

*Original Research Article***Causality of Interest Rate Policy and Agricultural Production in an Atmosphere of Economic Deregulation in Nigeria**

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*Department of Agricultural Economics and Rural Sociology, Ahmadu Bello University, Zaria, Nigeria***Abstract**

This study was carried out to examine the causal relationship between interest rate policy and agricultural production in a deregulated economic setting in Nigeria using time series data covering 1987 to 2011. The data utilized include data on interest rate and agricultural production which were obtained from various publications of central bank of Nigeria. Augmented Dickey Fuller (ADF) test, Vector autoregression (VAR) lag order selection test and Granger causality test were employed in the data analysis and the result indicated that market driven interest rate was not significant in influencing agricultural production over the period of deregulation and this was attributed to the substantial volatility and high market driven interest rate leading to limited accessibility to credit facilities by small scale farmers. It is recommended that the central bank of Nigeria should strongly exercise some measure of interest rate control that favours investment friendly interest rate policy that is supportive of credit mobilization for sustainable agricultural production and also the realization of the goal of Agricultural Transformation Action Plan (ATAP) in Nigeria.

Keywords: interest rate; control; agricultural production; development; ADF; VAR.

INTRODUCTION

The role of interest rate deregulation cannot be overemphasized in agricultural production in Nigeria and many economists have argued that the deregulation of interest rate has led to trudge in the real interest rate which has induced savings and investment in general (Ammasoma et al., 2011). Interest rate policy is among the emerging issues in current economic policy in Nigeria in view of the role it is expected to play in the deregulated economy in inducing savings which can be channel to investment and thereby increasing employment, output and efficient financial resource utilization (Uchendu, 1993). To date, Nigeria has pursued two-interest rate regime. The 1960s to mid-1980s with the administration of low interest rates which was intended to encourage investment. However, the advent of the Structural Adjustment Programme (SAP) in the third quarter of 1986 ushered in an era when fixed and low interest rates were gradually replaced by a dynamic interest rate regime, where rates were more influenced by market forces (Eregba, 2010). Since the inception of interest rates deregulation, the government of Nigeria has been pursuing a market determined interest rates regime, which does not permit a direct state intervention in the general direct of the economy (Adebisi and Babatope-Obasa, 2004). Prior to economic deregulation in Nigeria, interest rate ceilings and sectoral allocation of credit to priority sectors (agriculture and manufacturing) was pursued to ensure that funds are

available for driving the activities of these sectors but this turned out to be counterproductive and discouraged financial intermediation and therefore, the deregulation of interest rate in Nigeria which took effect from 1st August 1987 was necessitated. The importance of credit facilities in influencing agricultural growth for sustainable development of Nigeria cannot be overemphasized but unfortunately, the issue of credit accessibility has continued to be a challenge in Nigerian agriculture. Access to credit by farmers and agro processors is influenced by the prevailing interest rate regime and as noted by Philip et al. (2009), high interest rate constitute a hindrance to credit accessibility by farmers. It is estimated that only 2.5 percent of total commercial bank loans and advances is directed at agriculture (CBN, 2008). This is attributed to high interest rate amongst other factors. Therefore, the issue of interest rate as an instrument of monetary policy is central in agricultural financing because of its implication for resource mobilization in ensuring sustainable agricultural production and ultimately geared towards achieving food security, poverty reduction, job and wealth creation which are the cardinal points of Agricultural Transformation Action Plan (ATAP) of Nigeria. Despite the critical role of interest rate as a tool of monetary policy, little empirical information is available on the causal relationship of market driven interest rate policy and agricultural production in a deregulated economic setting in Nigeria. Hence, this study was designed to investigate

the causal relationship of market driven interest rate policy and agricultural production in Nigeria and make relevant inference in line with the agricultural transformation of Nigeria.

