

Determinants of Money Supply in Nigeria: Evidence from Autoregressive Distributed Lag Approach

Osuji Obinna* & Ekeagwu Innocent, PhD

Department of Economics, Michael Okpara University of Agriculture, Umudike, Nigeria.

*Corresponding Email: osuji.obinna@mouau.edu.ng

Abstract

This study examined the determinants of money supply in Nigeria from 1981 to 2019. The data for the study was collected from Central Bank of Nigeria (CBN) Statistical Bulletin 2019 and analyzed using Auto Regressive Distributed Lag (ARDL) bound testing model developed by Pesaran, Shin and Smith (2001). The empirical findings of the study provided evidence that inflation rate, gross domestic product growth and monetary base are the major determinants of money supply in Nigeria both in the long run and short run. The study therefore recommended that for the purpose of achieving better economic stability through the management of money stock, the Central Bank should seek to regulate and control the above major determinants as they significantly influenced the growth of money supply in Nigeria.

Keywords: ARDL approach, inflation, monetary base, money supply, Nigeria

Introduction

Money, as we all know, plays a crucial role in the economic process since it determines general price levels, aggregate national income, production and productivity, labour and capital employment levels, exchange rates, and the balance of payments (Jhingan, 2002). As a result, understanding the key influences on aggregate economic performance requires a thorough understanding of money.

In monetary theory and monetary policy formation, the concept of money supply and its determinants are critical. Apart from being an important monetary policy tool, its expansion or contraction determines an economy's investment and production growth. As a result, the Monetarist school of thought's standard slogan is "money matters." They claimed that shifts in

the amount of money in circulation cause other economic shifts. In other words, changes in the money supply have a variety of effects on macroeconomic variables, including inflation.

Inflation, according to Friedman (1956), is a monetary phenomenon that occurs at all times and in all places. He claimed that excessive money supply expansion is intrinsically inflationary, and that changes in money stock cause price changes in an economy. Friedman's hypothesis was based on the classical quantity theory of money, which postulated a direct link between money supply and general price level, assuming that aggregate income and transaction velocity were constant. Furthermore, according to Nyong (2001), inflation varies *ceteris paribus* favorably in connection to money supply growth and adversely in relation to real income or output growth. In support of this argument, Ogun and Adenikinju (2004) discovered that the time of Nigeria's oil boom, which was marked by fast monetary growth, coincided with periods of double-digit inflation.

Given these perceived relationship, monetary authorities (the Central Bank) aim to control the value, supply, and cost of money in the economy in order to achieve predefined macroeconomic objectives. Nigeria's central bank, like other central banks in developing countries, aims to ensure price stability by controlling money supply. In Nigeria, the fundamental goal of monetary policy has been the maintenance of monetary and price stability, in accordance with the requirements of the CBN Act 2007. This monetary policy stance of the CBN is based on Friedman's theory that inflation is a monetary phenomenon.

As a result, the expansion of the money supply and its economic implication is a topic that needs to be thoroughly researched. For decades, Nigerian policymakers have been troubled by this issue. Despite the lack of unanimity among different schools of thought on its usefulness

as a monetary policy instrument, the Nigerian Central Bank (CBN) uses it as its primary barometer for directing economic activity.

For Nigeria, studying the determinants of money supply is a vital one considering the country's inflationary experience over the years. According to Central Bank Statistical Bulletin (2020), inflation rate rose from 4.67% in 1985 to 15.75% in 2020. Furthermore, the Nigerian money supply process is reviewed to derive more from the consolidated balance sheet of the commercial bank plus the high powered money. A policy decision based on such data could be misleading, and its conceived implications on economic activity, particularly inflation, could also be misleading, as Nigeria's recent inflationary experience has shown that low and stable prices can be driven by structural rigidities in the Nigerian economy other than money supply growth.

It is instructive therefore to go beyond the usual multiplier approach in determining money supply and properly investigate the factors that empirically determine money supply in Nigeria from 1981 - 2019. The rest of this paper is structured as follows; Section II deals with the literature review while section III describes the methodology used followed by a discussion of major findings and result in section IV while section V concludes the study.

