bank deposit

JEL Classification: G21, Q18

INTRODUCTION

Nigerian economy was purely an agrarian economy in the early1960s. Agriculture provided food for the teeming population, generates revenue to the government, open window for raw material requirements for the production sector, provided employment opportunity for the labour force, enhances domestic savings and catalyzed foreign exchange earnings. During this period, agriculture share in the GDP was 64.3%, indicating the pivotal role played by the sector in the economy[1]. This sector also made it possible for Nigeria to reduce her importations of some goods and also control the movements of exchange rate, thus making it to be fairly stable. In the early 1970s, it was discovered that agriculture outputs recorded rapid decline and this resulted into food and raw material crisis. Consequently, Nigeria resorted into importation of agricultural products and this worsened foreign exchange position. The discovery of oil in the late70's changed the tune of economic pace from agriculture to oil related products. Agriculture became oblivious in the picture of Nigeria's economic prospects due to poor funding and sudden windfall from oil. The economy, therefore, became monolithic, depending solely on a single product (oil) for survival. As oil prices continue to fall in the international market during 1980's, expected revenue from oil dwindled drastically and this exerted serious pressure on the fiscal operation of

[1]. The computation was done from the Central Bank of Nigeria Statistical Bulletin, 2014.

government, thus causing the variables which supports economic growth to surfer[2].Government expenditure became moribund and highly selective on sectors. With dwindling oil revenue, fiscal operations of government, foreign reserves and exchange rate balance became worrisome. The high dependence of Nigeria on oil impacted serious challenges to policy formulation and implementation. The global economic crisis coupled with incessant volatility in the oil prices further strangulated domestic macroeconomic policies. Both theoretical and empirical studies have underscored the implication of having large deposits of oil as natural resource endowment. There appears to be a regularity in the literature, confirming that countries with abundant natural resource endowment experienced stunted growth due to corruption and rent-seeking activities. Based on this exposition, Nigeria fits in appropriately into the framework of countries with abundant natural resources with defective growth characterized by Dutch Disease[3] (see Brunnschweiler and Bulte, 2008; Bulte et al., 2005; Papyrakis and Gerlagh, 2004; Rodriguez and Sachs, 1999 and Ross, 2001).

With enormous resources coming from the oil sector, agriculture was relegated to the background. Efforts at revamping the sector rests on three critical factors: government, banks and individual agent. The first two represents the formal sector while the later denotes the informal sector. It should however be noted that the credit facilities provided by the formal and informal sectors are essential antidote for agricultural development and poverty reduction (Ijaiya and Abdulraheem (2000). Availability of credit facility would create auspicious economic climate for agricultural development. However, formal and informal sources of credits to agriculture is rather poor, epileptic and scanty. Banks profit after tax income were not effectively channelled to the agricultural sector[4].More so, government's policy towards agriculture were characterized by frequent changes, inconsistency and lack continuity. The spill-over of global economic crisis aroused the consciousness of nations to have a re-think of policies towards economic diversification from oil related products to agriculture. In order to fully address the problem surrounding agricultural production in Nigeria, government in collaboration with banks and other agencies need to initiate functional policies aimed at stimulating agricultural production.

Given the importance of the provision of credit assistance to agricultural sector, we observed that the provision of these facilities were largely inadequate, infinitesimal and lagged below the required standard for sustainable agricultural growth in Nigeria. Many studies have been conducted in Nigeria, both theoretical and empirical, relating commercial banks credit to agricultural production (See Aku,1995; Ijaiya, 2000; Muftau, 2003; Emmanuel, 2008 and Obilor, 2013). A number of these studies converged in their findings that commercial banks credit constitutes a critical fundamental catalyzing agricultural production in Nigeria. This paper seeks to consolidate on the existing studies and at the same time expand the data scope to reflect the nexus between banks credits and agricultural production in Nigeria. Within this framework, the study further seeks to establish whether loan facility provided by banks could raise agricultural output and foster growth potentials. Given the introduction, section two explains the review of literature on banks' credits, development and agricultural output. Section three discuss the model and data used for the study. Section four presents and discusses the empirical results. Section five concludes the paper and provides policy menu.

