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MONETARY POLICY AND AGRICULTURE, FORESTRY AND FISHERY FINANCING IN NIGERIA: ERROR CORRECTION MECHANISM APPROACH

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Abstract

The sole dependency of the Nigeria economy on oil has resulted to adverse effect most especially with the incessant fall in the global price of crude oil. Lots of calls have been made to the government to come up with measures that will increase participation in the agricultural sector. This study was carried out to examine the effect of monetary policy on agriculture, forestry and fishery financing in Nigeria using time series data which spans from 1981-2015. The study employed Augmented Dickey Fuller (ADF) and Philips Perron (PP) tests to ascertain the stationarity of the variables. A Cointegration test was also used to ascertain the long run relationship of the variables, and thereafter, error correction mechanism (ECM) technique was used for the analysis. The result revealed that there exist a long run relationship between monetary policy and debt financing of agriculture, forestry and fishery sector in Nigeria. Specifically, there exists a significant and positive relationship between broad money supply and agriculture, forestry and fishery financing in Nigeria. On the other hand liquidity ratio and monetary policy rate have a positive but insignificant relationship with agriculture, forestry and fishery financing in Nigeria. Also, exchange rate and interest rate were found to be insignificant

but negatively related to agriculture, forestry and fishery financing in Nigeria. Based on these findings, the study recommends that an expansionary monetary policy should be adopted with special emphasis on reduction of interest rate to agricultural sector which will attract more interest to agricultural sector, thereby shifting focus from oil and gas.

Keywords: *Monetary policy, Agriculture Forestry, Fishery, ECM*

1. Introduction

Agriculture was the mainstay in the Nigerian economy prior to the oil boom. The Nigerian economy was predicated on agriculture which contributed more to the nations GDP and foreign exchange than any other sector. The discovery of oil led to Dutch disease economy, a situation of sole dependence on oil, which resulted to crippling the agricultural sector. According to Adetiloye (2012) over the years successive governments and policymakers battled to have agriculture regain prime place in the economy. He further explained that for agricultural practice to be meaningful, one major factor is the availability of adequate credit to finance agricultural production. The availability of agricultural credit in any country is made up of the participating financial institutions and units that can effectively lend resources to facilitate the production of agricultural produce.

Consequently, the issue of financing of agricultural purposes has however, been very prominent such that, the amount of credit available is determined by a number of factors. Monetary policy has been identified as one of such factors. Ajie and Nenbee (2010) opined that reserves of the banks are influenced by the Central Bank through its various instruments of monetary policy. These instruments include the cash reserve requirement, liquidity ratio, open market operations and primary operations to influence the movement of reserves. All these activities affect the banks in their operations and thus influence the cost and availability of loanable funds. Thus, monetary policy instruments are critical in the demand for and supply of reserves held by banking institutions and consequently on availability of credit.

Prior studies on monetary policy and bank lending are mostly focused on financing SMEs, manufacturing sectors, real sectors (Olweny & Chiluwu, 2012; Nto, Jude & Alex, 2012; Ogar, Nkamare & Effiong, 2014, Oke & Aluko, 2015 and Oni, Emoh & Ijasan, 2016). To the best of our knowledge, no previous study has focused on monetary policy and agriculture, forestry and fishery financing in Nigeria. Hence, this study is an attempt to fill this existing gap by empirically examining the effect of monetary policy on agriculture, forestry and fishery financing in Nigeria.

The central objective of this study is to examine the effect of monetary policy on agriculture, forestry and fishery financing in Nigeria

The following hypotheses are formulated:

$H0_1$: There is no significant relationship between money supply and agricultural, forestry and fishery financing in Nigeria.

$H0_2$: Liquidity ratio does not significantly influence agricultural, forestry and fishery financing in Nigeria.

$H0_3$: There is no significant effect between monetary policy rate and agricultural, forestry and fishery financing in Nigeria.

$H0_4$: Exchange rate does not significantly affect agricultural, forestry and fishery financing in Nigeria.

$H0_5$: There is no significant relationship between interest rate and agricultural, forestry and fishery financing in Nigeria.

