



MONETARY POLICY AND AGRICULTURAL SECTOR OUTPUT IN NIGERIA

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Abstract

Monetary policy through its influence on the financial sector of the economy plays a major role in making credit available to the agricultural sector. This paper empirically examined the impact of monetary policy on agricultural output in Nigeria for a period of 40 years (1981 – 2021). The study relied on secondary data for our analysis which were sourced from Central Bank of Nigeria (CBN) and National Bureau of statistics (NBS). The study used ratio of Agricultural output to GDP (AGR GDP) as the dependent variable and Monetary Policy Rate (MPR), Treasury Bill Rate (TBR), Money supply (MS), Lending Rate (LENR) and Agricultural Credit Guarantee Scheme Fund (ACGSF) as independent variables. The Augmented Dickey Fuller (ADF) stationarity test, Johanson cointegration technique and adopted the Auto regressive Distributed Lag (ARDL) procedure introduced by Persaran Smith and Shin for the estimation were adopted. The results revealed that there is a long run relationship between dependent and the independent variables. The result further shows that the main monetary policy instruments (MPR, LENR, MS, and TBR) and money supply were significant while ACGSF was not statistically significant. It was found out that money supply, lending rate, treasury bill rates and monetary policy rate are important drivers of agricultural output. The study therefore recommends among others: The Central Bank of Nigeria should supervise the disbursement of the Agricultural Credit Guarantee Scheme Fund and ensure that the funds are properly channeled to the agricultural sector; Lending rate should be reduce to encourage borrowing and hence expand investment and productivity in the agricultural sector.

Key words: Monetary Policy, Agricultural sector, Economic growth, Agricultural output, Nigeria, Employment

Background to the study

Agriculture has been defined the science, art, or practice of cultivating the soil, producing crops, and raising livestock and in varying degrees the preparation and marketing of the resulting products (Webster Dictionary, 2021). Okolo, 2004 in Olajide, Akinlami & Tijani 2020) described agricultural sector as the most important sector of the Nigeria economy which holds a lot of potentials for the future economic development of the nation as it had done in the past. The agricultural sector serves all other sectors in the economy especially the industrial sector and at the same time is capable of generating broad-based sustained growth necessary for development. Little wonder the sector is referred to as the bedrock of economic development, especially in the provision of adequate and nutritious food vital for human development. The agricultural sector provides food for domestic consumption and export to needy countries thereby generating foreign exchange which in turn increases the national income in the long run (CBN, 2021).

Other contributions of the sector to an economy include; the generation of employment, raw materials for industrial processing, the rural areas also provide markets for primary inputs and consumer products. In addition, skills developed within the agricultural sector are transferred to other sectors during labour migration whether due to increased productivity or not (Ekine & Nwaokedibe, (2018).

More than 70 percent of Nigeria's population depends on agriculture, which contributes roughly 25 percent of GDP and 60 percent of non-oil exports. The agricultural sector is seen as a major way out of poverty and for the achievement of long-term economic development in developing nations (Ezihe, Agbugba, & Idang, 2017). The sector contributes a significant part of the nation's GDP. Between July and September, 2021, the sector contributed almost 30% of the total GDP (Sasu, 2022).

Governments all over the world drive desired changes in particular sectors of their economy through policy. The policies help to direct resources in favour of a particular goal of government. The problems facing the Nigerian agricultural sector include inadequate capital and credit for start-ups, investment, and expansion of agribusiness. The expectation is that the government can use the instruments of monetary policy to better the sector. Monetary policy through its influence on the financial sector of the economy plays a major role in making credit available to the

agricultural sector. Monetary policy refers to the deliberate efforts of the government to use changes in money supply; cost, size, and direction of credit to influence the level of economic activities to achieve desired macroeconomic stability in an economy (Chigbu & Okonkwo 2014). Monetary policy influences the economy and the agricultural sector through a variety of channels — interest rates, credit and/or bank lending, asset prices via exchange rates, equity and housing prices which are determined by Monetary Policy Rate, Treasury Bill Rates, etc.

In recent times, increasing attention has focused on the sectoral effects of monetary policy given that sectors respond differently to monetary policy shocks. The monetary policy of the Central Bank of Nigeria (CBN) through its influence on the financial sector of the economy is capable of playing a major role in and engineering credit availability to the agricultural sector (CBN, 2008). Despite these roles of the monetary policies in the economy, the agricultural sector output is still relatively low. Hence this study intends to investigate the impact of monetary policies on the Agricultural sector of the Nigerian economy.

Statement of the Problem

Before crude oil was discovered in commercial quantity, Nigeria was a major exporter of agricultural produce, especially cocoa, groundnuts, cotton, palm oil, palm kernel, and rubber. Overtime with the continuous rise of oil prices, both the volume and the range of agricultural exports have declined sharply while agricultural imports have instead increased dramatically.

Worse still, Nigeria seems to no longer be able to produce sufficient food for the country's large and rapidly growing population. The average annual rate of real output growth for agricultural sector fell from 5.4% in 2010 to 2.8 in 2012 and 1.3% in 2014. However, there was a little rise to 3.61%, 4.6% in 2016 and 2020 respectively (Olatunji, 2022). A major challenge facing Nigeria agricultural sector is the inability to capture the financial service requirements of farmers and agribusiness owners who constitute about 70 percent of the population. Farmers need access to capital to purchase land and equipment and to invest in the development of new products, services, production technologies, and marketing strategies. Yet banks are often reluctant to lend money to farmers for agricultural enterprises due to the lack of creditability and collateral. Many studies have shown that monetary effect causes

shocks to the economy in general (Alam & Gilbert, 2016; Iddrisu & Alagidede, 2020; Ekine & Nwaokedibe, 2018), while others stressed its long-run impacts (Abuka, Alinda, Minoiu, Peydro, & Presbitero, 2019). In Nigeria, most studies ignored the impact of main monetary policy instruments such as Monetary policy rate, Treasury bill rate (Abiola, Rotdelmwa, Adedoyin, Inegbedion & Olabisi, 2021; Adama, Asaleye, Oye, & Ogunjobi, 2018; Ajudua, Davis, & Okonkwo, 2015; Oboh, Tule, & Ebuh, 2019). Against this background, this study contributes to the existing literature by investigating the shocks and long-run impacts of monetary policy on Nigeria's agricultural output.

