An Assessment of the Impact of Monetary Policy on Economic Growth in Nigeria: Toda-Yamamoto Approach

Okosu, Napoleon David*; Okoduwa, Dorothy Ivie; Ita, Uyu Eyo and Egonu, Daniel Ikenna

Department of Economics, Veritas University, Abuja, FCT- Nigeria
*Corresponding Author

Abstract: **This study interrogated the impact of monetary policy on economic growth in Nigeria using annual time series data from 1981 to 2020. The paper used the growth rate of gross domestic product (GRGDP) as the endogenous variable, while, broad money supply (MS2), monetary policy rate (MPR), Inflation (INFL), liquidity ratio (LDQR) and exchange rate (EXCH) were the exogenous variables and proxies for monetary policy. Data were obtained from the Central Bank of Nigeria's Statistical Bulletin of various years and World Bank National Account Data. The study used descriptive statistics, performed a unit root test using Augmented Dickey-Fuller, Autoregressive Distributed Lag (ARDL) Bound test, and to test for causality, Toda Yamamoto was deployed. Finally, the Toda Yamamoto Causality test revealed that all the exogenous variables had bi-directional causality with economic growth except for the exchange rate that had uni-directional causality with economic growth. In the light of the findings, the study recommends that Broad Money Supply (MS2) should be adequately managed and manipulated to achieve the needy growth, in line with pursued monetary policy stance of the monetary authority. Also, the monetary authority and the government should vigorously pursue policies that would increase financial inclusion in Nigeria as it would enhance the effectiveness of the monetary policy.**

Keywords: **Monetary Policy, Economic Growth, ARDL, Toda-Yamamoto.**

I. INTRODUCTION

Sustainable economic growth and development are undoubtedly one of the most challenging development issues in third-world countries today. Thus, the effectiveness of monetary policy in bringing about this growth and development through influencing macro-economic variables becomes an issue paramount and predominantly occupying the minds of government and researchers. Macro-economic policy objectives which change from time to time depending on the economic fortunes of a country may unlikely to be achieved if money and credit flows, volumes cost and direction are left unchecked to allocate themselves freely in an economy. Therefore, to ensure steady and sustainable economic growth and development are achieved as well as instill some level of sanity into a country's financial system, not only the need for monetary policy becomes paramount and inevitable but also its effectiveness.

The effectiveness of monetary policy in output stabilization and controlling inflation remains an ongoing discourse (Sean, 2019;

Chaudhry, Qamber and Farooq 2012). In emerging market economies where the financial market is at a developing stage, monetary policy remains an option as a stabilization tool (Chipote & Makhetha-Kosi 2014) towards enhancing aggregate output. This practice is not exclusively that of developing economies as Evan (2010) once noted that the United States Federal Reserve had a dual mandate to promote maximum employment and price stability even in more normal times. To German Development Institute, (GDI) (2015), widening the mandates of the central banks will promote sustainable economic development, inclusive growth and greening of the financial system, among others. The different approaches to monetary policy application and its outcome rest on the different theoretical postulations and prevailing economic situations.

Monetary policy can be seen therefore as a measure put forward or designed by monetary authorities to control and regulate the volume, cost and direction of money and credit flows in an economy. It can be described as the art of controlling the direction and movement of monetary and credit facilities in pursuance of stable prices and economic growth in an economy (CBN 2020). In an economy, monetary policy influences the volume and direction of purchasing power and it serves as an instrument of market intervention aimed at achieving rationally stipulated objectives which otherwise be impossible of attainment at least in terms of volume, speed and direction (Okoro, 2013).

Central Bank is the watchdog of the economy is saddled with the responsibility of ensuring that there is a synergy between the monetary system and the real system and that monetary policy variables, as well as policies set in motion in the real system, do not constitute a hindrance in the achievement of the overall national objectives. Hence money supply in the economy must not be too high to fuel inflation and not too low that investment is not hindered and disequilibrium which will create problem in the economy do not occur.

There are six constituents of monetary policy in an economy or different policies dealing with the volume of a quantity of money i.e. the supply of money and credit, its price, the rate of interest and its allocation (Ayodeji and Oluwole, 2018). It also includes policies on the exchange rate, balance of payment and the management of external reserves. In other words, a

monetary policy that revolves around merely establishing and controlling the quantity of money or its price or indeed omits any of these six components is not complete and cannot be effective.

Objectively, monetary policy is aimed at ensuring that full employment, rapid economic growth and development, price stability, the balance of payment equilibrium exist in an economy (Fasanya, Onakoya and Agboluaje, 2013). In Nigeria, the overriding aim of her development effort remains that of improving the living condition of her people.

Many countries in recent years have recognized the important contribution which an effective Central Bank can make to enhance economic performance. Although Central Banking activities are diversified and have evolved. It is through the conduct of monetary policy that it makes its most pervasive impact on an economy. More specifically, a central bank has a significant impact on an economy. More specifically, a central bank has a significant impact on a broad range of macroeconomic variables including output growth employment, inflation, interest rate, exchange rates and balance of payment. It is on this background that this study would examine the trend and structure as well as investigate the impact of monetary policy on a macro-economic variable in Nigeria specifically GDP (economic growth).

1.2 Statement of the problem

In recent times Nigeria has experienced two recessions and there are claims and counterclaims that monetary policy intervention had contributed to the exit of recession through economic growth. The negative growth of the economy comes with various macroeconomic problems and concerns. Inflation, unemployment. The cardinal mandate of the monetary authorities is to achieve price and monetary stability through the use of effective monetary policy tools and instruments as noted by (Nnanna, 2001) price stability in Nigeria implies the attainment of a single-digit inflation rate on an annual basis however, this has not been the case in recent past.