Literature Review

Theoretical Review

Money theories have always been one of the most fascinating topics for economists. Traditional monetary theory is based on the assumption that the money supply is an exogenously fixed quantity. This is a common assumption among both classicalists and Keynesians. The money supply is held to be fixed and exogenously determined in Fisher's quantity theory of money, the Cambridge "Cash Balance" method, and the Keynesian "Liquidity Preference" approach.

Even Hicks (1989) succumbed to this traditional view in his "Suggested Interpretation" of Keynes, where a segment of the LM curve in his LM-IS curves is a vertical straight line at the upper level of interest rates.

This assumption that the money supply is fixed allows the theorist to concentrate on the demand-for-money function. As a result, the factors that affect the demand for money have occupied the thoughts of economists from Irving Fisher's Quantity Theory to Keynes' Liquidity Preference and down to Milton Friedman's Restatement. Each of these money ideas will be examined.

According to Irving Fisher's Quantity Theory, the quantity of money is the main determinant of price level such that any change in the quantity of money produces an exact proportionate change in the price level. His exchange equation is as follows: $PT = MV + M_1V_1$, where P denotes the price level of all transactions, M denotes the total quantity of legal tender money, V denotes the velocity of circulation of M , M_1 denotes the total quantity of credit money, V_1 denotes the velocity of circulation of M_1 , and T denotes the total amount of goods and services exchanged for money or transactions performed by money (Jhingan, 2002).

The cash balance approach otherwise known as Cambridge version explained the determination of value of money in terms of supply and demand. According to the cash balances concept, the quantity one desires to keep has some relationship to one's income because one's income impacts the volume of transaction purchases and sales one engages in. When the cash balances of community money holders are expressed as a percentage of their total. As a result, we can write $M = KPY$, where K is the proportion of real money income (PY) that people want to keep in cash and demand deposits, M is the exogenously determined supply of money, and P is the general price level. Y stands for "Aggregate Real Income". The Cambridge version, on the

other hand, acknowledges money's demand as a store of value as well as a medium of exchange. The equation indicates that the value of money is controlled by the demand for cash balance, given the supply of money at a given time. When the demand for money rises, people will cut their expenditure on goods and services in order to accumulate significant cash holdings. Price levels will fall and the value of money will rise as demand for products and services declines. A decrease in money demand, on the other hand, will raise the price level and diminish the value of money. In sum, this version of the quantity theory of money supply says that the general price level is directly proportional to the quantity of money in circulation (i.e. money supply).

Keynes (1886 – 1946) on the other hand formulated a monetary theory that focused on output rather than on prices. In his book, the *General Theory of Employment, Interest and Money*, published in 1936, he contends that it is not rational to separate monetary theory and value theory, as was done by classical quantity theorists. He does not agree that there is a direct and proportional relationship between the quantity of money and prices. His contention is that a change in money has an indirect and non-proportional effect on prices. Keynes disagreed with the postulations of the classical theorists which contend that there is a static equilibrium in which money is regarded as a neutral and does not influence the economy's real equilibrium, especially as with respect to relative prices. Keynes' view is that the equilibrium position is always shifting as the economic state changes. Money only enters as a link between the present state and all future positions in the economy.

Keynes provided a reformed quantity theory of money that attempted to reconcile monetary theory with value theory while also incorporating the theory of interest. As a result, changes in the money supply have solely an effect on the absolute price level and have no effect on the

relative price level. As a result, the revised quantity theory of money emphasizes the idea that as the quantity of money increases, prices rise only when full employment is reached, not earlier. The quantity of money, according to Keynes, has an indirect relationship with prices through interest rates. Thus, if the quantity of money is increased the first impact is a fall in the rate of interests, a fall in interest rates will increase the volume of investment, raise the level of effective demand through the multiplier effect, thereby increasing output, incomes and employment. In summary, Keynes' contention is that when there is full employment, prices will change in the same proportion as the quantity of money, but as long as there is unemployment output will change in the same proportion as the quantity of money.