Research Questions of the study

- a. Does Agricultural Credit Guarantee Scheme Fund, Monetary Policy Rate, Treasury Bill Rate, Commercial Bank Lending rate and Broad Money supply have any significant effect on Agriculture or agricultural output in Nigeria?
- b. Is there any relationship between Agricultural Credit Guarantee Scheme Fund, Monetary Policy Rate, Treasury Bill Rate, Commercial Bank Lending rate to farmers and Broad Money supply and agricultural output in Nigeria?

Objective of the study

The major objective of the study is to examine the effect of monetary policy on agricultural output and specifically to:

- i. examine the effect of the Agricultural Credit Guarantee Scheme Fund, Monetary Policy Rate, Treasury Bill Rate, Commercial Bank Lending rate, and Broad Money supply on agricultural output in Nigeria and
- ii. ascertain the existence of any long-run relationship between the Agricultural Credit Guarantee Scheme Fund, Monetary Policy Rate, Treasury Bill Rate, Commercial Bank Lending rate to farmers, and Broad Money supply on agricultural output in Nigeria.

Scope of Study

This research seeks to study agricultural output and how monetary policy affects it. The study shall be made using secondary time series data, for a span of 40 years that

is from 1981 to 2021 which is sufficient and suitable for conducting research, making new findings, and relevant recommendations.

LITERATURE REVIEW

Theoretical Literature

This can also be referred to as the Analytical framework of this paper, which will provide a basis for our empirical analysis. This will be examining the theories that relate to the research questions and hypothesis in terms of the impact of monetary policy on agricultural output.

a. General Equilibrium Theory (IS-LM)

The theoretical background of this study is based on the Keynesian ISLM framework. The term "IS" is the shorthand expression of the equality of Investment (I) and Saving (S) which represents the product market equilibrium. On the other hand, the term "LM" is the shorthand expression of the equality of money demand (L) and money supply (M) and represents the money market equilibrium. According to Jinghan (2012), the LM curve shows all combinations of interest rates and levels of income at which the demand for and supply of money are equal. The LM curve slopes upward from left to right because, given the supply of money, an increase in the level of income increases the demand for money which leads to a higher rate of interest. The LM function shifts to the right with the increase in the money supply given the demand for money or due to the decrease in the demand for money, given the supply of money.

An increase in the money supply brings down the interest rate in the money market. This in turn increases investment thereby raising the level of income. The general equilibrium of the product and money markets is based on the static equilibrium analysis. Thus the effect of an increase in money supply is to shift the LM function to a new equilibrium position at a lower interest rate and higher income level.

b. Liquidity Preference Theory of Money

Keynes' approach to the demand for money is based on two important functions. Firstly, the Medium of exchange and secondly store of value. Keynes explained the theory of demand for money with the following questions. i). Why do people prefer liquidity? ii). What are the determinants of liquidity preference? People require money to carry out day-to-day transactions but most of them receive income once a

month. Individuals hold cash in order “to bridge the interval between the receipt of income and its expenditure”. This is regarded as transactionary demand for money. Precautionary motive for holding money refers to the desire of the people to hold cash balances for unforeseen contingencies. The cash held under speculative demand for money is used to make speculative gains by dealing in bonds whose prices fluctuate. Keynes holds that the transaction and precautionary motives are relatively interest inelastic, but are highly income elastic.

The Keynesians believe that the money supply, through its transmission mechanism, has an indirect effect on the real GDP. Monetarists while agreeing with Keynes that in the short run, the economy does not operate at full employment, therefore expansionary monetary policy may work positively in the long-run, support classists that rising money supply will increase inflation only. Therefore, they suggest that the policy must accommodate the increase in real GDP without changing the price level (Lanlord, 2008). Most of the modern economists are of the view that long-run growth depends upon the enhancement of productivity. If an appropriate monetary policy is supplemented by the external environment of suitable liquidity, interest rate, robust demand, soft assistance from the world bank or the financial institutions and debt rescheduling would lead to sustainable economic growth in the long run (Russell, 2010). Monetarists strongly believe that monetary policy exerts a greater impact on economic activity as an unanticipated change in the stock of money affects output and growth, i.e. the stock of money must increase unexpectedly for the central bank to promote economic growth. They are of opinion that an increase in government spending would crowd out the private sector and such can outweigh any short-term benefits of an expansionary fiscal policy (Adefeso & Mobolaji, 2010).

