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The impact of monetary policy instruments on real sector output in Nigeria (1981-2020)

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Abstract
This study looked at how Nigeria's real sectors performed in relation to monetary policy tools. Data for the research were taken from the CBN statistics bulletin of the Central Bank of Nigeria. The enhanced Dickey Fuller and Philip-Perron unit root test was used to determine if the variables were stationary. The results of the ADF unit root test showed that the variables' orders of integration were 1(1) and 1. (0). This condition necessitates the use of the ARDL to cointegration approach in the research in order to determine the long-run connection between the variables utilising bound tests. The ARDL's findings demonstrated that the factors had a long-term association. It also demonstrates that the monetary policy tools (MPR, CRR MS, & TBR) have a short-term impact on Nigeria's real sector production (AGDP & MGDP). Therefore, the research suggests, among other things, that monetary targeting be used by the central bank (CBN) as a tool for monetary policy in order to attain some of the macroeconomic goals of price stability and full employment. In order to allow deposit money banks to provide affordable loans to investors, the monetary authority (CBN) should also evaluate the monetary policy rate and cash reserve ratio downward. Federal government should also peg the Treasury bill at a rate that is competitive enough to attract investors.

Keywords: Cash reserve ratio, Monetary policy rate, Money supply, Real sector output, Treasury bill rate

1. Introduction

Every government, whether developed and developing, aspires to a set of macroeconomic goals, such as full employment, price stability, a favourable balance of payments, etc. In Nigeria, government institutions in charge of carrying out economic policy work together to attain the macroeconomic goals via the manipulation of a number of instrumental factors. Target variables and instrumental variables are two major concepts that the monetary policy authority (CBN) in Nigeria uses to deal with and accomplish monetary policy goals. While instrumental variables seek to estimate demand and supply curves or factors that impact other variables in the model, target variables are those whose values are anticipated by and modelled by other variables (Siyasanga & Hlalefang, 2017). The real economy is anticipated to be impacted by macroeconomic goals via changes in interest rates, which will change the cost of capital and investment in the productive sector. The real sector, which is an economy's main constituent, deals with the production, acquisition, and movement of commodities and services. The manufacturing and service sectors make up the sector. Housing, agriculture, manufacturing, mining, infrastructure, and the service industry are some of them. The real economy is critical and essential for the overall development of the country. It provides several advantages to the country as it has been determined to have the greatest influence on that country's economic development and job creation (Anyanwu, 2010). The real sector's performance serves as a barometer in many countries for determining how successful macroeconomic policies are. Government initiatives may only be considered effective if they have a beneficial effect on how

commodities and services are produced and distributed. A thriving and productive real economy expands economic connections and fosters both internal and external balance**.**

The real sector is capable of fast-tracking growth and development of an economy through employment, revenue generation, provision of foods, raw material to other sectors and development of rural and urban areas. This is the reason the real sector is regarded as the life blood of a nation and the oil that lubricates the wheels of a nation's economy. It therefore, implies that inefficiency of this sector will mean that the economy of such country will experience a decline of the aforementioned importance of the real sector. In line with this idea, Ibadin, Moni, and Eikhomun (2014) said that the Nigerian economy is now becoming "cold" owing to a lack of attention while the actual sector of the economy sneezes. Due to this, the Gross Domestic Product (GDP) has decreased and the unemployment rate is significant (NBS, 2020). Take for instance, as at 2010 the gross domestic product (GDP) was about ₦54.6 billion, it increases to ₦62.9, ₦71.7, ₦80, ₦89 and ₦94 billion respectively within 2010 to 2015. The value of the gross domestic product (GDP), further increase to ₦101 billion in 2016 to ₦113, ₦127, ₦144 and ₦152 billion between 2016 and 2020 (CBN), 2020). Correspondingly, the Nigerian unemployment rate keep on increase. In 2010, unemployment rate in Nigeria was just 5.1% which is reasonably okay but increased to 7.8% in 2014. The value further moved up to 13.4%, 22.6%, 27.1% and 33.3% between 2016, 2018, 2019 and 2020 (NBS, 2020) The industry is now dealing with issues such as excessive manufacturing costs brought on by inadequate investment, subpar infrastructure development, and inefficient monetary policy (MAN, 2021). MAN (2021) estimates a 21% increase in the cost of producing goods and services. According to this scenario, Nigeria's manufacturing industry has long struggled with poor competitiveness, which is mostly brought on by high output as a result of persistent issues with insufficient infrastructure (Simon-Oke, & Awoyemi) (2010). In conjunction with this claim, it was highlighted that the decrease in output volume was due to a 29 percent increase in production costs**.**

On the other hand, monetary policy are tools, techniques or mechanisms adopted by government through the monetary policy authority (CBN), to regulate the flow of funds in the economy. According to Amadi and Amadi (2014), monetary policy are measures designed to regulate the volume of credit in the economy to achieve some predetermined macroeconomic objectives. In the view of Akomolafe *et al.* (2015), monetary policy are tools of monetary management which includes the combination of various techniques adopted by the monetary policy authority of a country. Monetary policies are very important tools to grow an economy. For instance, if the government want to grow the economy, they can review the monetary policy rate (MPR) downward, making it possible for individual deposit money banks reduce their lending rate. If the monetary policy rate (MPR) is not viable, the monetary authority can use the cash reserve ratio (CRR) down-ward to enable deposit money banks create sufficient funds that can be given as loans to investor, in the real sector.