Friedman (1956) in his essay, "The Quantity Theory of Money – A Restatement", set down a particular model of quantity theory of money. He stated that "quantity theory is first and foremost a theory of money demand." His main goal was to prove that the demand for real money and real money deposits had a steady demand curve depending on a few criteria. As a result, money demand is an element of capital or wealth theory. He sees actual cash balances (m/p) as a commodity that is in high demand because it provides services to the person who owns it. Income is a substitute for wealth, according to Friedman (1956), and wealth can be held in five various forms: money, bonds, equities, physical things, and human capital. By income, he means "permanent income" which is the average expected yield on wealth during its lifetime.

Empirical Literature Review

Using the Autoregressive Distributed Lag (ARDL) model, Adediyani (2020) extended the literature on money supply determinants in Nigeria by considering the effect of financial liberalization on money supply from 1980 to 2019. The study's empirical findings reveal that

financial liberalization, as well as currency ratio, necessary reserve ratio, and high-powered money, are crucial factors in determining money supply in Nigeria. The study therefore concluded that the extent of the liberalization of the financial sector matters in decisions on the regulation of money supply in the economy.

Abakpa, Purokayo and Asaph (2018) investigated the factors that influence the money supply in Nigeria. The study using the Autoregressive Distributed Lag Model, ARDL, approach found that lagged money supply and GDP exerted a positive significant effect on money supply in Nigeria. Inflation, interest rates, exchange rate and foreign direct investment had insignificant coefficients. The pairwise Granger causality results revealed the presence of a unidirectional causality from GDP to money supply and a bidirectional relationship between interest rate and money supply.

Denbel, Yilkal and Teshome, (2016) used the Johnson Co-integration test and VECM to investigate the causal link between inflation and money supply in Ethiopia from 1970 to 2011. The study's findings show that inflation and money supply have a long-term bi-directional causal relationship. However, the analysis discovered a one-way causation between money supply and economic growth and inflation in the short run. As a result, the study concluded that inflation is a monetary phenomenon in Ethiopia.

Lone and Yadav (2016) investigated determinants of money stock India. The study found that high-powered money and the money multiplier are the main determinants of money supply in India. In a similar vein, Tiwari (2016) examined the determinants of money supply in Nepal. Using ordinary least squares (OLS) econometric technique, the study identified reserved money as the main determinant of money supply in Nepal.

Similarly, Ifionu and Akinpelumi (2015), using the OLS technique, identified GDP as a prime determinant of money stock in Nigeria from 1981 to 2013. Using Johansen co-integration and Dominance methods of analysis, Shirvani and Bayram (2014) analyzed the determinants of money supply in the United States (US). The study identified excess reserve and currency ratios as the most important determinants of money supply in the US.

Salami and Kelikume (2013) using ARDL model and Quarterly time series data for Nigeria over the period 1970 to 2011 examined the quantity theory relationship between money and price movement to establish if inflation is always and everywhere a monetary phenomenon. The result of the study showed that inflation is not always and everywhere a monetary phenomenon in the case of Nigeria and therefore raises serious doubt on the continuous use of monetary policy tool to achieve price stability in Nigeria.

On the basis of mainstream and Post-Keynesian theoretical perspectives for both pre and post-liberalization period covering the sample period of 1965/66-2009/10, Shrestha (2013) examined the process of money supply in Nepal. Applying Granger causality test to Money multiplier, high powered money, currency ratio, bank rate and open market operations; the study identified high powered-money as the core determinant of the stock of money while Currency ratio and the Multiplier also affected the supply of money.

Odior (2013) analyzed the supply of money in Nigeria using a time-series generalized method of moment (GMM) model. The study assumed that broad money supply depends upon changes in monetary base and the money multiplier. The empirical result showed a positive but partially stable relationship between the base money and money supply, and money multiplier and money supply.

Chigbu and Okorontah (2013) sought to determine whether the supply of money is exogenous. Utilizing annual data from 1970 to 2008 and employing 2-Stage Least Square (2SLS), co-integration (Johansen), as well as the Granger-causality methods, the study found that real income and the interest rate co-integrate with the supply of money. The result further showed that money stock is controlled endogenously through a change in the level of real income, real rate of interest and value of money. Thus, the study argued that although the monetary authority could influence the supply of money, it is the economic activity, however, that exerts a larger influence on the money stock variations.