On the other hand, the concept of the liquidity trap, which is a situation in which real interest rates cannot be reduced by any action of the monetary authorities, was introduced by Keynesian economics. Hence, in at liquidity trap, an increase in the money supply would not stimulate economic growth because of the downward pressure of investment owing to the insensitivity of interest rate to the money supply. John Maynard Keynes recommends fiscal policy by stimulating aggregate demand to curtail unemployment and reduce it to control inflation. While there are several studies on this debate between Keynesian and Monetarist in developed countries,

only fragmented evidence has been provided on this issue in the case of Nigeria (Adefeso & Mobolaji, 2010).

c. The Classical theory

The classical monetary theory is the first renowned theory of monetary policy and is enshrined in the Irving-Fisher Quantity Theory of Money (QTM), which lays the foundation for the link between monetary policy (money) and economic variables. In this theory, both the velocity of money and output are assumed as constant, thus any increase in the quantity of money will only eventually increase prices proportionally in accordance with the quantity theory. The long-run growth was only affected by real factors, and the money supply has both short-run and long-run neutrality (Gali, 2008; Mankiw and Taylor, 2007). Keynes rejected the quantity theory, both theoretically and as a tool of applied policy, in part arguing that the velocity of money is unstable and not constant. QTM also assumed the absence of a trade-off between inflation and output (Keynes, 1936).

Keynesianism rationalized that prices are rigid and that the quantity of money adjusted rapidly. Money demand was not exogenous but endogenous and is dependent on income and interest rates as explained in the liquidity preference theory. The theory also assumes a positive relationship between output and interest rate, based on the liquidity preference money supply relationship, also known as the LM curve. The basic version of the IS-LM model assumes a fixed price level; and thus cannot be used to analyze inflation but output in the short run (Hicks, 1937). The liquidity preference theory combines money demand with the quantity of money supplied by the central bank to determine the money equilibrium level. This equilibrium makes the interest rate a monetary phenomenon. The money supply is assumed to be exogenous and any increase in the money supply will lead to lower interest rate at which the quantity of money demanded equals the supply.

Lower interest rates have a positive feedback on marginal efficiency of capital and investment, consequently leading to output expansion. Hicks IS/LM view of the Keynes's general theory was, however, contested empirically (Robinson, 1962; Leijonhufvud, 1968).

Empirical Review

There are some similar studies that empirically investigated the impact of macroeconomic factors, including monetary policy variables, on agricultural

performance. For instance, Oboh, Tule, & Ebuh (2019) examined the impact of monetary policy on agricultural sector performance in Nigeria. The study employed the Autoregressive-Distributed Lag (ARDL) approach and established a long-run relationship between agriculture value added and some monetary policy variables. Specifically, the findings suggested that in the long run, money supply and maximum lending rate have significant effects on agriculture value-added while exchange rate and inflation do not. Given the important role of money supply in promoting agricultural sector performance, the paper recommended an expansionary but non-inflationary monetary policy to improve value addition to the agricultural sector of the Nigerian economy.

In examining the impact of monetary policy channels on agricultural performance in Nigeria Abiola, Rotdelmwa, Adedoyin, Inegbedion & Olabisi (2021) used output, employment, and export as metrics for agricultural performance, and the channels of monetary policy considered were credit, interest rate, money and exchange rate. Structural Vector Autoregression (SVAR) and dynamic ordinary least squares (DOLS) were employed. The SVAR variance decomposition findings show that the forecast error shocks of monetary policy channels affect agricultural performance. Likewise, the long-run equations from the DOLS show that output has a positive relationship with money supply, a negative relationship between employment and interest rate, and a negative relationship between exchange rate and export.

Kolawole (2013) investigated the connection among institutional reforms, interest rate policy and agricultural sector financing using the error correction mechanism (ECM). Ajudua, *et al.* (2015) used the ordinary least squares (OLS) method to investigate the impact of monetary policy on output in Nigeria's agricultural sector. The scholars reported that interest rates negatively affect agriculture production, while money supply promotes output in the sector. Udejaja & Udoh (2014) also investigated the impact of monetary policy on the agricultural sector using autoregressive distributed lags. Also, Muftaudeen and Hussainatu (2014) analyzed the macroeconomic policy impact on agriculture using the VECM method. The results showed that government spending has a positive and substantial impact on agricultural productivity, while short-term credit to agriculture has a negative effect on agricultural productivity. Olorunsogun (2020), examined the impact of monetary policy on Agricultural output, using Vector Error correction Method (VECM). The

study revealed that there is a longrun statistical relationship between monetary policy instruments and agricultural output. The study further concluded that changes in monetary policy instruments causes changes in agricultural output.

Olajide, Akinlabi & Tijani (2016) analyzed the relationship between Agricultural resources and economic growth in Nigeria. The Ordinary Least Square regression method was used to analyze the data. The results revealed a positive cause-and-effect relationship between gross domestic product (GDP) and agricultural output in Nigeria. Ekine & Nwaokedibe (2018) investigated the effectiveness of monetary policy measures in driving agricultural output in Nigeria between 1981 and 2016. They examined the impact of money supply, prime lending rate, deposit money bank credits to agriculture and inflation rate on agricultural output, using static and dynamic regression models. Dynamic error correction model formed the basis for the data analysis. It was found from the parsimonious ECM that one period lag of money supply and deposit money bank credits to agriculture have a significant positive impact on agricultural output. The study concludes that instability in price level has a dampening effect on agricultural output. The effectiveness of the monetary policies in promoting agricultural development in Nigeria for the period 1970 to 2010 was investigated by Ehinomen and Akorah (2012) in Abiola *et al*, (2021). They employed the Ordinary Least Square method (OLS) using E-view. The results showed that although CBN's monetary policies play a 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 to attract both domestic and foreign investors; while more stringent punishment should be made for non-compliance to the monetary policies by financial institutions.