REVIEW OF LITERATURE ON BANKS CREDITS, DEVELOPMENT AND AGRICULTURAL OUTPUT

Banks[5] credit plays a critical factor in the process of economic development. Banks' receives funds in the form of deposits from surplus spending unit of the economy and also transform the surplus funds to the deficit spending units who need funds for productive purposes. Banks' can also be seen as debtors to the depositors of funds and creditors to the borrowers of funds (Stephen and Osagie, 1985; Ekezie, 1997; Ijaiya and Abudulraheem, 2000). Quite a number of studies have underscored the intermediary role of banks in the process of economic development, but there appears to be a general consensus that commercial banks constitute a critical fundamental factor driving economic development (see the works of Adeniyi,2006 and Nwanyanwu,2010). Data on domestic agriculture development show that between 1970-1979 and 2010-2015, credit to the agricultural sector increased from ₦89.9 million to ₦309,330.50. During the same period,

[2] . Such variables include: employment, prices of goods and services, income, savings, investment, aggregate monetary demand, exchange rate, e.t.c.

[3]. Dutch Disease occurs when a country discovers a substantial natural resource deposit and begins a large-scale exportation of it. As a result, the country's currency appreciates, thereby reducing the competitiveness of the country's traditional export sector. Therefore, this tradable goods sector is expected to contract, thus leading to structural changes in the economy. For further discussion on Dutch Disease, see Edun (2012).

[4]. In most cases Commercial Banks demand high collateral from poor 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. Despite series of policy guidelines giving by the government to the banks towards revamping the agricultural sector, commercial banks have failed in their responsibility at sporting farmers in need of credits and other forms of loan assistance. This puzzles why the financial institutions in Nigeria have not been able to operate effectively to grant credit to farmers to expand agricultural development.

[5]. Banks are interchangeably used as commercial banks. They are deposit money banks

Table 1: Domestic Agriculture Development, 1970-2015

Year	1970-1979	1980-1989	1990-1999	2000-2009	2010-2015
Banks loan to Agric. (₦m)	89.9	1,593.7	27,703.6	177,080.7	309,330.5
Nominal Agriculture GDP(₦m)	4,582.7	60,399.4	96,895.9	217,993.1	358,635.9
Agriculture share in GDP (%)	30.0	31.2	33.9	40.7	41.7

Source: Computed from the Central Bank Statistical Bulletin, 2014

nominal agriculture GDP rose sharply from ₦4582.7 million to ₦358635.90 million The share of agriculture in GDP increased from 30% to 41.7% respectively. The highest loan to agriculture was recorded during 2010-2015. This could be attributed to the determined policy stance of the government to diversify the economic base from oil to agriculture (see Table 1).

Considering the figures obtained from the table above, the critical role of banks credit in stimulating growth in agriculture performance could be well appreciated in terms of raising the quality of economic growth and development. Economic growth is conceptualized as persistent and sustainable increase in gross domestic product during a given period. The quantitative changes in the components of gross domestic product has to be credible and consistent. It should be noted that agriculture performance is a subset of gross domestic product components. The growth performance in agriculture is proxied by agricultural output. In spite of the huge banks' credit channelled to agricultural sector, productivity performance remains low compared with some advanced economy. This could be attributed to a number of reasons ranging from: use of crude and traditional implements against mechanised counterparts, poverty on the part of the farmers to embrace large-scale farming, illiteracy and ignorance to adapt to modern farming method, lack of good storage facility and transport system, perversion of banks credit for selfish ends, unfavourable climate coupled with poor research in agriculture.

The argument on the desirability of commercial banks credit on the growth of agriculture is inconclusive. A number of studies have established a positive relationship between banks credit and agricultural production (Nzotta,1999; Qureshi et.al, 1996; Fosu, 1992; Amin, 1996 and Egbetunde, 2012). Some strands of studies have also suggested that banks credit do not necessarily promote agricultural sector growth. Two justifications were provided on different scenarios. One, as banks mobilizes funds from the public, it disburses such funds into declining areas of the economy rather than raising agriculture output, hence, the system experiences selective growth process (Boyreau-Debray, 2003). Two, banks often exhibit apathy in lending to farmers based on asymmetric information which often lead to moral hazard and adverse selection in terms of collateral requirements (Josephine, 2010).