MATERIALS AND METHODS

Time series data on interest rate (lending rate) and agricultural production proxied by the index of agricultural production over the period of interest rate deregulation in Nigeria (1987 to 2011) were utilized in this study. The data were collected from various issues of central Bank of Nigeria statistical bulletin and annual reports (CBN, 2006, 2007, 2011). Augmented Dickey Fuller (ADF) test, Unrestricted vector autoregression (VAR) and pairwise Granger causality tests were employed using Eview 7.2 statistical package to analyse the data in order to achieve the objective of the study. ADF test was used to ascertain the time series properties of all the variables so as to avoid spurious regression which results from the regression of two or more non-stationary time series data. Unrestricted VAR was employed to select the optimal lag length used in the Granger causality test and finally, the pairwise Granger causality test was used to determine the causal relationship between interest rate and agricultural production. The model of the Augmented Dickey Fuller (ADF) with the constant term and trend is as follows:

$$\Delta Y_t = \alpha_1 + \alpha_2 t + \beta Y_{t-1} + \sum_{i=1}^n \gamma_i \Delta Y_{t-i} + \epsilon_t$$

Where:

ΔY_t = first difference of

Y_{t-1} = lagged values of

δ = test coefficient

e_t = white noise

β_1 = constant

β_2 = coefficient of time variable

The null hypothesis ($H_0: \beta = 0$) of the ADF test indicates that the series is not stationary and the alternative hypothesis ($H_0: \beta < 0$) indicates that the series is stationary. If the absolute value of calculated ADF statistic (τ) is higher than the absolute value of the critical values, we reject the hypothesis which states that the series is stationary. However, if this value is lower than critical value, time series is not stationary (Gujarati, 1995). The Granger causality test assumes that the information relevant to the prediction of the respective variables, X and Y, is contained solely in the time series data on these variables. The test involves estimating the following pair of regressions:

$$X_t = \beta_0 + \sum_{i=1}^n \beta_i X_{t-i} + \sum_{j=1}^n \alpha_j Y_{t-j} + \mu_{1t}$$

$$Y_t = \gamma_0 + \sum_{i=1}^n \gamma_i Y_{t-i} + \sum_{j=1}^n \delta_j X_{t-j} + \mu_{2t}$$

Where:

X_t = Time series variable X

Y_t = Times series variable Y

β_0, γ_0 = Constant terms

$\beta_i, \alpha_i, \gamma_i \delta_i$ = Estimated regression coefficients

μ_{1t}, μ_{2t} = Error terms

It is assumed that the disturbances μ_{1t} and μ_{2t} are uncorrelated. Thus there is unidirectional causality from X to Y if $\alpha_i \neq 0$ and $\delta_i = 0$. Similarly, there is unidirectional causality from Y to X if $\delta_i \neq 0$ and $\alpha_i = 0$. The causality is considered as mutual (bilateral causality) if $\delta_i \neq 0$ and $\alpha_i \neq 0$. Finally, there is no link between X and Y (independence) if $\delta_i = 0$ and $\alpha_i = 0$.

Model specification

To determine the causal relationship between interest rate and agricultural production in Nigeria in an atmosphere of economic deregulation, interest rate (IR) is given by lending rates and agricultural production (AP) is given by index of agricultural production. Therefore, the relationship between interest rate and agricultural production in Nigeria is modelled as follows:

$$AP_t = \varphi_0 + \sum_{i=1}^n \varphi_i AP_{t-i} + \sum_{j=1}^n \omega_j IR_{t-j} + \epsilon_{1t}$$

$$IR_t = \delta_0 + \sum_{i=1}^n \delta_i IR_{t-i} + \sum_{j=1}^n \gamma_j AP_{t-j} + \epsilon_{2t}$$

Where:

AP_t = Agricultural production given by aggregate of the index of agricultural production in Nigeria over the period of 1987 to 2011.

IR_t = Interest rate given by lending rate in Nigeria (%) over the period of 1987 to 2011.

φ_0, δ_0 = Constant terms

$\varphi_i, \omega_i, \delta_i, \gamma_i$ = Estimated regression coefficients

$\epsilon_{1t}, \epsilon_{2t}$ = Error terms

Eview 7.2 statistical package was used to carry out all the statistical analyses in this study.

RESULTS AND DISCUSSION

Descriptive statistics

The basic features of the variables (agricultural production and interest rate) under study are given in Table 1. Agricultural production is negatively skewed, leptokurtic and the

probability value of its JarqueBera statistic denotes that its errors are not normally distributed. Interest rate is positively skewed, leptokurtic and its errors are normally distributed based on the JarqueBera statistic.