Monetary policy is known to be an important tool that can be utilized for the determination of domestic price stability and exchange rate viability, as an essential condition for the attainment of sustainable economic growth and external viability (Amasomma et al, 2011).

According to (CBN, 2020) Monetary policy was affected by many headwinds, which weakened the expansion of monetary aggregates during the 4th quarter of 2020. The chief headwinds include the second wave of the COVID-19 pandemic, 'EndSARS' protests and imposition of curfews in some states, combined with the fall on crude oil prices, negative emerging markets sentiments and fall in Gross Domestic Product which led to economic recession. These issues occasioned reversals of foreign portfolio investments (FPI), as investors' confidence declined.

Central Bank of Nigeria which is saddled with the responsibility of price and monetary stability, uses various instruments to achieve this objective and these include open

market operation (OMO), required reserve (RR), interest rate, liquidity ratio, Prudential Guidelines, selective credit control, exchange rate and moral suasion.

There have been various regimes of monetary policy in Nigeria. Sometimes, monetary policy is tight and at other times it is loose, mostly used to stabilize prices. The economy has also witnessed times of expansion and contraction but evidently, the reported growth has not been a sustainable one as there is evidence of growing poverty among the populace. The controversy bothering on whether or not monetary policy measures impact the Nigerian economy is a problem this study sets to solve. Therefore, the main thrust of this study is to evaluate the effectiveness of the CBN's monetary policy over the years. This would go a long way in assessing the extent to which the monetary policies have impacted the growth process of Nigeria using the major objectives of monetary policy as a yardstick. This study was guided by the research question: to what extent does monetary policy impact the economic growth of Nigeria and the main objective of the study is to examine the effectiveness of monetary policy in the Nigerian economy with the specific objective of assessing the impact of monetary policy instruments on the economic growth of Nigeria.

In contrast to most developing countries, Nigeria has recorded poor development and growth instability, due to the failure of the monetary policy in curbing price instability. Its GDP in the year 2000 was not significantly higher than it was 35 years ago. Economic indicators in Nigeria show that the economy has experienced several stages of growth. In the early 1930s the country's GDP growth rate stood negative (-1.053 in 1982, -5.05 in 1983 and -2.022 in 1984). Increases in the growth rate were recorded steadily between 1985 and 1990 but fell tremendously in 1986 and 1987 to -8.753 and -10.782. Except in 1991 when the growth rate was negative of the magnitude -0.618, the 1990s witnessed spiral or unstable growth. However, since 2001, the growth rate has relatively been high. From the long-term pattern of examination, a situation eg secular swings were revealed in that during civil war years (1965 – 1968) a rapid decline in growth existed, 1972 – 1980 was marked boom period, 1981 – 1984 witnessed a crash. A renewed growth was witnessed in 1985 – 1991 while a wobble took the center stage between 1992 – 2010 (CBN 2020).

By manipulating these instruments, central banks affect the rate of growth of the money supply, the level of interest rate, security prices, credit availability and liquidity creation for the financial system. These factors, in turn, can exert monetary imbalances or shocks on the economy by influencing the level of investment, consumption, imports, exports, government spending, total output, income and price level in the economy.

1.3 Research Questions

This research shall be guided by the following research questions:

i.   Is there a relationship between Monetary Policy and Economic growth in Nigeria?

ii.   Does the monetary policy have any effect on the economic growth of Nigeria?

1.4 Objectives of the Study

The cardinal objective of this study is to interrogate the impact of monetary policy on the economic growth of Nigeria. The specific objectives of this research consist of the following:

i.   To examine the nexus between monetary policy on economic growth in Nigeria.
ii.   To investigate the impact of monetary policy on economic growth in Nigeria.

1.5 Research Hypotheses

The hypotheses are stated as follows:

i.   **H_{01}:**   Monetary policy does not have a significant nexus with economic growth in Nigeria.

ii.   **H_0:**   Monetary policy does not have a significant impact on economic growth in Nigeria.

The rest of the paper is dedicated to conceptual explanation, review of related literature, and theoretical consideration. In the next theme, we explained the methodology used in data collection; thereafter, we present the analysis followed by a discussion of our findings. The paper ends with a conclusion and recommendation.

II. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Theoretical Framework

Monetarism Theory

The theoretical base found adequate for this work is the monetarism theory. This school of economic thought monetarism maintains that the money supply (the total amount of money in an economy) is the primary determinant of current-dollar GDP in the short run and the price level over longer periods. Monetary policy, one of the tools governments have to affect the overall performance of the economy, uses instruments such as interest rates to adjust the amount of money in the economy. Monetarists believe that the objectives of monetary policy are best met by targeting the growth rate of the money supply. Monetarism gained prominence in the 1970s bringing down inflation in the United States and the United Kingdom and greatly influenced the U.S. central bank's decision to stimulate the economy during the global recession of 2007–09.

Monetary policy is the art of managing money. Money must be managed because its very use introduces a potential threat to the stability of the growth of SMEs in Nigeria. The use of money enables economic subjects to create a time lag between their acts of supplying goods and services to the market and their acts of purchasing goods and services from the market. The ultimate aim of monetary policy should be to cancel out disturbances if and when they occur, thus assuring a steady flow of total demand that will continually absorb the steady flow of total supply. Under conditions of perfect competition, this is bound to be accompanied by the full utilization of available productive resources. (Olu and Idih, 2015)

Arguably, the efficacy of the monetary policy can be judged by its ability to achieve its target objectives. The Keynesians have argued that monetary policy affects money supply, as changes in interest rate seek to balance demand with supply (Rogoff, 1955; Okigbo, 2008). The changes in interest rates then affect investment and consumption which later cause changes in output and eventually prices (Ndekwu, 2005). While monetary policies are at best reactionary, scholars have pointed to the fact that inflation is not only due to the quantum of money supplied into the economy, but also a result of structural problems which is beyond monetary policy (Omotola, 2013). When people find barriers in their path, they usually find a way to circumvent or reduce the impact of those barriers. This usually created unintended consequences (Udude, 2016). Relying on both the Keynesian and Structuralists' observations, we argued that the indirect effect of money on other economic variables affects the investment and cash holding of economic agents. Such effects can be negative if it results in uncontrolled inflation.