The remaining sections of the paper are structured as follows; after the introduction, is section two, which discusses the related studies as well as their findings and the theory that underpins the study. Next is the methodology of the study, model specification, results and discussion of findings, followed by conclusion and recommendations and references.

2. Literature Review

Ayeomoni and Aladejana (2016) defined agricultural credit/finance as the mobilisation of resources at all levels in order to increase production and productivity in agriculture and to enhance the productive capacity.Agriculture financing is mainly a long-term financing that aims at inducing agriculture led growth and development in an economy. Monetary policy on the other hand as defined by the Central Bank of Nigeria (CBN) is a deliberate action of the monetary authorities to influence the quantity, cost and availability of money credit in order to achieve desired macroeconomic objectives of internal and external balances. The action here involves changing money supply and/or interest rates with the aim of managing the quality of money in the economy.

The CBN adopts policy measures with the aim of stirring the economy to achieve specific targets. The choice of policy by the CBN, determines to a large extent the amount of credit that can be granted to the agriculture, forestry and fishing sector. Over the years, there have been calls from various segments of the economy to shifts focus from the dependency on oil to agriculture. This involves influencing monetary policies to attract stakeholders to the sector.

2.1 Review of Empirical Studies

A recent study by Bassey, Asinya, andAmba (2014) examined the impact of bank lending and macroeconomic policy on the growth of Small Scale Enterprises (SMEs) in Nigeria using time series data for the period 1992-2011. Data were analyzed using the Ordinary Least Square (OLS) regression technique. Empirical findings revealed that commercial bank credit finance and industrial capacity utilization exerted significant positive impact on the growth of SMEs. Also, exchange rate had a significant negative effect on the growth of SMEs, surprisingly, government expenditure and interest rate charged by banks fails to explain the variation in the growth of SMEs in the period under investigation. The major limitation of this study is that the data were not subjected to various diagnostic tests, besides the use of ordinary least square alone without diagnostic tests to justify its necessity is not sufficient.

Another Nigerian study with similar approach and methodological deficiency was that carried out by Atarere (2016) who examined the influence of monetary policies on the growth of the Small and Medium Scale Enterprises. Using regression analysis, the findings revealed that monetary policies are very important in the regulation of any economic system. it was however recommended that the Monetary authority (CBN) should implement policies that increase the flow of money and direct it to sectors like SMEs with higher propensity to contribute to national economic productivity and should endeavour to make more use of the cash reserve ratio in regulating the operations of commercial banks; and interest rate policy should be such that banks can efficiently intermediate funds in the economy. The major weakness of this study is that the residuals of the analysis were not subjected to various diagnostic tests.

Furthermore, Huelsewig, Mayer and Wollmershaeuser (2005) addressed the credit channel in Germany by using aggregate data by presenting a stylized model of the banking firm in which banks decide on their loan supply in light of uncertainty about the future course of monetary policy. Applying a vector error correction model (VECM) findings suggest that the credit channel in Germany is working alongsidethe interest rate channel. The study concludes that loan supply by the banks declines with an expected fall in the credit margin after a monetary policy shock, while loan demand drops with a fall in the output level and a raise in the loan rate. The decrease in loan supply occurs promptly and bottoms out gradually. The decrease in loan demand proceeds by degrees and continues persistently.

A further research by Ehimare, Emena and Niyan (2015) investigated the effects Monetary Policy has on loan risk exposure in Nigeria commercial banks between 1981 and 2013. The data analysis of this study was carried out with ordinary least

square multivariate regression perspective within the confinement of a vector error correction model (VECM) framework. The result of this study reveals that lending rate does not play significant role in support of loans and advances. However, monetary policy rate reveal the most significant effect on commercial banks loans and advance confirmed by its efficient estimate. The study recommended that monetary authorities give opportunity for the full interplay of the market forces of supply and demand in the allocation of credit .This interplay should be closely monitored to prevent banks from creating artificial scarcity of funds in order to hike their lending rate. The major limitation of this study is that the data were not subjected to various diagnostic tests such as heteroskedasticity.