However, despite the contributions of monetary policy instruments, the Nigerian economy have remained under-developed. The monetary policy rate has been stable for a long period with 12% (2011, 2012 & 2013, CBN, 2020) without any meaningful impact on the economy yet the monetary policy authority increased it to about 13% in the guise of fighting inflation. The question yet to be answered is that how can the monetary authority adopt good monetary policy to fight a sick economy. The Nigerian economy is believed to be

sick because it has not been also to achieve the basic macroeconomic objectives such as price stability, favorable balance of payment and full employment. Also, it is a well-known fact that Nigerian inflation rate as at May 2022 rose to 17.71% from 16.82% in April 2022 (NBS, 2022). Therefore, why have the government refused to fight the real sector that will create jobs, provide raw materials for other industries and reduce the unemployment rate and crime in the country.

It is imperative to note that lack of attention to the real sector has resulted to high cost of raw materials and processed goods. Business Day, 2022, noted that, the price of floor in 2015 was ₦7000 but increased to ₦26,500 in 2022 representing 279% increase. Also, bread increased from ₦300 in 2015 to ₦900 in 2022 amounting to 133% upsurge. Similarly, bag of rice was ₦8700 in 2015 but moved up to ₦32,000 in 2022 resulting to 268% rise, while, palm oil that was ₦6500 in 2015 is now ₦20,000 in 2022 about 208%. Again, create of eggs, (₦700 to ₦2000) diesel (₦145 to ₦800), cooking gas (₦3200 to ₦10,000) and cost of flight (₦15,000 to ₦50,000) has astronomically increased to 186%, 452%, 213% and 233% respectively. It is more worrisome that within this period government have directed funds that would have revamp the real sector to fuel subsidy. According to the Vanguard in April 19th 2022, petrol subsidy payment grew by 349..42% from ₦350 billion in 2019 to ₦1.573 trillion in 2021 yet unemployment rate is as high as 33.3% with a high inflation rate of 17.71% leading to all sort of crime in the country (kidnapping, armed robbery, bunkering etc.). Based on this ugly situation, this paper investigated the impact of monetary policy instrument on real sector output in Nigeria.

To achieve this, the paper is organized into five sections. Following this introduction, this paper is organized as follows: Section two is the conceptual, theoretical, empirical and literature review, section three presents the methodology of the work, section four shows analysis of the study and discussion of findings, while section five concluded the study with relevant policy recommendation from the findings.

2. Literature Review

2.1 Theoretical Literature

Quantity Theory of Money

Irving Fisher's Quantity Theory of Money was first proposed in (1920). the idea that the main factor influencing the level of prices or the value of money is the amount of money. According to Irving Fisher, "Other things remaining equal, as the quantity of money in circulation increases, the price level also increases in direct proportion and the value of money decreases, and as the quantity of money in circulation decreases, the price level also decreases in direct proportion and the value of money increases." When the amount of money doubles, the price level doubles as well, reducing the value of money by half. On the other hand, if the total amount of money is cut in half, the price level is likewise cut in half, and the value of the money is doubled. According to the quantity theory of money, sticky interest rates may regulate the economy in the short term, but actual cash balances were needed to exert influence in the long run (Irving Fisher, 1932). Fisher also believed that the rise in commodity prices would come before the rise in borrowing rates, which were seen as the major source of a company's operating expenses. Fisher develops his equation of exchange and makes it clear that;

$$MV = PT \quad (2.1)$$

Where p is the average price level, T is the number of transactions conducted each period, m is the real money stock, V is the transaction velocity of circulation of money, and According to him, prices are impacted by changes in the money supply if the money velocity varies. With M and T unchanged, an increase in circulation velocity will result in a corresponding rise

in prices, and vice versa. Prices increase as a result of money moving more quickly to pursue the same number of products. Interest rates have an impact on the velocity of money since higher interest rates and prices will encourage purchasers to save their cash holdings and slow down the flow of money. Fisher enforces the presumption that the equilibrium values of V and T will be relatively stable over the near term and invariant to changes in the amount of money. Equation (1) may be rewritten as; given the assumption.

Mv = PT (2.2)

where (-) bars denote constant values for v and t. Given that m is exogenous, the equilibrium connection between the money supply (m) and the general price level must be proportional. The foundation of the quantity theory of money is the relationship between the money supply (M) and the production it funds (PY), where p is the output and y is the price level. M and p have a proportionality factor, k, as shown by the following relationship:

M = kPY (2.3)

M/p = KY (2.4)

K is assumed to be constant

Equation (2) can actually be written as:

MV = PY (2.5)

The ratio of money income (nominal GDP) to the number of times the money stock turns over in a particular period to finance the flow of nominal income is called the income velocity of money, or V= 1/k.

Keynesian Theory of Money

John Maynard Keynes developed the Keynesian General Theory of Employment, Interest, and Money (1936). According to the notion, the best way to end the Great Depression was to encourage people to invest by reducing interest rates (monetary policy) and investing in infrastructure on the part of the government (fiscal policy). The government is telling commercial banks to treat their clients fairly by lowering the interest rate at which the central bank loans money to them. Government investments in infrastructure help the economy grow by generating demand, jobs, and business opportunities while also correcting the impacts of the aforementioned imbalance.