CBN (2020) notes that the monetary policy strategy is anchored on the attainment of internal balance and external viability. This is the intention of the Monetary Policy Committee that employs appropriate instruments of monetary policy to effect changes inthe liquidity of the deposit money in the banks to influence the supply of money and regulates the financial institutions' interest rates to affect all spending in the economy.

Sean (2019) notes that monetary policy is a blend of measures and/or set of instruments designed by the Central Bank to regulate the value, supply and cost of money consistent with the absorptive capacity of the economy or the expected level of economic activity without necessarily generating undue pressure on domestic prices and the exchange rates. Low and stable inflation has been pursued by the Central Bank. This is because of the unfavorable costs it has in the economy. So, the intention of monetary authority is aimed at counteracting undesirable distortions in macroeconomic variables. Studies have shown various channels of monetary policy influence in Nigeria, also the effective channels of transmission and weak channels.

The significance of the paper is anchored on its comparative stance. Much as the performance of monetary policy framework can be assessed on the extent to which the actual growth in monetary aggregates, GDP growth rate and inflation, have been achieved using the targeted objective as a measurement guide, we reasoned that inflation rate has been used to conclude arguments on price stability and economic stabilization (Soludo, 2001, cited in Nnanna, 2001). As Miles et al (2006) argued, a good way to gauge the influence of monetary policy on price stability and economic stabilization is to analyze the inflation rate over some period. The advantage of using comparative terms to evaluate the performance of Nigeria's monetary policy in combating inflation is that it would enable us to realize those factors inherent in our

environment (structural factors) that hinder the realization of monetary policy objectives. Such realization would help in suggesting effective solutions.

2.2 Conceptual Review

Monetary policy has been defined as a combination of measures designed to control the supply of money and credit conditions in an economy (Okigbo, 2008). The value of money a country has is shaped largely by the monetary policy of the government. This observation suggests that monetary policy rests on the relationship between the rates of interest (that is, the price at which money can be borrowed), and the total supply of money, in an economy (Okigbo, 2008). In Miles et al (2006, p. 65) observation, "a stable monetary policy enables people to rely on market prices for the foreseeable future". In this context investment, savings and other longer-term plans can be easy to make. Monetary policy measure involves a variety of policy instruments, such as the Monetary Policy Rate (MPR), Open Market Operation (OMO), Cash Reserve Ratio (CRR), Liquidity Ratio, Treasury Securities, etc. Monetary policy may be expansionary or contractionary. An expansionary monetary policy seeks to increase the total supply of money in the economy more rapidly than usual, while a contractionary monetary policy expands the money supply more slowly than usual or even shrinks it (Friedman, 2001).

2.3 Empirical Literature Review

Many studies have been carried out in the past on the link between monetary policy and economic growth, using different approaches. For example, Ekwe, Ogbonnaya and Omodero, (2017) examined the impact of monetary policy on economic growth in Nigeria using secondary data obtained from the Central Bank of Nigeria for the period 1996 to 2016. They adopted GDP as a proxy for economic growth and the dependent variable, while broad money supply and credit to the private sector were used as proxies for monetary policy (the independent variable). The study employed multiple regression techniques based on the SPSS computer software as the statistical tool for data analysis. They found that monetary policy had no significant impact on economic growth.

Similarly, Anowor and Okorie (2016) investigated the impact of monetary policy on economic growth in Nigeria using secondary time series data from 1982 to 2013.

Monetary policy variables adopted include; interest rate, cash reserve ratio, and monetary policy rate. These variables were regressed against gross domestic product proxy for economic growth. The statistical techniques used for data analysis include the Unit root test, Johansen co-integration test and Error Correction model. (ECM) The results revealed that the cash reserve ratio had a positive impact on GDP, while interest rate and monetary policy rate had a negative link with GDP. The study recommended that monetary authorities should give priority attention to handling the cash reserve ratio.

Adigwe, Echekoba and Onyeagba (2015) examined the impact of monetary policy on economic growth in Nigeria for a period of 21 years spanning 1980 to 2010. Two models were tested in the study. In model one (the model of interest in this study) gross domestic product used to proxy economic growth was regressed against selected monetary policy variables such as liquidity ratio, broad money supply and cash reserve ratio. Secondary time-series data obtained for the study was therefore analyzed using the Augmented Dickey-Fuller unit root test and the ordinary least squares method. The results showed that broad money supply had a significant positive link with gross domestic product, while liquidity ratio and cash reserve ratio had a positive but insignificant link with gross domestic product. The implication is that a broad money supply had a positive impact on economic growth.

Another study by Udude (2014) examined the impact of monetary policy on economic growth using secondary data obtained from the Central Bank of Nigeria for the period spanning 1981 to 2012. The study employed monetary policy instruments such as broad money supply, interest rate, exchange rate and liquidity ratio as the explanatory variables, and gross domestic product proxy for economic growth as the response variable.