In another study, Hsieh (2015) based on a reduced-form equation derived from the demand for and supply of bank loans in Greece, this paper finds that the equilibrium bank loan is positively associated with industrial production, the Greek government bond yield and bank deposits and is negatively affected by the policy rate of the European Central Bank, the 10-year U.S. government bond yield and the EUR/USD exchange rate. The significant negative sign of the policy rate suggests that monetary easing (tightening) would increase (reduce) bank loan supply and confirms the existence of the bank lending channel. The major limitation of this study is that the data were not subjected to various diagnostic tests such as heteroskedasticity.

A related work by Ogar (2014) focused on how commercial bank credit can influence manufacturing sector in Nigeria between 1992 and 2011. Ordinary least square of multiple regression model was used to establish the relationship between dependent variable and independent variables. The findings revealed that commercial bank credit had a significant relationship on manufacturing sector. It was recommended that government should endeavor to ensure that there are available and sufficient credit allocated to the manufacturing sector in Nigeria with reasonable or affordable interest rates, and for Nigeria to meet it millennium goals, she will have to depend on productive and services produced within her boundaries. The major limitation of this study is that, the data were no subjected to test of stationarity. Hence, the regression of this study may be sprious.

Again, Tawose (2012) investigated the effect of bank loans and advances on industrial performance in Nigeria between 1975 and 2009. Co-integration and Error Correction technique was adopted for the analysis. The results showed that industrial performance co-integrated with all the identified explanatory variables. The findings implies that every action towards infrastructural development, strengthening of commercial banks, deregulation of interest rate, encouragement of saving among rural dwellers and reduction of inflation rate will boost the

performance of industrial sector significantly.The study concluded that the behavior of real Gross Domestic Product contributed by industrial sector in Nigeria is significantly explained by the commercial banks' loan and advances to industrial sector, aggregate saving, interest rate and inflation rate. The study recommends that commercial banks should be further empowered, so as to be able to grant long-term loan that would boost industrial sector's performance. The major limitation of this study is that the data were not subjected to various diagnostic tests.

Agunuwa, Inaya, and Proso (2015) examined the impact of commercial banks' credits on agricultural productivity in Nigeria between 1980 and 2013. Using OLS techniques, findings revealed that there is a negative relationship between interest rate and agricultural productivity. While a significant positive relationship was found between government spending and agricultural productivity in Nigeria. The study recommended that the agricultural credit, Guarantee Scheme should improve on their conditions for credit guarantee in order to make agricultural financing attractive to commercial banks. Furthermore, the paper advocates amongst others, that the government should subsidized interest rate to the agricultural sector and stop fuel subsidy as this will provide more benefit to the society than the fuel subsidy. The major limitation of this study is that there was no evidence of co-integration. Hence, the OLS regression may be spurious.

Toby (2011) examined the effects of selected bank management ratios on rural lending and small business finance in Nigeria for the period 1992-2007. Regression results found that a critical gap in bank intermediation still exists in the Nigerian rural and SMEs sectors. The results suggest that rural bank management expanded aggregate credit in such a manner that constrained their liquidity profiles, particularly from year 2007. The excess liquidity in the banking system for the period 1992-2007 did not improve the flow of credit to SMEs in Nigeria. The study concluded that banks have failed in their social role of financing the entrepreneur-innovator by restricting the spread of fiat money contrary to the expectations of the Keynes-Schumpeter model. The study recommended that monetary policy should therefore focus on compliance with prudential standards, restoring the mandatory credit allocation regime to rural and SME sectors and deepening the rural financial system.

Imoughele and Ismaila (2014) investigated empirically the impact of commercial bank credit on Nigeria's SMEs between 1986 and 2012. The study employed Co-integration and Error Correction Modelling (ECM) techniques. The results revealed that SMEs and selected macroeconomic variables included in the model have a long run relationship with SMEs output. The study also reveals that

savings time deposit and exchange rate has a significant impact on SMEs output in Nigeria. Furthermore, commercial bank credit to SMEs, total government expenditure and bank density has direct but insignificant impact on the country SMEs output this may be connected with stringent policy in accessing credit facility and the crowd out effect of government expenditure in the economy. The study also shows that interest rate has adverse effect on SMEs output. The study recommended that interest rate on credit facility granted to SMEs should be drastically reduced, commercial banks should grant soft loan to this important sector of the economy and also reduced stringent policy in supply of credit to SMEs and monetary authority should encourage commercial bank to set up more branches in the rural areas in order to encourage rural occupant to save and have assesses to credit facility. The major limitation of this study is that the data were not subjected to diagnostic tests.