In India, Lodha and Lodha (2012) established money multiplier and high-powered money as the determinants of money stock. Utilizing a simple equation framework of analysis, the study found that the money multiplier and high-powered money positively influenced the growth in money supply between 1981 and 2012.

Bakare (2011) examined the determinants of money supply growth and its implications on inflation in Nigeria using a quasi-experimental research method of analysis. The study found that in Nigeria there exist a positive relationship between money supply growth and inflation and therefore affirmed the argument of the monetarist school that says money matters. The result further showed that credit to the private sector is a positive determinant of money supply.

Muhammad and Islam (2010) empirically examined the money stock function in Bangladesh using autocorrelation correction Ordinary Least Square (OLS) estimation technique. The study found that in Bangladesh the level of money stock is determined by bank rate, financial liberalization and external resources.

Sanusi (2010) examined the determinants of money supply in Ghana. The study found that prior to the 1990s, fiscal deficits determined money supply however in the aftermaths of the 1990s, the bank's net foreign assets became the major determinant of money supply.

Chimaobi and Uche (2010) using co integration and Granger causality test examined the relationship between output, money and inflation in Nigeria. The result of their study showed the non- existence of a co integrating vector in the services used. However, money supply was found to granger cause both output and inflation. The study therefore concluded that monetary stability contributes to price stability in the Nigerian economy.

According to Soludo (1998), money supply in Nigeria is influenced by changes in net foreign assets as well as the banking system's credit to the public and private sectors. The monetization of foreign reserves, as well as the form of government spending and the fiscal deficit, are significant factors in the efficacy of direct or indirect instruments in controlling money supply and, as a result, fulfilling the broad objectives of monetary policy. Iyoha (1990) wanted to know if the drivers of money supply in a developing economy like Nigeria are the same as in industrialized countries like the United States. The money supply, according to Iyoha, is influenced by the level of commercial bank reserves, marketing board (M-B) activity, and national revenue. The study concluded that marketing boards appear to influence significantly the money supply in Nigeria. The author suggested that reserves and interest rates are key determinants of money supply and volume of bank reserves in Nigeria. In addition, the study suggested that the traditional replace of monetary policy will also be effective in a developing country like Nigeria. Ajayi (1978) based his research on a portfolio approach to money supply determinants in Nigeria. The study's rationale was the persistence of quantitative research into Nigeria's monetary sector. The goal was to show that, rather than being exogenously

determined as previously thought in Nigeria, money supply is the product of portfolio shifts among non-bank public, banks, and the Central Bank's relation function. He used a stock adjustment model framework in his general framework, where the change from one quarter to the next is supposed to be a fraction of the discrepancies between the actual and desired value. In terms of statistical significance, Ajayi looked at the following assets: cash, demand deposits, time deposits, and savings deposits, and concluded that permanent income outperforms current income. A very interesting result from his work is that he discovered that savings deposit holders are unaffected by their own rate of return.

Methodology

The ARDL-Bounds Testing Procedure

In order to empirically investigate the determinants of money supply in Nigeria, the study will employ the Auto Regressive Distributed Lag (ARDL) bounds testing approach as developed by Perasan et al (2001). The advantage of this model is in its applicability irrespective of whether the underlying variables are purely stationary I (0) or non-stationary I (1). The research will be guided by the model specified below; first in its functional form then transformed into an ARDL model following Ukoha (2013).

$$MS = (INF, GDPG, MB, MPR) \quad (1)$$

Where:

MS = Broad Money Supply (M2), used in Adediyani (2020) and Salami and Kelikume (2013).

INF = Inflation Rate measured by consumer price index and was used in Bakare (2011) and Denbel et al (2016).

GDPG = Gross Domestic Product (GDP) Growth measured by percentage change in GDP and was used in Chigbu and Okorontah (2013) and Ifionu and Akinpelumi (2015).

MB = Monetary Base or High powered money is the sum of currency in circulation and commercial bank reserves. It was used in Adediyani (2020) and Lone and Yadav (2016).