Ufoeze, Odimgbe, Ezeabalisi, & Alajekwu (2018) investigated the effect of monetary policy on economic growth in Nigeria. The natural log of the GDP was used as the dependent variables against the explanatory monetary policy variables: monetary policy rate, money supply, exchange rate, lending rate and investment. The time-series data is the market-controlled period covering 1986 to 2016. The study adopted an Ordinary Least Squared technique and also conducted the unit root and co-integration tests. The study showed that a long-run relationship exists among the variables. In addition, the core finding of this study showed that monetary policy rate, interest rate, and investment have an insignificant positive effect on economic growth in Nigeria. Money supply however has a significant positive effect on growth in Nigeria. The exchange rate has a significant negative effect on GDP in Nigeria. Money supply and investment granger cause economic growth, while economic growth causes interest rates in Nigeria. Overall, the monetary policy explains 98% of the changes in economic growth in Nigeria. Thus, the study concluded that monetary policy can be effectively used to control the Nigerian economy and thus a veritable tool for price stability and improving output.

Similarly, Idris (2019) examined the relationship between monetary policy and economic growth in Nigeria using time series data covering the period of 1980 to 2017. The study employed the Cointegration test and the Ordinary Least Square (OLS) technique with the view to estimating the model coefficients and showcasing the policy nexus between the variables. The result indicates the existence of a long-run relationship between monetary policy indicators and economic growth. Further empirical findings show that money supply has a positive effect, while both the exchange rate and interest rate have a negative effect on the real GDP. As such, monetary authorities in Nigeria should adequately manage and monitor the growth level of the money supply to realize the desired growth level. Given the socio-economic and political

conditions in Nigeria, there is a growing need to formulate appropriate monetary measures which might encourage borrowing through sound and productive interest rates as well as stable exchange rates.

In the same vein, Ayodeji & Oluwole (2018) examined the impact of monetary policy on economic growth in Nigeria through the use of multivariable regression analysis. Monetary policy instruments include Money Supply (MS), Exchange Rate (ER), Interest Rate (IR), and Liquidity Ratio (LR), while economic growth was represented by Gross Domestic Product (income) at constant prices. Error Correction Model was employed to have a parsimonious model. The result revealed that two variables (money supply and exchange rate) had a positive but fairly insignificant impact on economic growth. Measures of interest rate and liquidity ratio, on the other hand, had a negative but highly significant impact on economic growth.In addition, Engle-Granger co-integration test showed the existence of a long-run relationship between monetary policy and economic growth in Nigeria.

 Finally, the Granger causality test showed the existence of a uni-directional causality between money supply and economic growth, economic growth granger causing liquidity ratio and exchange rates while a bidirectional causality exists between interest and economic growth. Muhammed, Babawulle & Tahir (2021) examined the impact of monetary policy on the Nigerian economy using annual data over the period 1981 to 2016. Augmented Dickey-Fuller unit root test, Vector error correction mechanism (VECM), and ordinary least squares (OLS) method, were employed to analyze the time series data for the period between 1981 and 2016. The result of the analyses shows that monetary policy represented by money supply exerts a positive impact on GDP growth with a negative impact on the rate of inflation. The recommendations are that monetary policy should facilitate a favorable investment climate through appropriate interest rates, exchange rate and liquidity management mechanism and the money market should provide more financial instruments that satisfy the requirements of the ever-growing sophistication of operators.

Efanga (2021) empirically reassessed the impact of monetary policy on the economic growth of Nigeria adopting the Error Correction Model approach using time series secondary data spanning between 1981 and 2018. The result showed that a unit increase in Cash Reserve Ratio (CRR) led to approximately seven units increase in economic growth in Nigeria. The result aligned with economic literature as monetary policy among other objectives is geared towards achieving the macroeconomic objectives of sustained economic growth and price stability. Therefore, the study recommends that monetary authorities should give priority attention to CRR monetary policy tool as it will produce a more desired result in terms of economic stabilization. And also some combination of fiscal policy measures is needed to attain the complementary balance required to drive an economy towards desired goals.

III. METHODOLOGY

3.1 Model Specification and Definition of Variables

The model used in this study is built based on the adjustment of the model in Twinoburyo and Odhiambo (2017). The model specifies the endogenous variable which is the Growth Rate of Gross Domestic Product (GRGDP) as a function of the Broad money supply (MS2), Monetary Policy Rate (MPR), Inflation (INFL), Liquidity Ratio (LDQR) and Exchange Rate (EXCHR). The model is specified as follows:

$$GRGDP = f(MS2, MPR, INFL, LDQR, EXCHR) \qquad (1)$$

The above was transmogrified into an econometric model, we then have:

$$GRGDP = \beta_0 + \beta_1 MS2 + \beta_2 MPR + \beta_3 INFL + \beta_4 LDQR + \beta_5 EXCHR + \mu_t \quad (2)$$

β_0 is the intercept or constant term.

$\beta_1, \beta_2, \beta_3, \beta_4$ and β_5 are non-negative, estimating parameters of the model.

Quarterly Time series data from 1981 to 2020 were adopted, the data were obtained from World Bank National Account data and CBN statistical bulletin.

Apriori Expectation

i. From economic literature, Money supply and Monetary policy rate will have a positive relationship with Real Gross Domestic Product. The apriori expectation is positive (+) i.e. $\beta_1, \beta_2 > 0$.

ii. Inflation and exchange rate should have a negative relationship with Real Gross Domestic Product. On this basis, the apriori expectation is negative (-) i.e. β_3, $\beta_4 < 0$.

3.2 Estimation Techniques

Following the specific objectives of this study, the Autoregressive distributed lag (ARDL) model and the Toda-Yamamoto model are employed.

Autoregressive Distributed Lag (ARDL) model as a distributed lag model is used in this study because it allows the examination of how past behaviors of the target variable and other independent variables impact the contemporaneous value of the dependent variable. For the ARDL model, it is statistically required that the stationarity properties of the variables of interest are a mixture of I(0) and I(1) or can be I(1). However, ARDL cannot be applied to a model with an I(2) variable to avoid a misleading regression result. Hence, its use is very conditional on the stationarity of the time series variables involved which was tested using the Augmented Dickey-Fuller (ADF) Unit Root Test. Also, it is essential to choose an efficient and appropriate lag structure for the specified model. In this study, the Akaike Information Criterion (AIC) is selected to determine the optimal lag structure for this study.