Ehinomen and Charles (2012) assessed the effectiveness of the monetary policies in promoting agricultural development in Nigeria for the period 1970 to 2010. OLSwas used in analyzing the data and results showed that although CBN's monetary policies play crucial role in influencing the level of agricultural productivity in the country, it has not recorded significant progress in terms of providing enabling environment for better performance in the agricultural sector. It is consequently recommended that the Central Bank of Nigeria should introduce more monetary instruments that are flexible enough to meet the ever-growing financial sector in order to attract both domestic and foreign investors; while more stringent punishment should be made for non-compliance to the monetary policies by financial institutions. The major limitation of this study is that the data were not subjected to diagnostic tests.

Oni, Emoh and Ijasan (2016) examined the relationship between money supply in the economy and some money market indicators with respect to their impacts on finance for real estate development in Nigeria for the period 2006 to 2010. The Pearson product moment correlation and multivariate regression models were adopted for data analysis. The study found that there is statistically significant relationship between broad money supply (M2) and explanatory variables except inter-bank call rate and prime lending rate. Also, stepwise regression of the variables showed that inflation, monetary policy rate, saving deposit rate, and Treasury bill rate have statistically significant impact on broad money supply in Nigeria. It was recommended that real estate investment trust may possibly be the best option to financing the real estate sector of the Nigerian economy, while the Nigerian Institution of Estate Surveyors and Valuers has great role in birthing the investment vehicle. The major limitation of the study is that the data were not subjected to various diagnostic tests.

Nto, Jude and Alex (2012) examined the influence of monetary policy variables on banks' credit supply to small and medium scale enterprises (SMEs) in Nigeria. Time series data which were collected on quarterly for the period of 1995-2010 and were analyzed using Fully Modified Least Squares (FMOLS). The result of the FMOLS indicated that policies on interest rate and liquidity ratio were negatively and positively significant. It was recommended that government through CBN should strengthen existing policies on the adjustment of interest rates and liquidity ratio so as to increase and stabilize credit supply to SMEs.

The proponents of credit channel include Bernanke and Gertler (1995) and Mishkin (1996). The theory explains that monetary policy describes the theory that a central bank's policy changes affect the amount of credit that banks issue to firms and consumers for purchases, which in turn affects the real economy. The credit channel theory occurs through two conduits namely the balance sheet and bank lending channel. The balance sheet channel theorizes that the size of the external finance premium should be inversely related to the borrower's net worth. For example, the greater the net worth of the borrower, the more likely she may be to use self-financing as a means to fund investment. Higher net worth agents may have more collateral to put up against the funds they need to borrow, and thus are closer to being fully collateralized than low net worth agents.

The bank lending channel theorizes that changes in monetary policy will shift the supply of intermediated credit, especially credit extended through commercial banks. The bank lending channel is essentially the balance sheet channel as applied to the operations of lending institutions. Monetary policy actions may affect the supply of loanable funds available to banks (i.e. a bank's liabilities), and consequently the total amount of loans they can make (i.e. a bank's assets).

The theory that underpins this study is the credit channel theory because, the theory has been postulated as an explanation for a number of puzzling features of certain macroeconomic responses to monetary policy shocks, since the credit channel operates as an amplification mechanism alongside the interest rate effect, small monetary policy changes can have large effects if the credit channel theory holds. It therefore explains how monetary policies can influence the agriculture, forestry and fishery sector of the economy.

3. Methodology and Data

The study will make use of secondary data sourced from CBN statistical bulletin spanning from 1981-2015. The study will make use of inferential analysis with the determination of the order of integration (stationarity) of the variables to

ensure that the analyses are not spurious. The unit root test adopted to check whether the time series data were stationary or not was Phillips Perron (1988). Phillip Perron adopts nonparametric statistical methods to take care of the serial correlation in the error terms without adding lagged difference terms (Gujarati, 2004). Also, cointegration test was conducted in order to analyse whether the variables were cointegrated of have a long run relationship. In order to reconcile the short run behavior, an Error Correction Model (ECM) is used to determine the relationship between monetary policy and agriculture, forestry and fishery financing.