This study is distinguished from the above studies by investigating the monetary policy main instruments' effects on Nigeria's agricultural output. Variables used for this study are, are agricultural sector's output, Treasury Bill Rates, Agricultural Credit Guarantee Scheme Fund, Monetary Policy Rate, Commercial Bank Lending rate to farmers, and Broad Money supply. ARDL model was used to investigate the long-run impact.

RESEARCH METHODS

Theoretical framework

Model Specification

The main focus of this study is to determine the extent to which monetary policy have influenced agricultural output in Nigeria. From our literature review a model used by Abiola *et al* (2021) is adapted. His model was given as:

$$AGRUT = f((INTR, EXCR, MMS, CRAS) \dots \dots \dots) \quad (3.1)$$

Where: AGRUT – Agriculture output;

INTR – Interest rate

EXCR – Exchange rate;

ACGSF -Agricultural Credit Guarantee Scheme Fund;

MMS– Broad Money Supply

The model for this study is given as;

$$AGR GDP = f(ACGSF, MPR, MS, TBR, LENR) \dots \dots \dots (3.2)$$

The model introduces 3 main instruments of monetary policy to the adapted model. equation 3.2 explicitly becomes;

$$AGR GDP = \beta_0 + \beta_1 ACGSF + \beta_2 MPR + \beta_3 MS + \beta_4 TBR + \beta_5 LENR + \epsilon \quad (3.3)$$

Taking log of AGRDP, ACGSF and MS we have

$$\ln AGR GDP = \beta_0 + \beta_1 \ln ACGSF + \beta_2 \ln MPR + \beta_3 \ln MS + \beta_4 TBR + \beta_5 LENR + \epsilon \dots (3.4)$$

Where: AGR GDP – Agriculture output;

ACGSF -Agricultural Credit Guarantee Scheme Fund;

MPR – Monetary Policy Rate;

TBR – Treasury Bill Rate;

LENR – Commercial Bank Lending rate;

MS – Broad Money supply,

ϵ_t is the error term that is assumed to be normally distributed with the mean of zero and constant variance; β_0 is the Constant term/intercept while $\beta_1; \beta_2; \beta_3; \beta_4, \beta_5$ are the Slope coefficient.

A-priori expectation: $\beta_0, \beta_1, \beta_3 > 0; \beta_2, \beta_4, \beta_5 < 0$

The following ARDL model was estimated in order to test the co-integration relationship between the variables: Agriculture output (AGR GDP); -Agricultural Credit Guarantee Scheme Fund (ACGSF); Monetary Policy Rate (MPR); Foreign Private Investment (FPI); Lending rate (LENR); Broad Money supply (MS).

$$\Delta \ln(\text{AGR GDP})_t = \alpha_0 + \sum_{i=1}^p b_1 \Delta(\text{ACGSF})_{t-i} + \sum_{i=0}^p b_2 \Delta(\text{MPR})_{t-i} + \sum_{i=0}^p b_3 \Delta(\text{LENR})_{t-i} + \sum_{i=0}^p b_4 \Delta(\text{TBR})_{t-i} + \sum_{i=0}^p b_5 \Delta \ln(\text{MS})_{t-i} + \delta_1 \ln(\text{AGR GDP})_{t-1} + \delta_2 \ln(\text{ACGSF})_{t-1} + \delta_3 (\text{MPR})_{t-1} + \delta_4 (\text{LENR})_{t-1} + \delta_5 (\text{TBR})_{t-1} + \delta_6 \ln(\text{MS})_{t-1} + U_t \dots \dots \dots (3.5)$$

The first step in the ARDL bounds testing approach is to estimate equation (3.5) by Ordinary Least Squares (OLS) in order to test for the existence of a long run relationship among the variables by conducting an F-test for the joint significance of the coefficients of the lagged levels of the variables, that is:

$$H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = 0 \text{ against the alternative}$$

$$H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq \delta_6 \neq 0$$

Once co-integration was established the conditional ARDL model with estimates of the long run position represented by the ECM is as stated below;

$$\Delta \ln(\text{AGR GDP})_t = \alpha_0 + \sum_{i=1}^p b_1 \Delta \ln(\text{ACGSF})_{t-i} + \sum_{i=1}^p b_2 \Delta(\text{MPR})_{t-i} + \sum_{i=0}^p b_3 \Delta(\text{LENR})_{t-i} + \sum_{i=0}^p b_4 \Delta(\text{TBR})_{t-i} + \sum_{i=0}^p b_5 \Delta(\ln \text{MS})_{t-i} + \theta \text{ECM}_{t-1} + U_t \dots \dots \dots (3.6)$$

Sources of data

This study utilizes historical and quantitative data. It employs annual time series data spanning the period 1981 to 2021. Sources of the data include Central Bank of Nigeria Statistical Bulletins various issues and National Bureau of Statistics.

Presentation and discussion of results

Descriptive Statistics

Table 1: Descriptive statistics of the variable under study

	AGR GDP	ACGSF	LENR	TBR	MPR	MS
Mean	9446.636	3220109.	1.15E+14	1.18E+10	4.80E+09	7416.717
Median	5024.540	728545.4	31327285	162754.8	442413.4	1269.320

Maximum	41126.06	12456251	4.72E+15	4.81E+11	1.96E+11	41768.53
Minimum	2303.510	24654.90	2321.572	33.78443	403.4288	14.47000
Std. Dev.	8561.062	3898679.	7.37E+14	7.52E+10	3.06E+10	11011.55
Skewness	2.072271	0.856914	6.166408	6.166368	6.166276	1.597557
Kurtosis	3.878654	2.297717	3.02473	3.02441	3.02367	4.736503
Jarque-Bera	70.00494	5.860276	2476.878	2476.835	2476.736	22.59134
Probability	0.873481	0.053390	0.627421	0.700134	0.634419	0.612894
Sum	387312.1	1.32E+08	4.73E+15	4.83E+11	1.97E+11	304085.4
Sum Sq. Dev.	2.93E+09	6.08E+14	2.17E+31	2.26E+23	3.74E+22	4.85E+09
Observations	41	41	41	41	41	41