According to the Keynesians, government spending boosts aggregate demand, which improves the profitability of private investments and encourages greater levels of investment to take advantage of the economy's better aggregate demand. Government spending exceeds the amount of tax revenue that the government collects, which results in a fiscal deficit. Governments support this expenditure by borrowing money from the market via the issuance of government bonds. Keynesian economics comes to the conclusion that, under certain circumstances, there is no powerful automatic mechanism that drives production and employment towards full employment levels. This result runs counter to economic theories that hold that there is a strong propensity for everything to be in equilibrium.

The Keynesian theory of money serves as the foundation for this idea. Since the Keynesian theory holds that an increase in the amount of loanable money accessible via the banking system results in a decrease in interest rates, this theory was embraced. When interest rates are lower, collective spending on investments and interest-sensitive consumer items often rises, which increases real GDP. Therefore, monetary policy might indirectly influence the real sector. According to Irving Fisher's quantity theory of money, there is a direct connection between monetary policy instruments, the amount of money in circulation, its velocity, and the overall level of prices in the economy. This suggests that a rise in money supply will lower interest rates, enabling business owners in the real economy (agriculture, manufacturing, services, etc.) the power to obtain low-cost loans for investment purposes that will help them reach their goals.

2.2 Empirical Review

In 2020, Adongo, John, Zeph, and Muyima study the impact of monetary policy on Kenya's agriculture sector GDP. OLS regression was used to conduct empirical study to determine the link between monetary policy and agricultural domestic product from 1981 to 2019, utilising annual data from those years. Central bank rates, the cash reserve ratio, the exchange rate, and the broad money supply were selected as the monetary policy instruments (ER). Both the stationary state of the variables and the short- and long-term connections between them were confirmed using the Johansen Co-integration tests. Although the exchange rate has a negative impact on the agricultural sector's performance, the total money supply has a positive effect on agricultural GDP. The government must increase fiscal support for agriculture and maintain exchange rate volatility through the monetary policy commission in order to fully realise the agricultural sector's potential.

To better understand the effects of monetary policy instruments on Nigeria's industrial sector, Ogugua (2019). It was necessary to utilise an ex post facto research strategy since the data for the study came from the Central Bank of Nigeria Statistical Bulletin, 2020, which included secondary data. Research shows that Nigerian manufacturing production is influenced by monetary policy in the near term by the output of the manufacturing subsector. Treasury bill rates have little effect on manufacturing production, but the policy rate and money supply have a positive and large influence. The report recommends that Nigeria's Central Bank execute an expansionary monetary policy in order to increase the quantity of money accessible to the economy and enhance its performance. The MPR should be lowered by the Central Bank of Nigeria in order to attract low interest rates that might promote lending and enhance productivity across all sectors in Nigeria.

With regards to monetary policy in Nigeria, the manufacturing sector was examined by Osakwe, Ibenta, and Ezeabasili (2019). Manufacturing (MANU) output is the dependent variable, whereas the monetary policy rate, Treasury bills rate, cash reserve requirement, and money supply are explanatory factors. Ex-post facto research was used in the study, which relied on data from the CBN Statistical Bulletin. The investigation spanned 32 years (1986 to 2017). Augmented Dicker Fuller stationarity testing was used to determine which econometric instrument would be most suited for these investigations. It was utilised for a model estimate using the Autoregressive Distributive Lag (ARDL). There is only a short-term influence on Nigeria's manufacturing sector output from monetary policy instruments, according to the results. As a short-term policy instrument, treasury bills and the money supply might be used in Nigeria's industrial sector, according to the study.

Between 1980 and 2016, Egbulonu (2018) studied the impact of Nigeria's monetary policy on the rise of the manufacturing sector. The CBN Statistical Bulletin, published in 2016, provided secondary data for this research. As a result of this, the Bounds test for cointegration was necessary. Test results show that the factors have a long-term link. The data were analysed using the Autoregressive Distributive lag model, which calculated both short- and long-term versions of the model. The results showed that the availability of money has both a short- and long-term positive and significant impact on Nigeria's industrial output. Although it was not statistically significant, the short and long-term exchange rates were both negative. Interest rates had a small but positive impact on industrial production, even if they were excellent for the short and long terms. Despite the present interest rate and money availability, manufacturers in Nigeria continued to borrow money for production, according to the research, but

this was not correlated with a major growth in the country's manufacturing output. For Nigerian manufacturers to be able to long-term plan and invest, the monetary authority should avoid making policy choices that are contradictory.

Chiejina investigated how monetary policy affected industrial growth in Nigeria (2017). According to the objectives of this study, secondary data from the Central Bank of Nigeria Statistical Bulletin for the years 1996 to 2015 was compiled. Analysis of data on factors such as open market operations, cash reserves, the exchange rate, and Nigeria's Monetary Policy Rate from 1996 to 2015 was conducted using multiple regressions. All the factors were demonstrated to have a significant impact on industrial development with an Adjusted R2 of 0.694 (69.4 percent). Cash Reserve Rates and Exchange Rates have a significant beneficial influence on Nigeria's manufacturing sector GDP, whereas Open Market Operations and Monetary Policy Rates have a negative impact, according to this study. Each variable is shown to be statistically significant in the statistics. Boosting economic growth is recommended by expanding the manufacturing sector of the economy via capital expenditure. Because of the positive impact on capital expenditures for productive activities and social overhead capital, industrial development and economic growth can't help but be boosted. This study contributed to our understanding of the Nigerian manufacturing sector by developing models for measuring its performance.