The model that captures the relationship between monetary policy and agriculture, forestry and fishery is stated below:

$$LnAFFF = \beta_0 + \beta_1 LnM2_t + \beta_2 LR_t + \beta_3 MPR_t + \beta_4 EXrate_t + \beta_5 INTR_t + \varepsilon$$

Where,
AFFF = Agriculture, forestry and fishery financing
M2 = Broad money supply
LR = Liquidity ratio
MPR = Monetary policy rate
EXrate = Exchange rate
INTR = Interest rate
$\beta_0 - \beta_6$ = coefficient of the explanatory variables
ε = error term
Ln = Natural Logarithm

Table 3.1: Variables Measurement

S/N	Variable	Nature	Measurement
1.	Agriculture, Forestry and fishery financing	Dependent variable	Measured as total loan advanced to the sector by commercial banks
2.	Broad money supply	Independent variable	Measured as money supply that includes currency in circulation with non -bank (M1) as well as savings and time deposit
3.	Liquidity ratio	Independent variable	Measured as the total specified liquid cash reserve assets to total current liabilities
4.	Exchange rate	Independent variable	Measured as the annual rate of naira to dollar
5.	Minimum policy	Independent	Measured as the official interest

	rate	variable	rate of the CBN which anchors all other interest rates in the economy
6.	Interest rate	Independent variable	Measured as the annual interbank rate

Source: Authors compilation (2016)

From table 3.1, the independent variable is monetary policy, which is proxy by broad money supply (M2), liquidity ratio, exchange rate, minimum policy rate and inflation rate. The dependent variable is mortgage lending which is proxy by mortgage loan.

4. Econometric Analysis and Interpretation

4.1 Unit Root Test Results

Table 4.1: Augmented Dickey-Fuller and Phillips-Perron Unit Root Tests

Variable	ADF t-statistics	Order	PP t-statistic	Order
AFFF	-6.680729***	1	-7.079949***	1
M2	-3.123059**	1	-3.096064**	1
LR	-5.771064***	1	-6.043256***	1
MPR	-3.052333**	0	-3.010467**	0
EXrate	-5.053272***	1	-5.049945***	1
INTr	-5.101073***	1	-6.637030***	1

Note: * significant at 1%; ** significant at 5%; *** significant at 10% Mackinnon critical values
Source: Authors' computation (2016)

Table 4.1 shows the stationarity test results which was carried out to test the presence of unit root which was tested at 5% percent Mackinnon critical value. This was carried out using both Augmented Dickey Fuller (ADF) test and Phillip Perron (PP). According to Gujarati (2014) ADF is conducted by augmenting the preceding three equations by adding the lagged values of the dependent variable, the idea being to include enough terms so that the error term is serially uncorrelated. On the contrary, PP test use nonparametric statistical methods to take care of the serial correlation in the error terms without adding lagged difference terms. From our analysis, Agriculture, forestry & fishery financing (AFFF), broad money supply (M2), liquidity ratio (LR), Exchange Rate (EXrate) and Interest Rate (INTr) were found to be stationary at first difference while, Monetary Policy Rate (MPR) was found to be stationary at levels.

4.2 Cointegration Result

Johansen test for cointegration was conducted among the variables with 1 lags. The result is presented in Table 4.2:

Table 4.2: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.699066	97.45344	95.75366	0.0380
At most 1	0.521460	57.82492	69.81889	0.3082
At most 2	0.385930	33.50343	47.85613	0.5291
At most 3	0.283014	17.41112	29.79707	0.6096
At most 4	0.158774	6.432048	15.49471	0.6444
At most 5	0.021775	0.726507	3.841466	0.3940

Trace test indicates 1 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The result in table 4.2 shows that a long run relationship exist among the variables and therefore, allowed the application of the Vector error correction mechanism to explain the short run relationship between the variables.