THE MODEL AND DATA

The broad objective of this study is to analyze the effectiveness of commercial banks loan on agricultural performance and its implication on growth in Nigeria. Agriculture performance is proxied by agriculture output. Specifically, a model used by Ijaiya (2000) with some modifications is therefore adopted. The modified model is presented as specified in equation 1.

$$AGROUT = f(BNKCR, INTRT, DDOPT) \quad (1)$$

Expressing equation (1) in linear form, we have

$$AGROUT = \vartheta_0 + \vartheta_1 BNKCR + \vartheta_2 INTRT + \vartheta_3 DDOP + e \quad (2)$$

where :

$AGROUT$ = Agriculture Output

$BNKCR$ = Banks credit facility made available to the agriculture sector

$INTRT$ = Interest rate charged by the bank on loans

$DDOPT$ = Demand Deposit of Commercial Banks which serves as the stock of loans to the agriculture sector.

e = Disturbance term

ϑ_0 = Intercept of equation 1

ϑ_1,..., ϑ_3 = Parameters to be estimated.

Theoretically, we expect the coefficient of banks credit to agriculture to be positive. Interest rate coefficient to be negative and demand deposit of commercial banks' coefficient to be positive. The data employed for estimation in this study were obtained from secondary sources. This include the various issues of the Central Bank of Nigeria's (CBN's) Statistical Bulletin and publications of the National Bureau of Statistics. The data point is from 1970 to 2015.

PRESENTATION AND DISCUSSION OF RESULTS

The first step involved in the estimation of a linear relationship is the comprehensive pre-testing procedure to investigate the characteristics of the time series variables, using the Augmented Dickey-Fuller (ADF)

Table 2. ADF and PP Unit Root Tests Results

	Levels				1st Difference				Remark
Variables	ADF1	PP1	ADF2	PP2	ADF1	PP1	ADF2	PP2	
AGROUT	-2.0192	-1.7596	-1.8432	-3.2576	-5.2894	-9.3828	-6.3803	-6.4458	I(1)
BNKCR	-1.5885	-1.5684	-2.1819	-2.4834	-6.6320	-6.7348	-6.2109	-6.2108	I(1)
DDOPT	-2.0926	-1.4887	-1.6853	-1.2812	-4.4871	-4.4618	-4.2436	-4.2395	I(1)
INTRT	-0.4373	-0.7176	-0.8444	-0.8946	-8.6894	-8.6894	-4.3758	-8.0007	I(1)

Source: Computed by the Author from E-View 8.0
Note: ADF1 and PP1 = Unit Root Test with Constant and Trend. ADF 2 and PP2 = Unit Root Test with Constant. With constant and Trend: McKinnon (1996) critical values are: -4.1809 (1%), -3.5131(5%) and -3.1869(10%). With constant only: McKinnon (1996) critical values are: -3.5847 (1%), -2.9281 (5%) and -2.6022 (10%).

Table 3. Johansen Maximum Likelihood Co-Integration Test Results

Panel A: Maximum Eigenvalue and Trace Test for Agriculture Output function					
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5% Critical Value	Trace Statistic	5% Critical Value
None	0.4209	23.491	27.584	49.962*	47.856
At Most 1	0.3274	17.055	21.132	26.471	29.797
At Most 2	0.1297	5.973	14.265	9.416	15.495
At Most 3	0.0770	3.443	3.842	3.443	3.842
Panel B: Normalized Cointegrating coefficients of the Agriculture Output Equation					
AGROUT = −3.970274BNKCR + 4.739709DDOPT + 0.125511INTRT					
		(1.12438)	(1.30627)	(0.05442)	
Note: * indicates rejection of the null hypothesis at 5% significance level. t-statistics are in the parentheses below the coefficients.					

Source: Computed from E-views 8.0

and Phillips-Perron tests (PP)[6], the results as presented in table 2 show that all the series are stationary at first difference. This is consistent across variables. Having ascertained the unit root status of the variables, we proceeded to establish whether or not there is a long run co-integrating relationship among the variables by applying Johansen full information maximum likelihood method.

Having carried out the stationarity tests and established that all the variables are stationary at first difference. The paper proceeds to test for long run relationship among the variables using the Johansen co integration test[7]. The lag length used in the study was based on Akaike's Information Criterion and Schwartz Bayesian Criterion.