Over the course of a 25-year period from 1986 to 2013, Ajudua, Davis, and Okonkwo explore how monetary policy influences the Nigerian agriculture business. Explanatory variables including money supply, interest rate, Monetary Policy Rate (MPR), and Inflation Rate (INF) were used to generate a multivariate regression equation using ordinary least square (OLS) regression. The Johansen cointegration test was performed to evaluate whether the dependent and explanatory variables had an equilibrium link over the long run by using the unit root test. According to the report, Nigeria's agriculture industry is linked to the country's monetary policies. Budgetary allocations should be raised, monies should be utilised properly after they have been allotted, and monetary policies should be handled effectively and responsibly with low interest rates to stimulate investment in the agricultural sector, as has been advised to enhance it.

A 2015 research by Osmond, Egbulonu, and Emerenini examines how monetary policy influences Nigerian manufacturing from 1981 to 2012. The theoretical relationship between monetary policy variables and the industrial sector was fully examined and established in this paper (i.e., the real sector). Because of this, the researcher decided to focus on four different explanations for the results of this study. The Johansen cointegration test was used to identify a long-term equilibrium link between the explained and explanatory variables. The error correction model was used to estimate the model (ECM). Private sector access to capital and credit had a substantial influence on Nigerian manufacturing, according to the study results.

The SVAR paradigm was utilised by Mordi and Amoo (2014) to study the impact of monetary policy on different real output components. Researchers found that sectoral production reacted differently to contractionary monetary policy shocks based on the findings of impulse response functions, with certain sectors (such as services and wholesale/retail) reacting adversely right away while others showed delayed negative reactions. Based on quarterly data from 1993Q1 to 2012Q4, it utilised a wide range of policy and non-policy macroeconomic factors (manufacturing, building and construction, and agriculture). Economic theory expects

a decrease in output in each sector after monetary tightening. Since the unanticipated changes in monetary policy have hurt certain industries, the study concludes the monetary authority should help them out.

Nigeria's industrial sector was studied by Imoughele and Ismaila (2014), who looked at the impact of monetary policy between 1986 and 2012. According to the National Bureau of Statistics' Annual Abstracts of Statistics (various issues), the Statistical Bulletin, Annual Report, and Statement of Accounts of the Central Bank of Nigeria were used to obtain data (NBS). The unit root test, the Granger Causality test, the co-integration model, and the VAR model were some of the econometrics methodologies used for data estimation. Variable time series exhibited stationarity at the level and first order in accordance with an ADF statistical analysis. One to two co-integrated variables might be found in each of the three equations. The manufacturing sector's production was statistically substantially affected by the specific variables of foreign reserve, exchange rate, and inflation rate in previous and current years, but not by the broad money supply or interest rate. Despite the fact that the overall money supply and inflation rate benefited the industry, interest rates, currency rates, and foreign reserve balances had a negative impact on output. Nigeria's industrial production and the real exchange rate and foreign reserves are linked in a one-way Granger causality test. The survey also found that Nigeria's industrial sector contributes just a little amount to the country's GDP. Following this study's findings, the central bank was tasked with formulating policies that would help create an environment conducive to investment by making market-based interest rate and exchange rate regimes more readily available, as well as encouraging domestic and foreign investment in the manufacturing sector, which is currently operating at or below installed capacity.

According to Ehinomen and Charles (2012), Nigeria's agricultural business has been affected by monetary policy issues between 1986 and 2013. Explanatory variables including money supply, interest rate, Monetary Policy Rate (MPR), and Inflation Rate (INF) were used to generate a multivariate regression equation using ordinary least square (OLS) regression. The Johansen cointegration test was performed to evaluate whether the dependent and explanatory variables had an equilibrium link over the long run by using the unit root test. According to the report, Nigeria's agriculture industry is linked to the country's monetary policies. Budgetary allocations should be raised, monies should be utilised properly after they have been allotted, and monetary policies should be handled effectively and responsibly with low interest rates to stimulate investment in the agricultural sector, as has been advised to enhance it.

Summary of Empirical Literature

There are conflicting results from the empirical analysis of how monetary policy tools affect real sector production. Some of the data suggest that monetary policy tools, notably the moderating effect of the money supply, have a considerable impact (Adongo et al., 2020; Ogugua, 2019; Osakwe et al., 2019; Egbulonu, 2018; Chiejina, 2017; Ajudua et al., 2015; Osmond et al., 2015; Mordi & Amoo, 2014; Imoughele & Ismaila, 2014; Marisa, 2013; Ehinomen & Charles, 2012). These researches disagree on the direction of the effects while agreeing that monetary policy tools increase real sector production.

According to literature such as Adongo et al. (2020), Ogugua, (2019), Osakwe et al. (2019), Egbulonu (2018), Chiejina (2017), Ajudua et al. (2015), Osmond et al. (2015), Marisa (2013), and Eh (2013), increasing monetary policy instruments will instead limit or hinder real sector output in Nigeria.

For example, Mordi and Amoo (2014) and Imoughele (2012).