Table 1. Descriptive statistics of agricultural production and interest rate (1987 – 2011)

Statistic	lnAPlnIR	
Mean	5.399659	3.119308
Median	5.455748	3.060583
Maximum	5.735281	3.586016
Minimum	4.754452	2.867899
Std. Dev.	0.232718	0.175351
Skewness	-1.179819	1.012477
Kurtosis	4.029954	3.541599
Jarque – Bera	6.904894	4.576844
Probability	0.031668	0.101426
Sum	134.9915 7	7.98269
Observations	25	25

Source: Author's computation

Augmented Dickey Fuller Unit root test

The result of the Augmented Dickey Fuller test with the assumption of trend and intercept in Table 2 shows that lnAG was non-stationary (has unit root) at level form and also at first difference form but became stationary at second difference form. This was necessary to avoid spurious

result when the variable is used in its non-stationary form. However, lnIR was found to be stationary at level form and therefore, it did not require differencing.

Vector Autoregression (VAR) lag order selection criteria

Granger causality test is known to be sensitive to lag length (Foresti, 2006; Afzal, 2012) and therefore, VAR model was fitted to the time series data in order to find an appropriate lag structure for the granger causality test. The maximum lag length began with 4 lags and proceeded down to the appropriate lag by examining the Likelihood ratio (LR), Final prediction error (FPE) Akaike information criterion (AIC) and Schwarz criterion (SC) information criteria as shown in Table 3. The result indicates that the optimal lag length is one based on LR, FPE, AIC and SIC.

Granger Causality test

The Granger causality test was carried out using an optimal lag length of one and the result as shown in Table 4 indicates that there is no causal relationship between interest rate and agricultural production in Nigeria over the period of economic deregulation and this implies that the interest rate policy of the deregulation regime is not significant in influencing the outcome of agricultural production in Nigeria and vice versa. This observed result could be explained on the basis that market driven

Table 2. Result of Augmented Dickey Fuller test

Variable Level	ADF Statistic	Lag	Test Critical value (5%)	Decision
lnAG	-2.873940	0	-3.612199	Nonstationary
lnIR	-3.856472	0	-3.612199	Stationary
First difference				
ΔlnAG	-3.109993	5	-3.690814	Nonstationary
Second difference				
ΔlnAG	-4.865354	4	-3.690814	Stationary

NB: ln = natural logarithm, Δ = difference operator

Lag length selection was automatic based on Schwarz information criterion (SIC)

Table 3. VAR lag order selection result

Lag	LR	FPE	AIC	SIC
0	NA	0.000461	-2.006655	-1.907176
1	16.31370*	0.000274*	-2.532019*	-2.233584*
2	1.048142	0.000381	-2.216575	-1.719184
3	1.569178	0.000515	-1.947707	-1.251359
4	1.980307	0.000683	-1.731780	-0.836475

NB: * indicates lag order selected by the criterion

LR: Likelihood ratio AIC: Akaike information criterion
FPE: Final prediction error SIC: Schwarz information criterion

Table 4. Result of Pairwise Granger Causality test

Null Hypothesis(H_0) Obs.		F- statistic Prob.		Decision
IR does not granger cause AG	24	0.42350	0.5223	Accept H_0
AG does not granger cause IR	24	0.54951	0.4667	Accept H_0

interest rate policy of the deregulation era limit accessibility to credit by farmers especially smaller holder farmers due to substantial volatility and undue high interest rate amongst other factors such collateral, poor credit information, incidence of loan default and unfavourable disposition of formal credit institutions such as banks to agricultural lending. Hence, the expected role of credit facilities in financing agricultural activities by small holder farmers who are responsible for the bulk of agricultural production in Nigeria becomes farfetched.

CONCLUSION AND RECOMMENDATION

This paper investigated the causal relationship between interest rate policy and agricultural production in a deregulated economic set up in Nigeria using time series data covering 1987 to 2011. The major finding of this study is that the market driven interest rate policy of the deregulated period did not granger cause agricultural production over the period and this was attributed to the substantial volatility and high interest rates that limits credit mobilization for agricultural production. The Monetary Policy Rate (MPR) remained the operating instrument to influence the direction of interest rate in line with monetary conditions (CBN, 2008). Therefore, an adequate review of MPR by the monetary authority of Nigeria is necessary to influence interest rate to favour the Nigeria's agricultural sector; being a priority sector of the Nigerian economy in view of its significant contribution to the GDP of Nigeria. Therefore, some measure of interest rate control is strongly advocated as opposed to a total market driven interest rate policy so as to achieve investment friendly interest rate policy that is supportive of credit accessibility by small scale farmers and other actors in the agricultural sector. This is necessary to enhance agricultural production and also ensure that the objectives of agricultural transformation are realized in Nigeria.

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