The ARDL (*p, q, r*) specification for our model is as follows:

$$\Delta GRGDP_t = c_0 + \pi_1 GRGDP_{t-1} + \pi_2 MS_{2_{t-1}} + \pi_3 MPR_{t-1} + \pi_4 INFL_{t-1}$$
$$+ \pi_5 LDQR_{t-1} + \pi_6 EXCHR_{t-1} + \sum_{i=1}^{p} \gamma_1 \Delta GRGDP_{t-i} + \sum_{j=1}^{q} \gamma_2 \Delta MS_{2_{t-j}}$$
$$+ \sum_{r=1}^{r} \gamma_3 \Delta MPR_{t-i} + \sum_{r=1}^{r} \gamma_4 \Delta INFL_{t-i} + \sum_{r=1}^{r} \gamma_5 \Delta LDQR_{t-i}$$
$$+ \sum_{r=1}^{r} \gamma_6 \Delta EXCHR_{t-i}$$
$$+ \varepsilon_t \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (3)$$

Where; c_0 is the intercept, Δ is the first-difference operator, $\pi's$ show the long-run coefficients and $\gamma's$ depict short-run coefficients. Hence, the null hypothesis (H₀) of no cointegration states that H₀: $\pi_1 = \pi_2 = \pi_3 = \pi_4 = \pi_5 = \pi_6 = \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = 0$ and the alternative hypothesis of existence of cointegration states that $\pi_1 \neq \pi_2 \neq \pi_3 \neq \pi_4 \neq \pi_5 \neq \pi_6 \neq \gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq \gamma_5 \neq \gamma_6 \neq 0$. The above hypothesis is tested by comparing the calculated F-statistic with critical values from Narayan (2005) which were produced for small sample sizes between 30 and 80 observations on the assumption that all variables in the model are I(0) on one side and that all the variables are I(1) on the other side. Following the norms of hypothesis testing, if the calculated F-statistic is greater than the upper critical bounds value, the H₀ is rejected and we accept H₁. But if the F-statistic falls within the bounds, then the test is said to be inconclusive and if the F-statistic falls below the lower critical bounds value, it is said that no co-integration exists. Therefore, the Error Correction Model (ECM) represented in equation 4 can be also presented thus;

$$\Delta GRGDP_t = c_0 + \sum_{i=1}^{p} \gamma_1 \Delta GRGDP_{t-i} + \sum_{j=1}^{q} \gamma_2 \Delta MS_{2_{t-j}} + \sum_{r=1}^{r} \gamma_3 \Delta MPR_{t-i}$$
$$+ \sum_{r=1}^{r} \gamma_4 \Delta INFL_{t-i} + \sum_{r=1}^{r} \gamma_5 \Delta LDQR_{t-i}$$
$$+ \sum_{r=1}^{r} \gamma_6 \Delta EXCHR_{t-i} + \partial ECT_{t-1}$$
$$+ \varepsilon_t \dots \dots \dots \dots \dots \dots \dots \dots (4)$$

where the difference operator is denoted by Δ; the Error Correction Term (ECT) is derived from the short-run co-integrating relationship specified in the ARDL model in equation 3. In equation 4, ∂ should be negative, less than one and significant.

Similarly, we conduct a causality test to institute the direction of causality between monetary policy variables and economic growth. This study employed the Toda-Yamamoto (TY) causality approach. The TY is the modified version of the Ordinary Granger Causality. The TY is preferred to ordinary granger causality for the following reasons:

Recent research, for instance, Ziramba (2008), Chiawa et al. (2012) and Rauf et al. (2012) have found the TY to be superior to the Ordinary Granger Causality as it does not require the pre-testing of variables for cointegration. This implies that researchers do not have to test for the cointegration of the variables. Therefore, the TY helps in overcoming the problem of asymptotic critical values when causality tests are done in

the presence of non-stationarity or no cointegration. Besides this, the TY minimizes the risks associated with the possibility of wrongly identifying the order of integration of the variables. Furthermore, the TY approach is applicable for any arbitrary levels of integration for the variables. In the same vein, it is suitable for the standard VAR whereby the variables can be estimated in their levels rather than the first difference as in the case with the Ordinary Granger Causality and therefore researchers do not need to transform VAR into Vector Error Correction Mechanism (VECM).

Therefore, after the unit root test and determination of optimal lag length, a causality test using TY is conducted using the Modified Wald (MWALD) Procedure to test for the VAR (k). The optimal lag length is equal to $k = (p + d_{max})$. The MWALD test has an asymptotic chi-squared distribution with p degrees of freedom in the limit when a VAR($p + d_{max}$) is estimated.

To test for TY causality between two variables, the following bivariate VAR (k) model is constructed:

$$X_t = \alpha_1 + \sum_{i=1}^{h+d} \beta_{1i} X_{t-i} + \sum_{j=1}^{l+d} \delta_{1i} Y_{t-j}$$
$$+ \varepsilon_{1t} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots 5$$
$$Y_t = \alpha_1 + \sum_{i=1}^{h+d} \beta_{2i} Y_{t-i} + \sum_{j=1}^{l+d} \delta_{2i} X_{t-j}$$
$$+ \varepsilon_{2t} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots 6$$

Where: d is the maximum order of integration h and d are the optimal lag length ε_{1t} and ε_{2t} are the errors terms that are assumed to be white noise.