3. Methodology

Secondary data from the Central Bank of Nigeria's (CBN) statistics bulletin are used in this research. The variables include the percentage of the agricultural and manufacturing sectors in the GDP (AGDP and MGDP, respectively), which serve as proxies for the real sector's performance, and the monetary policy rate (MPR), cash reserve ratio (CRR), treasury bill rate (TBR), and broad money supply (Ms), which serve as proxies for monetary policy instruments covering the period from 1980 to 2020. Because of their dependence on other economic sectors, both the agricultural and manufacturing sectors were utilised. The percentage of gross domestic product that the agricultural and manufacturing sectors contribute to is known as their respective share of the GDP, respectively. The target rate for the monetary policy is calculated as follows: target rate = neutral rate + 0.5 (GDPe - GDPt) + 0.5 * (ie-it), while the cash reserve ratio (CRR) is calculated as the percentage of net demand and time liability**.** Broad money supply (Ms) is measured as M2 = M1 + M2, where M1 = C (coin or currency in circulation), M2 = savings and time deposit. Treasury bill rate (TBR) is calculated as par value less purchasing price/ purchasing price

Model Specification

The model of this study is based on the modification of Ezinne (2012), when investigating the performance of monetary policy in the Nigerian economy. The model is stated below:

$\Delta GDP_t = \beta_0 + \Delta GDP_{t-1} + \Sigma\beta_{1t}\Delta MS_{t-1} + \Sigma\beta_{2t}\Delta EXR_{t-1} + \Sigma\beta_{3t}\Delta INT_{t-1} + U_t$

Where:

GDP = Gross Domestic Product, **Ms** = Broad Money Supply, **EXR** = Exchange Rate, **INT** = Interest Rate

The model above will be modified by introducing cash reserve ratio and Treasury bill rate as a new variable, thus:

Model One: Monetary Policy and Share of Agricultural Sector to Gross Domestic Product Model

AGDP = f (MPR, CRR, TBR, Ms)

The Econometric form is stated below;

AGDP = *b0* + *b1*MPR + *b2* CRR + *b3*TBR + *b4*M2 + ε

Model Two: Monetary Policy and Share of Manufacturing sector gross domestic product Model

MGDP = f (MPR, CRR, TBR, Ms)

The Econometric form is stated below;

MGDP = *b0* + *b1*MPR + *b2* CRR + *b3*TBR + *b4*M2 + ε

The Autoregressive Distributed Lag (ARDL) Model is specified as follows:

$\Delta LAGDP_t = \beta_0 + \Delta LAGDP_{t-1} + \Sigma\beta_{1t}\Delta LMPR_{t-1} + \Sigma\beta_{2t}\Delta LCRR_{t-1} + \Sigma\beta_{3t}\Delta LMS_{t-1} + \Sigma\beta_{4t}LTBR_{t-1} + U_t$

$\Delta LMGDP_t = \beta_0 + \Delta LAGDP_{t-1} + \Sigma\beta_{1t}\Delta LMPR_{t-1} + \Sigma\beta_{2t}\Delta LCRR_{t-1} + \Sigma\beta_{3t}\Delta LMS_{t-1} + \Sigma\beta_{4t}LTBR_{t-1} + U_t$

Where;

Where: AGDP = share of agricultural sector to gross domestic product, MGDP = share of manufacturing sector to gross domestic product, MPR = monetary policy rate, CRR = cash reserve ratio, TBR = Treasury bill rate, and MS broad money supply, *b0* is the constant while *b1-4* are the coefficients of the explanatory variables (MPR, CRR TBR, and Ms). ε is the error term.

4. Results and Discussion

The data for this study were analyzed with autoregressive distributive lag (ARDL) model after subjecting the model to unit root test using the augmented Dicky fuller unit root test.

Table 4.1.1a: Unit Root Test Results

Variable	ADF statistics	1% critical value	5% critical value	Order of integration
LAGDP	-4.340008	-4.219126	-3.533083	1(1)
LMGDP	-3.039678	-3.621023	-2.943427	1(1)
LMPR	-3.178519	-3.610453	-2.938987	1(0)
LCRR	-5.553382	-4.219126	-3.533083	1(1)
LMS	-5.218976	-4.211868	-3.529758	1(0)
LTBR	-6.361595	-4.219126	-3.533083	1(1)

Source: Extracts from E-view 10. ** Level of significance at 5%*

Result from table 4.1.1a above revealed that the variables have mixed order of integration or a combination of I(0) and I(1) series. This implies that the log of monetary policy rate (LMPR) and log of money supply (LMs) were stationary at levels while others (LGADP, LMGDP, LCRR & LTBR)) became stationary after first differencing using the Augmented Dickey-Fuller (ADF) unit root tests. This condition makes the Autoregressive Distributive Lag (ARDL) Bounds test approach to co-integration appropriate for investigating the long-run relationship among these variables.