In panel A of table 3, two tests statistics: Maximal Eigenvalue and Trace tests are given. Results from these tests show that the trace test statistic indicated one (1) co-integrating relationship, while maximum eigenvalue statistic showed no co-integrating relationship among the variables. Whenever there is a conflict between trace and eigenvalue statistics, Johansen and Juselius (1990) recommended the use of trace statistics. This indicates that there is a long-run relationship between agriculture output, banks credit, interest rates and demand deposits. Panel B of table 3 presents the long-run elasticities obtained from the normalized co-integration equation. The normalized co-integrating equation indicated a negative relationship between bank lending and agriculture output, while demand deposits of banks and interest rates influenced agriculture output positively. This implies that banks' lending to agriculture is low or not sufficient enough to improve the quality of output in the sector. Another reason that could be given as justification for the negative relationship is that banks failed to comply with the Central Bank of Nigeria's monetary policy guidelines on agriculture loan, thereby channelling loans to other

[6]. Studies have shown that these tests lack power in small samples, however, studies give more credence to the PP test because of its validity even if the disturbances are serially correlated and heterogeneous while the ADF tests require that the error term be serially uncorrelated and homogeneous. Despite the shortcomings of these tests, we cannot over-emphasize their importance for empirical modelling because they show the order of integration among variables.

[7]. Johansen technique is more efficient in detecting multiple cointegrating relationships among variables (if they exist) and it does not suffer from problems associated with normalization. For testing cointegration vectors, trace and maximum statistical eigenvalues are established.

Table 4. The Results from the Static Model

Variables	Coefficient	Standard Error	t-Statistic
C	-2.765	0.322	8.592
BNKCR(-1)	0.363	0.156	2.322
DDOPT	0.117	0.182	0.640
INTRT	0.010	0.007	1.433
R^2 = 0.894 ; Adj. R^2 = 0.886 ; S.E = 0.241 ; F-Stat. = 117.8 ; D.W= 0.534			

Source: Authors Estimation

Table 5. The Results from the Parsimonious Error-Correction Model

Variables	Coefficient	Standard Error	t-Statistic
C	-20.129	8.474	-2.375
AGROUT(-1)	8.391**	3.058	2.743
BNKCR(-1)	-2.832**	1.133	-2.500
INTRT(-1)	-0.069**	0.030	-2.321
DDOPT	-0.800**	0.294	-2.718
DDOPT(-3)	-1.230**	0.334	-3.680
ECM(-1)	-7.875**	3.075	-2.561
R^2 = 0.968 ; Adj. R^2 = 0.962 ; S.E = 0.111 ; F-Stat. = 148.99; Prob.(F-Stat.) = 0.000; D.W= 2.28			

Notes: ** denotes statistically significant at 5% level
Source: Authors Estimation

areas. Apart from the co-integration analysis established in this paper, we set up error-correction model as demonstrated in equation (3). This equation is estimated to ascertain the short run effect of banks credit on agriculture performance. To obtain the parsimonious error-correction model, we estimate the over-parameterized model (see appendix 1) and explore the "general to specific approach proposed by Hendry(1974, 1977)[8].

$$\Delta AGROUT_t = \alpha \sum_{i=0}^{n1} \beta_i \Delta AGROUT_{t-i-1} + \sum_{i=0}^{n2} \varphi \Delta BNKCR_{t-i} + \sum_{i=0}^{n3} \delta_i \Delta INTRT_{t-i} + \sum_{i=0}^{n4} \vartheta_i \Delta DDOPT_{t-i} + \gamma_i EC_{t-1} + \mu_t \quad (3)$$

where, Δ is first difference operator; n gives the number of lags involved in the estimation; EC_{t-1} gives the error-correction term derived from co-integration equation; μ_t is the error term. $AGROUT_t$, $BNKCR_t$, $INTRT_t$ and $DDOPT_t$ has been defined in section 3. It should be noted that the over parameterized model is difficult to interpret and does not yield any meaningful economic result. It only allows us to establish and identify the main dynamic patterns in the model. This study therefore, relies on the parsimonious model, which is more interpretable to analyze the effect of banks credit on agriculture performance in Nigeria. However, it is imperative that we show the static position of the model using the conventional OLS method. The static model is presented in Table 4.

A look at the static model results show that banks credit positively influenced agriculture output. Though not statistically significant at 5% level, the demand deposit and interest rate affected agriculture output positively. The parsimonious results are presented in Table 5.