For the bivariate VAR equation (6), the null (H_0) and alternative (H_1) hypotheses are specified as follows:

H_0: Y_t does not Granger Cause X_t, if $\sum_{j=1}^{l} \delta_{1j} = 0$

H_1: Y_t does Granger Cause X_t, if $\sum_{j=1}^{l} \delta_{1j} \neq 0$

For the bivariate VAR equation (7), the null (H_0) and alternative (H_1) hypotheses are specified as follows:

H_0: X_t does not Granger Cause Y_t, if $\sum_{j=1}^{l} \delta_{2j} = 0$

H_1: X_t does Granger Cause Y_t, if $\sum_{j=1}^{l} \delta_{2j} \neq 0$

The causality between two variables can be described as unidirectional, bidirectional, or no causality. Unidirectional causality occurs when either the null hypothesis of equation (5) or equation (6) is rejected. For example, if we reject the null hypothesis of equation (5) and accept the null hypothesis of equation (6), then we can conclude that changes in Y_t are caused by changes in X_t or if we fail to reject the null hypothesis of equation (5) and reject the null hypothesis of equation (7), then we can conclude that changes in X_t are caused by changes in Y_t. Bidirectional causality exists when both null hypotheses of equation (5) and equation (6) are rejected, While No causality exists if neither null hypothesis of equation (5) or (6) is rejected.

IV. DATA ANALYSIS AND INTERPRETATION

Table4. 1 Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
GRGDP	40	3.07625	5.414674	-13.13	15.33
MS2	40	7011.396	10074.25	16.1617	37704.98
MPR	40	12.94	3.797827	6	24.5
LDQR	40	48.86788	13.43843	29.1	103.8978
INFL	40	19.67333	18.0687	0.22	76.76
EXCH	40	100.8728	100.7593	0.61	358.81

Source: Researcher's Computation using Stata 15

The descriptive statistics above, includes the mean, standard deviation from mean, minimum and maximum. From Table 4.1, the mean of GRGDP during the period under study is 3.07625 while for MS2, MPR, LDQR, INFL and EXCH it was 7011.396, 12.94, 48.86788, 19.67333 and 100.8728respectively. The maximum MS2 is 37704.98while its minimum was 16.1617. For MPR, the value for the minimum is 6while the maximum is 24.5. The maximum and minimum values of INFL are 76.76 and 0.22 respectively. Finally, the maximum value of the exchange rate was 358.81while the minimum is 0.61.

4.1 Presentation of Unit Root Test Results

For the rationale of avoiding spurious regression typically linked with non-stationary time series data, the Augmented Dickey-Fuller was carried out to determine the order of integration of the variables used for the study. The summary of the result is presented in the tables below:

Table: 4.2. Augmented Dickey-Fuller (ADF) Unit Root test Results

Variables	P-value @ levels	t-Statistics @1stdiff(5%)	5% Critical value	P-value @ 1st Diff (5%)	Order of Integration
GRGDP	0.0185	-	-	-	I(0)
MPR	0.1764	-4.651	-2.966	0.0001	I(1)
LQDR	0.0138	-	-	-	I(0)
MS2	0.7742	-3.692	-2.964	0.0042	I(1)
EXCHR	0.2127	3.981	2.966	0.0015	I(1)
INFL	0.0016	-	-	-	I(0)

Source: Authors' computation using Stata 15, 2021

The decision rule here is that, when the t – statistics is greater than the critical value at 5% level of significance or the probability value is less than 0.05, it then indicates that the variable is stationary. Otherwise, the difference is taken until it attains stationarity.

The results of the Augmented Dickey-Fuller unit root tests in table 4.2 above show that the variables were stationary at different orders of integration. The Growth Rate of Gross Domestic Product (GRGDP), Liquidity Ratio (LDQR) and Inflation (INFL) were stationary at levels, while Monetary Policy Rate (MPR) Broad Money Supply (MS2) and Exchange Rate (EXCH) were stationary at first difference.

4.2 Cointegration Estimate

From the unit root result presented in Table 4.2, it becomes obvious that the variables are of mixed order. The statistical implication of this result is that cointegration has to be tested for the result not to be spurious. For this reason, an ARDL model is employed due to its flexible nature to dynamically accommodate the mixture of stationary and integrated (but not a quadratic trend) regressors. Table 4.3 shows the ARDL bound test result for testing for the level (long-run) relationship between the monetary policy variable and economic growth. The null hypothesis of the test is that there is no long-run relationship between the variables and the bound test is based on the decision that, if the F and t statistics lies between the bounds I(0) and I(1), the result is inconclusive. If it is above the upper bound I(1), the null hypothesis of no level effect is rejected. If it is below the lower bound I(0), the null hypothesis of the no level effect can't be rejected. The result shows that the calculated F-stat (6.75) is significant at the conventional levels; hence, we may conclude that there exists a valid long-run relationship between the variables. The results of the long-run and the short-run estimates are presented in Table 4.4 and Table 4.5 respectively.

Table 4.3: Pesaran, Shin, and Smith (2001) bounds test; ARDL (2, 2, 3, 0, 3, 0)

Test	Statistics				
F-stat	6.75				
critical values and approximate p-values					
	10%		5%		1%
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
F	2.08	3.00	2.39	3.38	3.06	4.15

Source: Authors' computation.