Table 4.1.1b: Unit Root Test Results

Variable	PP statistics	1% critical value	5% critical value	Order of integration
LAGDP	-4.042464	-3.615588	-2.941145	1(1)
LMGDP	-3.714461	-3.615588	-2.941145	1(1)
LMPR	-3.166552	-3.610453	-2.938987	1(0)
LCRR	-5.430252	-3.615588	-2.941145	1(1)
LMS	-23.79103	-3.615588	-2.941145	1(1)
LTBR	-2.95759	-3.610453	-2.938987	1(0)

Source: Extracts from E-view 10. ** Level of significance at 5%*

Result from table 4.1.1b above revealed that the variables have mixed order of integration or a combination of I(0) and I(1) series. This implies that the log of money supply (LMs) and log of treasury bill rate (LTBR) were stationary at levels while others (LGADP, LMGDP, & LMPR, LCRR)) became stationary after first differencing using Philip perrron unit root tests. This condition makes the Autoregressive Distributive Lag (ARDL) Bounds test approach to co-integration appropriate for investigating the long-run relationship among these variables.

Table 4.1.2: ARDL Bound Test

Test Statistics	Value	K
F-statistics	8.838652	4

Significance	I (0)	1(1)
10%	2.2	3.09
5%	2.56	3.49
2.5%	2.88	3.89
1%	3.29	4.37

Source: Authors computation from E-view 10 Output

From table 4.1.2, the bound test result indicates that there exist long run relationships amongst the variables as the F-statistic value of 8.838652 exceeds both the lower and upper bound critical values. Thus, we reject the null hypotheses of no long run relationship and accept its alternative.

Table 4.1.3: ARDL Short-run Result

Variables	Coefficient	Std. Error	t.Statistics	Prob
D(LMPR)	-0.107545	0.138370	-0.777229	0.4446
D(LMPR(-1)	-0.129415	0.152067	-0.851041	0.4032
D(LCRR)	0.150393	0.058574	2.567576	0.0169
D(LCRR(-1)	0.028524	0.058633	0.486472	0.6310
D(LMS)	0.072632	0.034581	2.100356	0.0464
D(LMS(-1)	0.009997	0.035027	0.285396	0.7778
D(LTBR)	0.141295	0.092885	1.521191	0.1413
D(LTBR(-1)	-0.005648	0.104365	-0.054119	0.9573
Ecm(-1)	-0.098299	0.012280	-8.005013	0.0000
Adj R^2 = 0.957817 F-Stat = 37.89790 (0.000001), DW = 2.4057102				

*Source: Extracts from E-view 10. * Level of significance at 5%*

The model's short-run estimations are shown in Table 4.1.3. It demonstrates that the log of the monetary policy rate (LMPR) is negative and negligible when considering the contribution of the agriculture sector to GDP during the most recent and preceding lag periods. However, the log of cash reserve ratio (LCRR) showed a positive relationship with the share of the agricultural sector to the GDP in both the current and previous year lag periods, but only significant to influence the share of the agricultural sector to the GDP in the current year period at the 0.01 level of significance. Similar to the previous example, the log of broad money supply (LMS) showed a positive relationship with the share of the agricultural sector to gross domestic product (AGDP) at the current and previous year lag periods, but it is significant to influence the share of the agricultural sector to gross domestic product (AGDP) in the current year lag period at the 0.01 percent level of significance. Finally, the log of Treasury bill rate (LTBR) revealed a negligible correlation between the contribution of the agriculture sector to the GDP (AGDP).

The coefficient estimates for the error correction component, ECM (-1), is negative and significant at the 0.01 level of significance. It shows that the model will move at a 0.9 percent yearly rate toward long-run equilibrium. This suggests that a yearly adjustment speed of 0.9 percent may

be used to fix the inaccuracy from the prior year.

According to the corrected R-Square (R2) value, the independent factors account for 96% of the variance in the dependent variable (AGDP) (MPR, CRR, MS, & TBR). The whole model is significant, according to the F-statistics, which is statistically significant at a level of significance of 5%. The lack of serial correlation in the model is shown by the Durbin-Watson statistics of 2.4057102**.**

Table 4.1.4: ARDL Long-run-run Result

Variable	Coefficient	Std Error	t-Statistics	Prob
LMPR	4.515133	4.095856	1.102366	0.2812
LCRR	0.063515	0.544400	0.116671	0.9081
LMS	0.752652	0.269863	-2.789026	0.0102
LTBR	-2.402573	2.622731	-0.916058	0.3687

Source: Authors computation from E-view 10 Output

Table 4.1.4 of the Autoregressive Distributive Lag (ARDL) Long Run Estimates Report demonstrates that the log of the monetary policy rate (LMPR) is positive but has little impact on the contribution of the agriculture sector to the GDP (AGDP). This indicates that when the monetary policy rate (MMR) rises over time, the proportion of the agricultural sector in the GDP will grow by around 4.515133 percentage points (AGDP). The p-value of 0.2812 revealed, however, that the rise in monetary policy of 4.515133 had no discernible effect on the contribution of the agricultural sector to the GDP (AGDP). The result is that the predicted contribution of the agricultural sector to GDP in terms of job creation, tax generation, and development of the nation's rural and urban regions would be modest. High growth rates, inflation rates, and potentially the redirection of funding intended for agriculture's expansion to other sectors might all contribute to this.