Source: Author's extraction from E-views 9

Table 1 presents the descriptive statistics for Agricultural output (AGR GDP), Broad money supply (MS), Lending Rate (LENR), Treasury Bill rate (TBR), Monetary Policy Rate (MPR), and Agricultural Credit Guarantee Scheme Fund (ACGSF). The table explains the mean, median, maximum, minimum, and standard deviation of the series. The Skewness result is averaging 0, showing normality for all the series. Kurtosis is approximately 3, revealing that the distributions are normally distributed. Probability for the Jarque– Bera statistics and the equivalent *p*-values are greater than 5% for all the series except ACGSF. This further supports the normality of the data used for the study.

Unit Root Test

This study conducted a test of the order of integration for each variable using the Philip-Perron unit root test. This becomes necessary because Granger and Newbold (1974) and Granger (1986) noted that if time series variables are non-stationary, all findings with these time series will be at variance with the conventional theory of variables, and will be spurious and deceptive. The test is designed to examine the order of integration of the variables. The null hypothesis is that the variables under

investigation have unit root as against the alternative that they do not. The decision rule is to reject the null hypothesis if the ADF statistic value exceeds critical value at a chosen level of significance (in absolute term). These results are presented in table 4.2 below.

Table 2 Summary of Augmented Dickey-Fuller unit root test

VARIABLES	ADF VALUE	CRITICAL VALUE AT 5%	ADF VALUE @ 1 ST DIFF.	ORDER
AGR GDP	3.275370	2.941145		I(0)
MS	6.969187	2.960411		I(0)
LENR	6.313185	2.936942		I(0)
ACGSF	01.488375	2.938987	-7.157253	I(1)
MPR	-6.325182	-2.936942		I(0)
TBR	-6.307931	-2.936942		I(0)

***Significant if ADF > Critical @5%**

Source: Author's extraction from E-views 9

Table 2 shows that all the variables (AGR GDP, MS, LENR, MPR and TBR) are stationary at level I(0), except ACGSF that is stationary at first difference I(1). This shows that the regression results that will be generated from this data shows the actual condition and not spurious.

Bounds Test for Co-Integration

The results of the bounds test for co-integration along side with critical values are reported in Table 3 below.

Table 3: ARDL Bound Test for Co-integration Analysis

Test statistic	Computed F-statistic	Lag	Significance level	Critical values	
F-statistic	7.900074	1	10%	Lower Bounds	Upper Bounds
			5%	2.26	3.35
			5%	2.62	3.79
			2.5%	2.96	4.18

	1%	3.41	4.68
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Source: Author Regression Output from Eviews 9.

The Computed F-Statistic from bound test is 7.900074. This value exceeds the lower and upper bounds critical value of 2.62 and 3.79 at the 5% significance level respectively. This implies that the alternative hypothesis of the existence of a unique co-integration (long run) relationship between dependent variable (Agriculture output (AGR GDP)) and the independent variables (Money supply (MS), Lending rate (LENR), Monetary policy rate (MPR), Treasury Bill Rate (TBR)) is accepted. We therefore conclude that cointegration exists among the variables.

Longrun estimation

Table 4: The longrun Estimate for ARDL model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3796.559	636.7974	5.961957	0.0000
LnAGR GDP(-1)	1.285838	0.085983	14.95447	0.0264
LnACGSF	-0.577695	0.298411	-1.935901	0.0593
MPR	-0.422064	0.060561	-6.969187	0.0281
MPR(-1)	143.1143	37.92749	3.773367	0.0008
lnMS	0.720884	0.049981	14.42321	0.0483
LnMS(-1)	0.456606	0.0089783	5.085661	0.0000
TBR	-0.772704	0.068900	-11.21491	0.0000
LENR	-2.460880	0.321663	-7.650495	0.0371
R-squared	0.908414	Mean dependent var		9446.636
Adjusted R-squared	0.895330	S.D. dependent var		8561.062
F-statistic	69.43067	Durbin-Watson stat		1.876194
Prob(F-statistic)	0.000000			

Source: Author Regression Output from Eviews 9.

Table 4 above reveals the long-run impact of the regressors on the dependent variable. Agricultural credit guarantee scheme fund (ACGSF) has a negative sign

which does not conform to the a-priori expectation. With a coefficient of -0.577695 indicating a unit increase in ACGSF will lead to a 0.578 fall in agricultural output (AGR GDP) and not statistically significant. This can be attributed to non accessibility of the fund by the farmer. This is contrary to the findings of Abiola *et al* (2021). Monetary policy Rate (MPR) has a negative sign which tallies with the a priori specification, that there is an inverse relationship between monetary policy rate (MPR) and agricultural output (AGR GDP). With a coefficient of -0.422064, implies a unit change in MPR will lead to -0.422064 decrease in agricultural output (AGR GDP) because agribusinesses at this point will obtain minimal or no loans and credit for expansion therefore, curtailing production in the sector and output in general. This is in agreement with the work of (Abiola *et al*, 2021).