MPR = Monetary Policy Rate is the rate of interest charged by the central bank for rediscounting short term bills for banks especially when they are under pressure for short term funds. This variable was used in Ukoha (2013) and Shrestha (2013)

$$\begin{aligned} \Delta MS_t = & \alpha_0 + \alpha_1 \sum_{i=1}^n \Delta MS_{t-i} + \alpha_2 \sum_{i=1}^n \Delta INF_{t-i} + \alpha_3 \sum_{i=1}^n \Delta GDPG_{t-i} + \alpha_4 \sum_{i=1}^n \Delta MB_{t-i} + \alpha_5 \sum_{i=1}^n \Delta MPR_{t-i} \\ & + \alpha_6 \sum_{i=1}^n MS_{t-i} + \alpha_7 \sum_{i=1}^n INF_{t-i} + \alpha_8 \sum_{i=1}^n GDPG_{t-i} + \alpha_9 \sum_{i=1}^n MB_{t-i} + \alpha_{10} \sum_{i=1}^n MPR_{t-i} + U_t \end{aligned} \quad (2)$$

Where: $\alpha_6 \alpha_7 \alpha_8 \alpha_9 \alpha_{10}$ = long run coefficient; $\alpha_1 \alpha_2 \alpha_3 \alpha_4 \alpha_5$ = Short run coefficient; μ_t = white noise error term; Δ = first difference operator and i is the lag length.

The bounds test involves performing the F-test on the null hypothesis of no co integration (i.e. $H_0: \alpha_6 = 0; \alpha_7 = 0; \alpha_8 = 0; \alpha_9 = 0; \alpha_{10} = 0$) against the alternative: $H_1: \alpha_6 \neq 0; \alpha_7 \neq 0; \alpha_8 \neq 0; \alpha_9 \neq 0; \alpha_{10} \neq 0$). When the computed F-statistic exceeds the upper critical bounds value then the H_0 hypothesis is rejected. When the F-statistic is lower than the lower bounds value then the null hypothesis of no co integration cannot be rejected. However, when the F statistic falls within the bounds, the co-integration test becomes inconclusive. For the short run relationship between inflation and money supply, we use unrestricted error correction version of ARDL model by estimating the equation below:

$$\Delta MS_t = \alpha_0 + \alpha_1 \sum_{i=1}^n \Delta MS_{t-i} + \alpha_2 \sum_{i=1}^n \Delta INF_{t-i} + \alpha_3 \sum_{i=1}^n \Delta GDPG_{t-i} + \alpha_4 \sum_{i=1}^n \Delta MB_{t-i} + \alpha_5 \sum_{i=1}^n \Delta MPR_{t-i} + \alpha_6 \sum_{i=1}^n ECM_{t-i} + U_t \quad (3)$$

Where: ECM_{t-1} is the lagged error – correction term obtained from the long run relationship.

Sources of Data

Data for the study were obtained from the CBN Statistical Bulletin for various years covering 1981 – 2019.

Results and Discussion

Unit Root Test Result

To avoid running a spurious regression, a unit root test was carried out to ensure that all the variables are mean reverting i.e stationary. In this study, the Augmented Dickey Fuller (ADF) unit root was used for this purpose. The result of the ADF test is presented in the table 4.1.

Table 1: Augmented Dickey Fuller (ADF) Test

Variable	Level Form		First Difference		Order of Integration
	ADF Stat	5% Critical Value	ADF Stat	5% Critical Value	
MS	-3.29	-2.94			I(0)
INF	-3.05	-2.94			I(0)
GDPG	-12.91	-2.94			I(0)
MB	-3.22	-2.94			I(0)
MPR	-3.11	-2.94			I(0)

Source: Authors computation using E-views 9

The ADF unit root test result reported in table 4.1 above showed that all the variables are stationary in their level forms and hence does not contain unit root. The null hypothesis of non-stationary was rejected for all the series at 5 percent significant level. Hence we conclude that the variables are integrated of order zero I (0).