Additionally, the ARDL long-run result revealed a positive (0.063515) but negligible (0.9081) correlation between the cash reserve ratio (CRR) and the proportion of the agricultural sector to the GDP (AGDP). The implication of this is that increase in cash reserve ratio in Nigeria will stifle the agricultural sector. This is because farmers in the agricultural sector would not be able to access cheap loans as the monetary authority (CBN) will direct deposit money banks to increase the ratio of the balance with CBN thereby limiting the ability of the banks to create money. This situation will affect food supply, and raw material to the manufacturing and other sectors will also be grossly affected leading to high unemployment rate. Furthermore, the log of broad money supply (MS), revealed a positive relationship with the share of agricultural sector to gross domestic product (AGDP) in the long-run. This implies that a unit increase in money supply will lead to about 0.752652 increase in agricultural sector output (AGDP). The implication of this result is that if the government through the monetary authority (CBN) continue to increase money supply, individual deposit money banks will equally reduce lending rate, making it possible for investors in the agricultural sector access loanable funds. This situation will lead to business expansion, job creation, increase output, food security and foreign exchange earnings. This result conforms to economic theory and agree with the findings of *Ajudua et al.* (2015), and Ehinomen and, Charles (2012). Finally, the log of Treasury bill rate (LTBR) is reported to be negative with agricultural sector output (AGDP). This result conforms

to apriori expectation. It is expected that increase in Treasury bill rate will discourage investors in the agricultural sector from investing on it. However, the p-value of 0.3687 implies that Treasury bill rate cannot influence the share of agricultural sector to gross domestic product (AGDP).

Table 4.15: Normality Test, Ramsey Reset Test, Serial Correlation LM Test and Homoscedasticity Test Results for Model One

	F-Statistic	Prob.Value
Normality Test	2.450808	0.293639
Ramsey Reset Test	1.132607	0.2653
Breusch-Godfrey Serial Correlation LM Test	0.050485	0.9509
Breusch-Pagan-Godfrey Heteroskedasticity Test	0.459941	0.8893

Ramsey's linearity test shows the f-statistic (1.132607) with a computed value of 0.2653 is greater than the 5 percent (0.05) critical value, which leads the study to reject the null hypothesis and conclude that the model is correctly specified (see Table 4.1.5 above), as shown by diagnostic test results in Table. Serial Correlation LM by Breusch and Godfrey There was a 0.050485 f-statistic and 0.9509 Chi-Square probability value found during the serial or autocorrelation test. Since a result, it may be concluded that there is no serial link in this model, as the probability value of 0.9509 is more than the critical value of 0.05.

The f-statistic is 0.459941, and the Chi-Square probability is 0.8893, as determined by the Breusch-Pegan-Godfrey test for heteroscedasticity. There is no evidence of heteroskedasticity in the model since the probability Chi-square value is more than 5% ($P > 0.05$). Consequently, residuals have a constant variance, which is desirable in regression, since they are homoscedastic.

Additionally, the test findings demonstrate that the residuals are normally distributed, with a Jarque-Bara value of 2.450808 and an associated probability value of 0.293639 that is larger than the 0.05 criterion of significance.

Figure 4.2: Stability Test

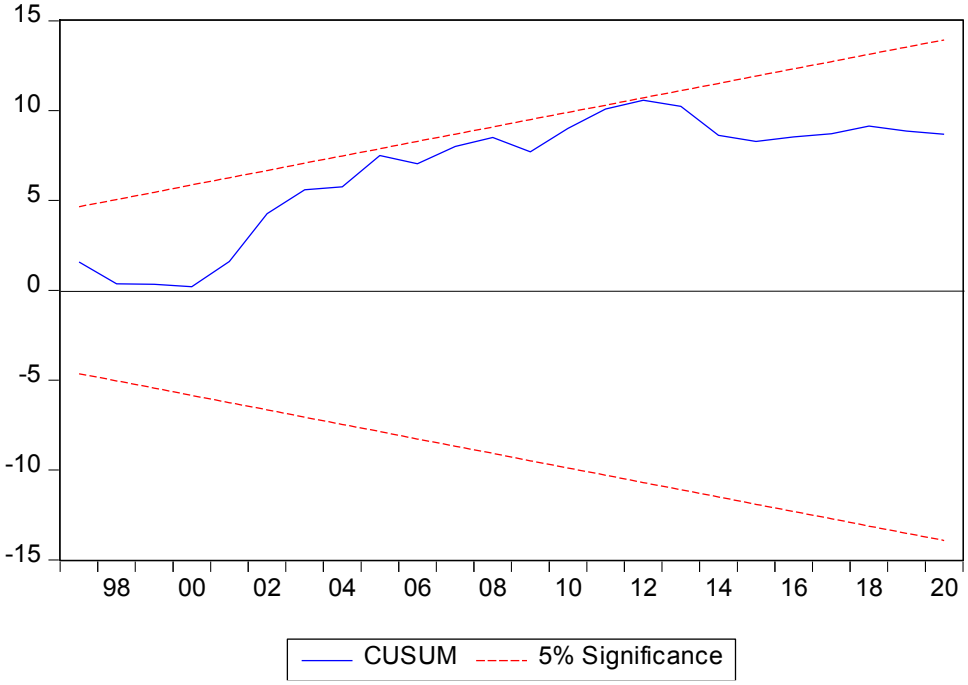

Figure 4.2, shows summary of the stability test, the result showed that the model is stable. This is evident to the fact that the blue line is in-between the two red (-5 & +5) or less than 0.05 level of significance.