Money supply had an expected positive sign with a coefficient of 0.720884 and statistically significant at 5 per cent. This implies that a unit increase in money supply will increase agriculture value added by 0.72 units. The positive impact of money supply on agricultural value added agrees with economic theory. That is, an increase in nominal money supply causes a decrease in nominal interest rate which encourages borrowing for investment purposes, hence, a boost in agriculture value added (Thapa, 2002). The results tend to re-affirm the relevance of expansionary monetary policy stance in promoting agricultural development. It however disagreed with an earlier study by Aroriode and Ogunbadejo (2014) that found an inverse relationship between money supply and agricultural output. The contrasting findings may be due to the different measures of agricultural sector performance adopted by the two studies.

Treasury bill rate (TBR) has negative sign which conform to the a-priori expectation. With a coefficient of -0.772704, implies that a unit increase in TBR will lead to 0.77 decrease in agricultural output. This conforms to economic theory that there is an inverse relationship between Treasury bill rate and agricultural output in Nigeria. This is in agreement with the work of Ekine & Nwaokedibe (2018). Lending rate (LENR) has a negative sign, which is line with the a-priori expectation. It has a coefficient of -2.460880, this implies that a unit increase in lending rate will lead to a fall in agricultural output (AGR GDP). This is in agreement with the work of Oboh *et al* (2019) that maximum lending rate is negative and has significant effect on agricultural output.

The R^2 measures the goodness of fit, the coefficient of multiple determinations (Adjusted R^2) explains the extent to which the independent variables affect the dependent variable. R-square at 0.908414 or 91% indicates a very strong relationship between the dependent and independent variables. In this case, 91% of the variations in the dependent variable are explained by the independent variables. The adjusted R-square shows a more conservative way of looking at the coefficient of determination is also above 50% at 90%. So 90% of the changes in agricultural output (AGR GDP) are explained by changes in the (ACGSF), Monetary policy rate (MPR), Broad Money Supply (MS), Treasury Bill Rates (TBR), and commercial bank lending rate (LENR). Only 10% of the variations are determined by other factors outside our model. Moreover, this table shows the results of the serial correlation test i.e Durbin- Watson statistic placed at 1.876194 indicates the absence of autocorrelation in the series. The value of the F-statistic is 69.43067 [0.0000] and suggests that the estimated model has an overall significance at the traditional 1% level.

Short Run Estimation.

Given the fact that the variables of the model are co-integrated, a short-run dynamics estimation is carried out to capture the speed of adjustment to equilibrium in the case of any shock to any of the independent variables. Based on the general to the specific framework, an overparameterized error correction model of AGR GDP was estimated. As such parsimonious equations were obtained.

The result obtained from the parsimonious estimation of the equations is presented as follows.

Table 5: Error Correction Representation for ARDL Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	713.0265	486.6290	1.465236	0.1584
D(ACGSF)	0.482148	0.173769	2.774653	0.0125
D(MPR)	-0.782294	0.137876	-5.673911	0.0108
D(MS)	1.192844	0.256529	4.649939	0.0002
D(LENR)	9.91E-10	4.25E-10	2.332560	0.0302
D(TBR)	0.950410	0.361517	2.628946	0.0182
D(AGR GDP(-1))	0.155372	0.202532	0.767150	0.4520

D(ACGSF(-1))	0.107632	0.038259	2.813242	0.0125
D(MPR(-1))	-0.158235	0.059950	-2.639423	0.0179
D(MS(-1))	0.420205	0.424757	0.989283	0.3343
D(MS(-2))	-0.824319	0.439274	-1.876546	0.0452
ECM(-1)	-0.482148	0.173769	-2.774653	0.0125
R-squared	0.909777	Mean dependent var		1018.868
Adjusted R-squared	0.833087	S.D. dependent var		3100.206
F-statistic	11.86311	Durbin-Watson stat		1.597718
Prob(F-statistic)	0.000001			

Source: Authors computation on Eviews 9

Table 5 shows the error correction representation for ARDL model for the short run. It reveals that in the short run, a small change in Agricultural Credit Guarantee Scheme Fund (ACGSF), Treasury bill rate, Money Supply, Monetary policy rate, commercial banks lending rates as well as a year lag of these dependent variables have significant impacts on the Agricultural sector output. The value of the ECM is -0.482148 and is correctly signed, that is, it conforms to a-priori expectation and is significant at the 5% level. It implies that the speed of adjustment, 48.21% of the errors in the previous disequilibrium has been corrected in the current period.

STABILITY TEST

Stability test is performed using Cumulative Sum (CUSUM) and Cumulative Sum of Square (CUSUM Q) of residual of the model as shown in figure 1 and 2. The existence of parameter instability is established if the Cumulative Sum of the residual goes outside the area between the critical (dotted bounded) lines. It is estimated at 5 percent critical level. From figure 1 and 2, it can be inferred that the model at 5 percent level of significance has been stable over time. The decision rule is that all the coefficients of the error correction are stable and the null hypothesis cannot be rejected provided that the plots stay within 5% range of the significance level (i.e. within the two straight lines), if otherwise, we reject the null hypothesis (Pesaran, Shin & Smith 2001). As shown in figures 1 and 2, both plots lie within the critical boundaries, this implies that the long run coefficients of the model is stable.