From the parsimonious error-correction model, in the short run, a 1% rise in banks credit would lead to a 2.83% decrease in agriculture output; an increase in interest rate by 1% would lead to a 0.07% decrease in agriculture output; a rise in demand deposit of 1% would lead to 0.80% and 1.23% decrease in the agriculture output for the contemporaneous and lagged three values respectively. These effects are statistically significant at 5% level. This result shows that as banks mobilizes funds from the surplus segments of the economy, it disburses them to profit driven segments of the economy rather than raising agriculture output. This result found support with the submission of Boyreau-Debray (2003). The error-correction term (*ECt-1*) show the expected negative sign and is statistically

[8]. In this approach, first, the error-correction model is estimated, and then, statistically insignificant variables are excluded from the general error correction model.

significant, confirming the long-run relationship between agriculture output, banks credit, interest rates and demand deposits. Additionally, the size of the coefficient of an error-correction term shows that 787.5% adjustment of agriculture output toward long-run equilibrium occurs yearly. The significance of error-correction mechanism (ECM) further confirms that the variables in the model are indeed co-integrated. The adjusted R^2 show that about 96% of the total variation in agriculture output is determined by changes in the explanatory variables. Thus, it is a good fit. The F-statistic (149.0) indicates that all the variables are jointly statistically significant at 5% level. The Durbin-Watson statistics value of 2.28 reveals that it is within the acceptable bounds, thus it is good for policy analysis.

CONCLUSION AND POLICY IMPLICATIONS

This study has analyzed the effect of banks credits, interest rates charged on agriculture loans and demand deposits of banks on agriculture output during the period 1970 to 2015. The time series data used for the study was estimated using Johansen co-integration technique and parsimonious error-correction method. Empirical results showed mixed outcomes both in the short run and long run. In the short run, banks credit, interest rates, and demand deposits of banks influenced agriculture output negatively, while in the long run, only banks credit affected agriculture output negatively, demand deposits and interest rates affected agriculture output positively.

Based on the outcome of this results, this paper therefore suggests that government in collaboration with Central Bank of Nigeria should ensure that its monetary policy directives are strictly carried out by the commercial banks and the participating agents. There is need by the monetary authorities to enforce that commercial banks be made to channel a significant proportion of their profit after tax income to the agricultural sector in order to reduce dependence on oil related products. There is need by the monetary authority to reconsider interest rates both deposit and lending, so that they would be much more accessible and favourable to the beneficiaries. Government should give tax relief to banks that extends credits to the agricultural sector as a way of motivation. Above all, there is need to provide a stable macroeconomic environment that would ensure sound fiscal and monetary policies.

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Appendix 1. Over-parameterized Model

Dependent Variable: AGROUT
Method: Least Squares
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-32.95873	13.34332	-2.470055	0.0207
AGROUT(-1)	13.08311	4.819697	2.714509	0.0119
BNKCR	0.032735	0.128717	0.254315	0.8013
BNKCR(-1)	-4.507039	1.772327	-2.543007	0.0176
BNKCR(-2)	-0.161245	0.165607	-0.973665	0.3396
BNKCR(-3)	0.255152	0.160547	1.589261	0.1246
BNKCR(-4)	-0.080854	0.139412	-0.579966	0.5671
INTRT	-0.002983	0.007736	-0.385533	0.7031
INTRT(-1)	-0.112620	0.047419	-2.374972	0.0255
INTRT(-2)	-0.008931	0.008041	-1.110639	0.2773
INTRT(-3)	0.005656	0.008495	0.665810	0.5116
INTRT(-4)	-0.000519	0.007475	-0.069421	0.9452
DDOPT	-0.988032	0.340090	-2.905212	0.0076
DDOPT(-2)	-0.611739	0.606313	-1.008950	0.3227
DDOPT(-3)	-1.039042	0.565113	-1.838643	0.0779
DDOPT(-4)	1.249436	0.340387	3.670630	0.0011
ECM(-1)	-12.55580	4.818048	-2.605993	0.0152

R-squared	0.973681	Mean dependent var	4.911868
Adjusted R-squared	0.956836	S.D. dependent var	0.569127
S.E. of regression	0.118241	Akaike info criterion	-1.141446
Sum squared resid	0.349526	Schwarz criterion	-0.438104
Log likelihood	40.97038	Hannan-Quinn criter.	-0.883644
F-statistic	57.80429	Durbin-Watson stat	2.281719
Prob(F-statistic)	0.000000		

Source: Computed from E-View 8.0

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