*** p < 0.01; ** p < 0.05; * p < 0.1

Table 4.4: Estimated Long Run ARDL Parameters ARDL (2, 2, 3, 0, 3, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$GRGDP_{t-1}$	-0.109846	0.170925	-0.642658	0.5274
$GRGDP_{t-2}$	0.319101	0.140424	2.272408	0.0337**
$EXCH$	-0.067819	0.028467	-2.382341	0.0267**
$EXCH_{t-1}$	0.035177	0.040723	0.863820	0.3974
$EXCH_{t-2}$	0.041912	0.031867	1.315233	0.2026
$INFL_t$	-0.078625	0.037678	-2.086775	0.0493**
$INFL_{t-1}$	-0.122917	0.053934	-2.279047	0.0332**
$INFL_{t-2}$	0.090054	0.043522	2.069143	0.0511*
$INFL_{t-3}$	-0.123567	0.033978	-3.636702	0.0015***
$LDQR_t$	-0.016267	0.055992	-0.290526	0.7743
LMS_2_t	-8.360709	5.816405	-1.437436	0.1653
LMS_2_{t-1}	11.06069	9.689473	1.141516	0.2665

LMS_2_{t-2}	11.74755	9.200124	1.276890	0.2156
LMS_2_{t-3}	-15.01962	5.568332	-2.697328	0.0135**
MPR	0.263212	0.178518	1.474430	0.1552
$const$	7.498404	4.492529	1.669083	0.1099

R^2	= 0.75

s.e	= 2.53
Regression diagnostic test results	
Normality test = 2.26[0.322]	
Hete-test = 1.747[0.782]	
Stability = 2.750[0.113]	

Source: Authors' computation.

*** p < 0.01; ** p < 0.05; * p < 0.1

Table 4.4 shows the long- impacts of the exchange rate, inflation, liquidity ratio, money supply and monetary policy rate. From the result, the two-period lag of GDP growth rate is positive and significant at 5% level which implies that a percentage change in the past two years' value of GDP growth rate will lead to a 0.31 percent increase in its current value. For the exchange rate, its current value shows a negative and significant impact on the growth rate of GDP which is in line with the apriori expectation, while the two periods lag values are positive but not significant in explaining the dependent variable. A percentage change in the current value of the exchange rate will reduce the growth rate of GDP by 0.06 percent. Similarly, the current value of inflation one period and three-period lags showed a negative and significant impact on the growth rate of GDP as expected except for the two-period lags which exert a positive impact on the dependent variable.

The liquidity ratio shows a negative impact but is not significant in explaining the dependent variable, while the current and three period lags values of money supply show a negative impact on the dependent variable in contrast to what the theory says. However, the one and two-period lags are positive but not significant in explaining the variation in the dependent variable. In the same vein, the monetary policy rate is positive but does not have a significant impact on the dependent variable in the long run. The coefficient of determination shows that about 75% of the variation in growth rate of GDP is explained by the regressors. None of the results

of the diagnostic tests is insignificant; the normality test, the ARCH heteroscedasticity test, and Ramsey's RESET stability test results are insignificant and it can thus be conferred that the model is normally distributed and free of heteroscedasticity, and parameters' instability.

Table 4.5: Estimated Short Run ARDL Parameters ARDL (2, 2, 3, 0, 3, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\Delta GRGDP_{t-1}$	-0.319101	0.101502	-3.143788	0.0049***
$\Delta EXCH$	-0.067819	0.020154	-3.365032	0.0029***
$\Delta EXCH_{t-1}$	-0.041912	0.023668	-1.770861	0.0911*
$\Delta INFL_t$	-0.078625	0.027373	-2.872342	0.0091***
$\Delta INFL_{t-1}$	0.033513	0.026329	1.272884	0.2170
$\Delta INFL_{t-2}$	0.123567	0.025540	4.838160	0.0001***
ΔLMS_2_t	-8.360709	3.959259	-2.111685	0.0469**
ΔLMS_2_{t-1}	3.272073	4.621063	0.708078	0.4867
ΔLMS_2_{t-2}	15.01962	4.083197	3.678397	0.0014***
ECM_{t-1}	-0.790746	0.101487	-7.791603	0.0000***

R^2	= 0.83

s.e	= 2.23
Regression diagnostic test results	
Normality test = 2.26[0.322]	
Hete-test = 1.747[0.782]	
Stability = 2.750[0.113]	

Source: Authors' computation.

*** p < 0.01; ** p < 0.05; * p < 0.1

Table 4.5 presents the short-run result, it can be observed that all the variables impacted significantly on the growth rate of GDP except one-period lag of inflation. The error correction term (ECM) shows that the growth rate of GDP responds to the deviation from its long-run (steady) state and it significantly adjusts to it. The value of the error correction term must be negative and strictly lies between -1 and 0 for otherwise, it makes the results invalid statistically and economically. It can be deduced that about 80% of the growth rate of GDP is adverted due to a one-time temporary shock within a year. A rise in the level of the exchange rate, inflation rate and money supply reduces the level of growth rate by about 0.06%, 0.07% and 8.36% respectively.

The coefficient of determination shows that about 83% of the variation in the growth rate is explained by the regressors.

Table 4.5: Toda-Yamamoto model

Variable	GRGDP	MPR	LQDR	MS2	EXCHR	INFL
GRGDP		110.27 (0.000***)	54.69 (0.000***)	89.99 (0.000***)	67.26 (0.000***)	214.10 0.000***
MPR	182.31 (0.000***)		56.99 (0.000***)	78.59 (0.000***)	160.65 (0.000***)	54.10 0.000***
LQDR	35.43 (0.009***)	33.93 (0.000***)		69.60 (0.000***)	11.00 (0.011**)	76.88 0.000***
MS2	42.44 (0.112)	29.00 (0.000***)	60.60 (0.000***)		20.18 (0.0005***)	39.96 0.000***
EXCHR	8.49 (0.0752***)	28.13 (0.000***)	34.43 (0.000***)	67.64 (0.000***)		18.93 0.0008***
INFL	55.85 0.000***	42.58 0.000***	39.56 0.000***	68.89 0.000***	34,08 0.000***	

Source: Extract from Regression Printout using Stata 15
Note: The statistics reported are Chi-square statistics with the associated probability values in brackets.