Fig. 1: Plot of Cumulative Sum of Recursive Residual Results

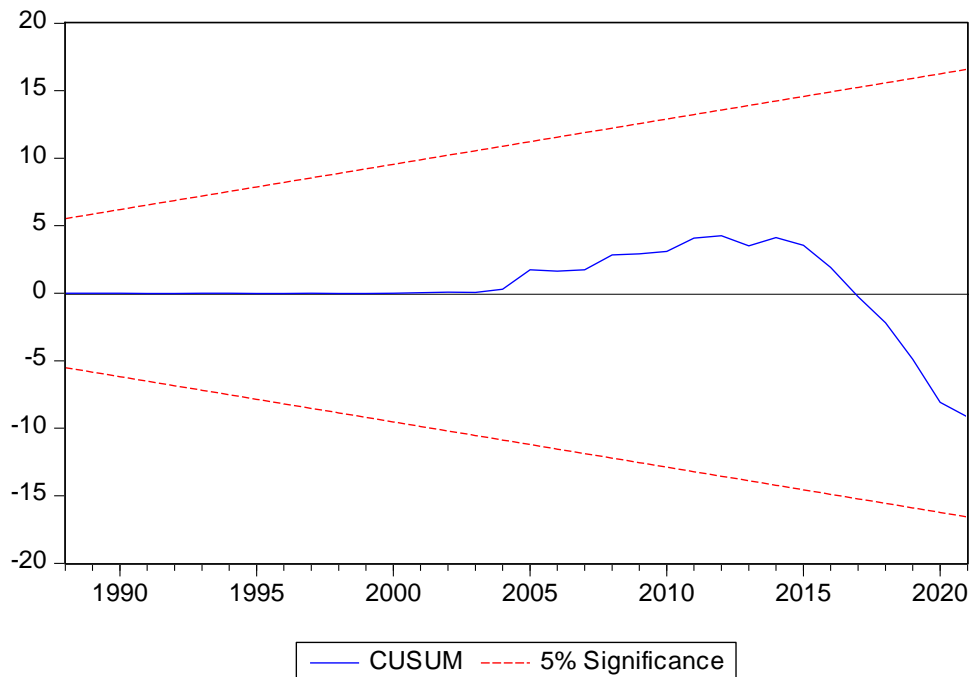
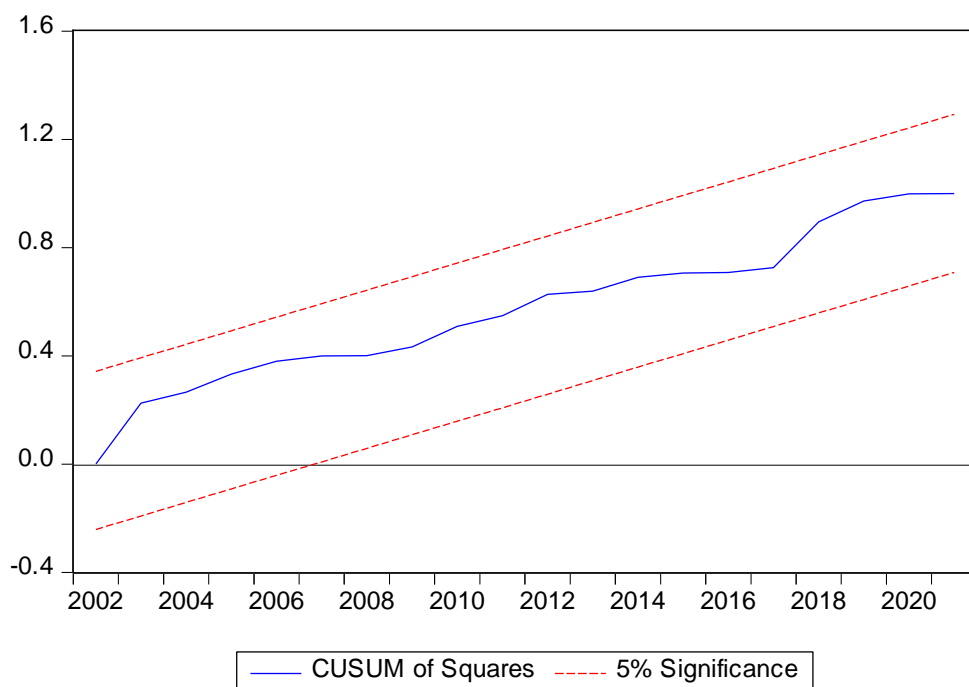


Fig. 2: Plot of Cumulative Sum of Square of Recursive Residual Results



Conclusion and Policy Recommendations

This study empirically analyzed impact of monetary policy instruments measures on agricultural output in Nigeria, for the period which spanned between 1981 and 2021.

A dynamic regression mode was specified and estimated to ascertain the relationship between agricultural output and the explanatory variables. Variables used for the study are two core monetary policy instruments (Treasury bill rate (TBR) and monetary policy rate (MPR)), money supply (MS), commercial bank lending rate to agriculture (LENR), and Agricultural Credit Guarantee Scheme Fund (ACGSF). The variables were tested for stationarity, co-integration analysis was carried out and also error correction test was performed.

The study found that the agricultural output has a long run relationship with the independent variables. The study further revealed that money supply, lending rate, treasury bill rates and monetary policy rate are important drivers of agricultural output while Agricultural Credit Guarantee Scheme Fund was found insignificant. This might be as a result of commercial banks misappropriating this fund, by directing such funds to non agricultural. The study therefore conclude that the 3 core monetary policy instruments have significant impact on agricultural output in Nigeria.

Based on the findings, the study recommends the following;

- a) The Central Bank of Nigeria should supervise the disbursement of the Agricultural Credit Guarantee Scheme Fund and ensure that the funds are properly channeled to the agricultural sector.
- b) The Central Bank of Nigeria (CBN) should place more emphasis on expansionary monetary policy framework with a view to increasing monetary aggregates to boost output in the agricultural sector.
- c) Lending rate should be reduce to encourage borrowing and hence expand investment in the agricultural sector.