4.3 Parsimonious Error Correction Mechanism (ECM) Analysis

With the identification of cointegrating relationship among the variables, the ECM estimation presents option for predicting the dynamic behavior of agriculture forestry and fishery financing response to money supply, liquidity ratio, money policy rate, exchange rate and interest rate.

Dependent Variable: D(AFFF,1)
Method: Least Squares
Date: 10/25/16 Time: 22:54
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(M2,1)	0.758621	0.184876	4.103403	0.0003
D(LR,1)	9.53E-05	0.001967	0.048453	0.9617
D(MPR)	0.010935	0.006951	1.573236	0.1269
D(EXRATE,1)	-0.000776	0.001286	-0.602992	0.5514
D(INTR,1)	-0.000558	0.007430	-0.075077	0.9407

ECM(-1)	-0.663250	0.178230	-3.721319	0.0009

R^2= 28.8%, Adj R^2= 16%, DW=1.905

The ECM term is in line with our apriori expectations. The negative sign and the statistical significance of the ECM are necessary conditions for the correction of any disequilibrium. The coefficient of the ECM (-1) is -0.6632. The negative sign of the coefficient satisfied on condition while the fact that its p-value is significant at 1%, satisfies the second condition. This implies that the speed of adjustment between the short run dynamics and the long run dynamics to its long run equilibrium is 66.3%. Thus, ECM will adequately act to correct any deviations of the short run dynamics to its long run equilibrium by 66.3% annually.

The coefficient of M2 is positive and significant at 1%. This implies that an increase in money supply will result to increase in supply of finance to agriculture, forestry and fishery sector in Nigeria. These findings are in line with the study of Olweny and Chiluwe (2012).Secondly, the coefficient of LR is positive, indicating that a unit increase in LR will result to increase in AFFF in Nigeria for the period under review. Exchange rate is negative but not significantly correlated with AFFF. The finding is contrary to the findings of Bassey *et al*. (2014). Imoughele and Ismaila (2014) concluded that the negative sign implies that devaluation of currency leads to inflationary tendencies which have adverse effect for advancing credit to agriculture, forestry and fishery. The result of INTR shows that the coefficient is negative but insignificant such that an increase in interest rate will lead to a decrease in financing to agriculture, forestry and fishery.

The coefficient of determination measured by the R^2 is 0.288 which implies that 28.8% of the total variations in agriculture, forestry and fishery financing is accounted for by the explanatory variables: money supply, liquidity ratio, monetary policy rate, exchange rate and interest rate. The remaining 71.2% represents the changes in the dependent variable which was not included in the regression equation. The Durbin Watson indicated the absence of serial correlation.

Also on the residuals of the regression analysis, the Jarque-Bera test was carried out to ascertain if the data are normally distributed. It was found that the data were distributed. Also, test of heteroskedasticity was carried to ascertain if the error term hetroskedastic or homokedastic, using Breusch-Pegan-Godfrey test, the null hypothesis was acceptable which implies that the error term was homoscedastic which is desirable.

5. Conclusion and Recommendations

The main purpose of this study is to examine the effect of monetary policy on agriculture, forestry and fishery in Nigeria for the period which spanned from 1981 to 2015. Econometric model was specified and estimated using the OLS techniques to ascertain the relationship between dependent variable (AFFF) and the explanatory variables. The variables were tested for stationarity using ADF and PP. Thereafter, cointegration analysis was carried out and also, ECM test was performed. The findings revealed that monetary policy variables have a long run relationship with agriculture, forestry and fishery financing in Nigeria for the period under review. Furthermore, the study established the fact that broad money supply had a positive and significant relationship with agriculture, forestry and fishery financing in Nigeria. Liquidity ratio and monetary policy rate had a positive but insignificant relationship with agriculture, forestry and fishery financing in Nigeria. Also, exchange rate and interest rate have negative but insignificant relationship with agriculture, forestry and fishery financing in Nigeria.

In view of the findings, the study recommends that an expansionary monetary policy should be adopted with special emphasis on reduction of interest rate to agricultural sector which will attract more interest to agricultural sector, thereby shifting focus from oil and gas. Secondly, effort should be made by government at all levels to direct credit to the agriculture, forestry and fishery sector so as to grow the sector and shift attention from the oil dependent sector.

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