Table 4.1.6: ARDL Bound Test

Test Statistics	**Value**	**K**
F-statistics	13.01443	4

Significance	**I (0)**	**1(1)**
10%	2.2	3.09
5%	2.56	3.49
2.5%	2.88	3.87
1%	3.29	4.37

Source: Authors computation from E-view 10 Output

From table 4.1.6, the bound test result indicates that there exist long run relationships amongst the variables as the F-statistic value of 13.01443 exceeds both the lower and upper bound critical values. Thus, we reject the null hypotheses of no long run relationship and accept its alternative.

Table 4.1.7: ARDL Short-run Result

Variables	Coefficient	Std. Error	t.Statistics	Prob
D(LMPR)	-0.096212	0.110958	-0.867108	0.3930
D(LCRR)	0.067471	0.045551	1.481223	0.1493
D(LMS)	0.048118	0.023676	2.032334	0.0514
D(LTBR)	-0.009440	0.075958	-0.124278	0.9020
Ecm(-1)	-0.096873	0.010124	-9.568164	0.0000
Adj R^2 = 0.957817 F-Stat = 37.89790 (0.000001), DW = 2.4057102				

Source: Extracts from E-view 10. * Level of significance at 5%

Table 4.2.3 presents the short-run estimates of the second model. It demonstrates that the logarithms of the monetary policy rate (LMPR) and the logarithm of the Treasury bill rate (TBR) are negative and small when compared to the contribution of the manufacturing sector to the GDP (MGDP). However, the log of broad money supply (LMS) and the proportion of the manufacturing sector in the GDP (MGDP) both exhibited positive relationships, whilst the log of cash reserve ratio (LCRR) and the share of the manufacturing sector in the GDP only showed a positive but minor link (MGDP). The coefficient estimate for the error correction term ECM (-1) is negative and significant at the 0.05 level of significance. It shows that the model will move at a 0.9 percent yearly rate toward long-run equilibrium. This suggests that a yearly adjustment speed of 0.9 percent may be used to fix the inaccuracy from the prior year.

According to the modified R-Square (R2) value, the independent variables account for 96% of all the variance in the dependent variable (MGDP) (MPR, CRR, MS, & TBR). The whole model is significant, according to the F-statistics, which is statistically significant at a level of significance of 5%. The lack of serial correlation in the model is shown by the Durbin-Watson statistics of 2.4057102**.**

Table 4.2.3: ARDL Long-run-run Result

Variable	Coefficient	Std Error	t-Statistics	Prob
LMPR	0.783851	1.520977	0.545161	0.6102
LCRR	-0.312627	0.524370	0.596195	0.5557
LMS	0.715381	0.117213	6.105250	0.0000
LTBR	-5.784627	2.864097	-2.019704	0.5228

Source: Authors computation from E-view 10 Output

Table 4.2.3 of the Autoregressive Distributive Lag (ARDL) Long Run Estimates Report

demonstrates that the log of the monetary policy rate (LMPR) is positive but has little impact on the contribution of the manufacturing sector to the GDP (MGDP). Accordingly, a unit increase in the monetary policy rate (MPR) would result in a 0.783851 increase in the manufacturing sector's contribution to the GDP (MGDP). However, the p-value of 0.6102 indicated that the monetary policy rate (LMPR) had little bearing on the contribution of the manufacturing sector to the GDP (MGDP). Furthermore, the log of the cash reserve ratio (LCRR) and the log of the Treasury bill rate (LTBR) showed a weak and negligible association between the production share of the manufacturing sector and the GDP (MGDP). Accordingly, a unit rise in the cash reserve ratio (CRR) and Treasury bill rate (TBR) would lead to falls in the manufacturing sector's contribution to GDP of -0.312627 and -5.784627, respectively (MGDP). All of the factors had an insignificant connection, as

shown by the p-values of 0.5557 and 0.5228. Last but not least, the log of broad money supply (LMS) revealed a favourable and substantial association between the manufacturing sector's contribution to the GDP (MGDP). This indicates that an increase in the broad money supply (MS) will result in an increase of roughly (0.715381) in the manufacturing sector's contribution to the GDP (MGDP)

5. Conclusion and Recommendations

Conclusion

This research looked at how Nigeria's real sector production was affected by monetary policy tools. The dependent variables are the proportion of the agricultural sector to gross domestic product (AGDP) and the proportion of manufacturing sector output, whereas the explanatory factors are the monetary policy rate, cash reserve ratio, broad money supply, and Treasury bills rate (MGDP). The study employed secondary data from the CBN Statistical Bulletin and an ex-post facto research approach. The research spanned a 40-year period (1981 to 2020). To find the most appropriate econometric methodology, the Augmented Dicker Fuller stationarity test was used to the data. For model estimate, the Autoregressive Distributive Lag (ARDL) was used**.** The result indicates that all the explanatory variables. Thus, the results indicate money supply (MS) is statistically significant to influence real sector output while other study variables (MPR, CRR & TBR) are insignificant.

Recommendations

The recommendation of this research work are based on the findings arising from the analysis of the data. Thus,

In line with the findings of this study, broad money supply should be adopted by the monetary authority (CBN) as a monetary policy instrument to achieve some of macro-economic objective of price stability and full employment, While the federal government should fix the rate on treasury bills to allow investors to make large-scale investments on them and the monetary authority (CBN) should revise the monetary policy rate and cash reserve ratio downward to enable deposit money banks to provide investors inexpensive loans**,** as determination of treasury bill by the market forces negatively affect it particularly when the price is high.

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