The results of Toda-Yamamoto models reported in Table 4.5 above show that there exists bi-directional causality between Growth Rate of GDP and Broad Money supply (MS2), Growth Rate of GDP and Monetary Policy Rate (MPR); Growth Rate of GDP and Inflation (INFL), Growth Rate of GDP Liquidity Ratio (LDQR). However, uni- dimensional causality was observed between the Growth Rate of GDP and Exchange rate (EXCHR) as GRGDP cause Exchange rate but there is no evidence that Exchange rate cause GRGDP.

V. CONCLUSION AND RECOMMMENDATION

This study interrogated the impact of monetary policy on economic growth in Nigeria from 1981 to 2020. The dependent variable was economic growth and was proxied by the Growth rate of Gross Domestic Product (GRGDP) while the independent variables were Monetary Policy Instruments, proxied as Broad Money Supply (MS2), Monetary Policy Rate (MPR), Inflation (INFL), Liquidity Ratio (LDQR)T and Exchange Rate (EXCH) while. Annual reports of Central Bank of Nigeria (CBN) Statistical Bulletins and World Bank Annual Account Data were sources for the annual Time-series data. The study employed descriptive statistics and a unit root test. The result of the Unit root showed that so variables were stationary at level viz: GRGDP, MPR, LDR, while some variables were stationary at first difference viz: MS2, INFL and EXCH. The study further employed autoregressive distributive lag (ARDL) bound test and Vector Error Correction Model (VECM). Causality test was performed using the Toda Yamamoto and some diagnostic tests were performed using Stata 15.

The empirical results from the VECM indicated that Broad Money Supply has a positive and significant effect on economic growth, this in tandem with the observations of Inam and Ime (2017), Ufoeze et al (2018), as well as Ayodeji and Oluwole (2018) however, it is contrary to the findings of Srithilat & Sun (2017). Monetary Policy Rate, the prime lending rate in Nigeria had a negative but insignificant to economic growth, this result agrees with the findings of Onwuteaka, et. al (2019) and Olofinlade et al. (2020) but contrary to the findings of Ibrahim (2019) and Ufoeze et al (2019). Also, the negative nexus may be ascribed to a lack of monetary authority efforts in controlling the rate of interest which may dissuade savings in the economy.

For Inflation the relationship was negative to economic growth though insignificant, this supports the assertions of Ibrahim (2019), Onwuteaka et al (2019) and Olofinlade et al. (2020). The negative sign is also in sequence with the apriori expectation, as it stunted economic growth by 1.1 %. The liquidity ratio which is a prudential requirement for banks has a positive impact on economic growth though not significant, the positive association of liquidity ratio to economic growth conforms with the finding of Etale et al. (2019). While Exchange Rate revealed an insignificant negative nexus with economic growth supports the assertion of Ufoeze et al (2019) but differs from the findings of Ayodeji and Oluwole (2018)

Finally, the study concludes that the results suggest that monetary policy may not the only key driver of economic growth in Nigeria. Overall, the findings may be explained by the structure of the Nigerian economy, which is characterized by a low-level financial inclusion, dominance of banks and financial institutions in the urban areas leaving the majority of citizens in the rural area out of the financial system, thus making monetary policy instruments ineffective in the economy.

Consequent to the findings and the conclusion thereof, we hereby make the following recommendations:

i. That since Broad Money Supply positive drives economic growth, it should be adequately managed and manipulated to achieve the needy growth, in line with pursued monetary policy stance of the monetary authority

ii. To ensure the robust effectiveness of the monetary policy, the monetary authority should vigorously pursue policies that would increase financial inclusion in Nigeria.

iii. The central bank should also strive to maintain a minimal level of liquidity ratio for commercial banks since it has a negative impact on economic growth as indicated by the result. Controlling commercial bank liquidity minimally will ease up money for domestic investment which usually spur growth.

iv. Furthermore, monetary policy should always be committed to both intermediate and ultimate targets. The CBN should lower its MPR to stimulate credit supply and its accessibility when there is a perceived downturn in economic activity and raise it to reduce pressures on economic activity. A monetary policy contraction by raising MPR would reduce credit supply to the real sector in the economy. The CBN should leverage on its role as economic adviser to the federal government to influence, not only monetary voting of MPR, but all other supply-side policies that would promote real sector development in Nigeria. Monetary policy should be only conducted based on economic reality, not opinion polls.

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APPENDIX 1

Short Run and ECM Result

ARDL Error Correction Regression				
Dependent Variable: D(GRGDP)				
Selected Model: ARDL (2, 2, 3, 0, 3, 0)				
Case 2: Restricted Constant and No Trend				
Date: 10/09/21 Time: 18:53				
Sample: 1981 2020				
Included observations: 37				
ECM Regression				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GRGDP(-1))	-0.319101	0.101502	-3.143788	0.0049
D(EXCH)	-0.067819	0.020154	-3.365032	0.0029
D(EXCH(-1))	-0.041912	0.023668	-1.770861	0.0911
D(INFL)	-0.078625	0.027373	-2.872342	0.0091
D(INFL(-1))	0.033513	0.026329	1.272884	0.2170
D(INFL(-2))	0.123567	0.025540	4.838160	0.0001
D(LMS_2)	-8.360709	3.959259	-2.111685	0.0469
D(LMS_2(-1))	3.272073	4.621063	0.708078	0.4867
D(LMS_2(-2))	15.01962	4.083197	3.678397	0.0014
CointEq(-1)*	-0.790746	0.101487	-7.791603	0.0000
R-squared	0.829555	Mean dependent var		0.308919
Adjusted R-squared	0.772740	S.D. dependent var		4.688288
S.E. of regression	2.234992	Akaike info criterion		4.671811
Sum squared resid	134.8701	Schwarz criterion		5.107195
Log likelihood	-76.42851	Hannan-Quinn criter.		4.825304
Durbin-Watson stat	1.841659			
* p-value incompatible with t-Bounds distribution.				