References

- Abiola, A.J; Rotdelmwa, F.; Adedoyin,Maimako.I; Inegbedion H; & Olabisi, P. (2021) Monetary Policy Channels And Agricultural Performance: Evidence From Nigeria. *Asian Economic and Financial Review*. Retrieved online at DOI: [10.18488/journal.aefr.2021.113.205.218](https://doi.org/10.18488/journal.aefr.2021.113.205.218) on 20/12/22.
- Abuka, C., Alinda, R. K., Minoiu, C., Peydro, J., & Presbitero, A. F. (2019). Monetary policy and bank lending in developing countries: Loan applications, rates, and real effects. *Journal of Development Economics*, 139, 185 – 202. Available at: <https://doi.org/10.1016/j.jdeveco.2019.03.004>.
- Adama, I. J., Asaleye, A. J., OYE, A. J., & Ogunjobi, J. (2018). Agricultural production in rural communities: Evidence from Nigeria. *Journal of Environmental Management and Tourism*, 9(3), 428-438. Available at: [https://doi.org/10.14505/jemt.v9.3\(27\).04](https://doi.org/10.14505/jemt.v9.3(27).04).

- Adefeso, H.A. and Mobolaji, H.I. (2010). The Fiscal-Monetary Policy and Economic Growth in Nigeria: Further Empirical Evidence. *Pakistan Journal of Social Sciences*, 7(2): 137-142.
- Ajudua, E. I., Davis, O. J. P., & Okonkwo, O. N. (2015). A review of monetary policy and the Nigerian agricultural sector performance. *International Journal of Academic Research in Progressive Education and Development*. 4(3), 70-86. Retrieved online at <https://doi.org/10.6007/ijarped/v4-i3/1789>. on 18th January, 2023.
- Aroriode, J.R and Ogunbadejo, H.K. (2014). Impact of Macroeconomic Policy on Agricultural Growth in Nigeria. *Journal of Agriculture and Veterinary Science*, 7(2) [online] www.iosrjournals.com (Accessed 17 November, 2022)
- Central Bank of Nigeria (2021) Statistical Bulletin of Central Bank of Nigeria (CBN). Retrieved from: <http://www.cbn.org/out/publications> on 15/12/2022 on 27th January, 2023.
- Chigbu E. E and Okonkwo O.N.,(2014) Monetary Policy and Nigeria's Quest for Import Substitution Industrialization. *Journal of Economics and Sustainable Development*. 5(23), 99-105.
- Ekine, D.A. & Nwaokedibe, L.I. (2018) Effect of Monetary Policy on Agricultural output in Nigeria (1981-2016) *IOSR Journal of Agriculture and Veterinary Science (IOSRJAVS)*, pp 2319-2372. Retrieved online at www.iosrjournals.org on 18th December, 2022.
- Ezihe, J.A.C., Agbugba, I.K. and Idang, C. (2017). Effect of Climatic Change and Variability on Groundnut (*Arachis hypogea*, L.) Production in Nigeria, *Bulgarian Journal of Agricultural Science*, (BJAS), 23 (6), 906-914.
- Jinghan M. L. (2012). *Macro Economic Theory*. Delhi. Vrinda Publications (P) Ltd
- Kolawole, B. O. (2013). Institutional reforms, interest rate policy and the financing of the agricultural sector in Nigeria. *European Scientific Journal*, 9(12), 259-272.
- Leijonhufvud, A. (1968). *On Keynesian Economics and the Economics of Keynes: A study in monetary theory*. Oxford University Press, New York.
- Mankiw, G.N. & Taylor, M.P. (2007). *Macroeconomics. (European Edition ed.)* Basingstoke: Palgrave Macmillan.
- Muftaudeen, O. O., and Hussainatu, A. (2014). Macroeconomic policy and agricultural output in Nigeria: *Implications for food security. American Journal of Economics*, 4(2), 99-113.
- Oboh, V.U.; Tule, M.K. & Ebuh, G.U (2019) Does Monetary Policy matter for Agricultural Sector Performance? Empirical Evidence from *Nigeria Journal of Economics and Sustainable Development*. 10(12): 203 – 211.
- Okolo, D. A. (2004). "Regional Study on Agricultural Support: Nigeria's Case," being Special Study Report prepared for Food and Agricultural Organization (FAO).
- Olajide, O.T.; Akinlabi, B. H. Tijani, A.A. (2016) Agriculture Resource And Economic Growth In Nigeria *European Scientific Journal* October edition vol. 8, No.22 ISSN: 1857 – 7881 (Print) e-ISSN 1857- 7431
- Olatunji, E. (2022). Nigeria's food imports hit N464.5bn in 6months. Retrieved online at <https://businessday.ng/amp/business-economy/article/Nigerias-food-imports-hit-N464.5bn-in-6months/> on 17th January, 2023.
- Olorunsogun (2020) Impact of monetary policy on Agricultural output. Retrieved online at ht

Pesaran, M. H., Shin, Y. & Smith, R. J. (2001). Bound testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16: 289-326.

Robinson, J. (1962). Review of Johnson. *Economic Journal*, Vol. 72, pp. 690-2.

Sasu, D.D. (2022). Contribution of agriculture to GDP in Nigeria 2019 – 2021. Retrieved online at <https://www.statista.com/statistics/1193506/contributions-of-agriculture-to-gdp-in-Nigeria/> on 17th January, 2023.

Udejaja, E. A., & Udoh, E. A. (2014). Effect of monetary policy on agricultural sector in Nigeria. *CBN Economic and Financial Review*. 52 (Issue 2). Retrieved online at <http://dc.cbn.gov.n/efr/vol52/iss2/1/> on 17th January, 2023.