Co integration Test Result

Having established that the variables used in this study are integrated of order zero, the ARDL bounds test for co integration was carried out and the result is presented in Table 4.2 below.

Table 2: ARDL Bounds Test Result

Computed F- Statistics: 6.25*	I(0)	I(1)
Critical Value Bounds (10%)	2.45	3.52
Critical Value Bounds (5%)	2.86	4.01
Critical Value Bounds (2.5%)	3.25	4.49
Critical Value Bounds (1%)	3.74	5.06

Source: Authors computation using E-views 9

* denotes 1% level of significance

The results of the bounds test presented in Table 4.2 above revealed that the computed F-statistics (6.25) exceeds the upper bound critical value (5.06) at 1% level of significance thereby establishing the presence of co integration. This implies that there is a long run relationship between inflation, gross domestic product growth, monetary base, monetary policy rate and money supply in Nigeria. Having conducted the bounds test, the next step is to examine the effect of inflation; gross domestic product growth; monetary base; monetary policy rate on money supply in Nigeria. The result of the long run and short run ARDL model based on (4, 2, 4, 0 and 0) is presented in Table 3

Result of ARDL Model Estimation

Table 3: Result of ARDL Model Estimation (4, 2, 4, 0, 0)

Panel A: Long Run Coefficients – Dependent Variable is BROAD MONEY SUPPLY (MS)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF	19.918185	11.236121	1.772692	0.0915***
GDPG	3.085888	1.221569	2.526168	0.0201**
MB	0.368745	0.112446	3.279313	0.0024*
MPR	-1.481068	1.257530	-1.177760	0.2527
C	23.057422	15.830895	1.456483	0.1608
Panel B: Short Run Coefficients – Dependent Variable is BROAD MONEY SUPPLY (MS)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.48579	9.809983	1.374701	0.1844
D(MS(-1))	-0.021044	0.158321	-0.132922	0.8956
D(MS(-2))	0.020233	0.141399	0.143092	0.8876
D(MS(-3))	-0.238568	0.152283	-1.566607	0.1329
D(MS(-4))	-0.297588	0.152051	-1.957154	0.0644
D(INF)	0.435051	0.186885	2.327908	0.0305**
D(INF(-1))	-0.749135	0.223772	-3.347753	0.0032*
D(INF(-2))	-0.272335	0.196146	-1.388429	0.1803
D(GDP)	0.235508	0.071687	3.285218	0.0037*
D(GDP(-1))	0.725688	0.247789	2.928660	0.0083*
D(GDP(-2))	0.690496	0.236561	2.918897	0.0085*
D(GDP(-3))	0.108276	0.191481	0.565469	0.5780
D(GDP(-4))	0.044901	0.265290	0.169252	0.8673
D(MB)	0.334389	0.110688	3.020998	0.0067*
D(MPR)	-0.866245	0.688118	-1.258861	0.2226
CointEq(-1)	-0.584879	0.326006	-1.794071	0.0879***
R-squared	0.752313	Mean dependent var	24.66011	
Adjusted R-squared	0.578932	S.D. dependent var	16.25905	
S.E. of regression	10.55045	Akaike info criterion	7.847741	
Sum squared resid	2226.240	Schwarz criterion	8.514319	
Log likelihood	-122.3355	Hannan-Quinn criter.	8.077844	
F-statistic	4.339081	Durbin-Watson stat	1.977179	
Prob(F-statistic)	0.001523			

Source: Authors computation using E-views 9

*, **, & *** denotes 1%; 5% & 10% significant levels respectively.

From the long-run relationship in Panel A of table 3 above, we observed that the coefficient of inflation is 19.91 and its t-statistics is 1.77. This implies that a unit increase in inflation rate will lead to a 19.91 units increase in money supply in the long run. Thus we conclude that inflation rate is a major determinant of money supply in Nigeria since its estimated coefficient

was shown to be positive and significant at 10%. This finding is consistent with a prior economic theory and the earlier findings of Bakare (2011). A similar result was obtained in the short-run as shown in Panel B of table 3 above where the estimated coefficient for inflation rate at the current period was positive and statistically significant.

Gross domestic product growth (GDPG) is also estimated to have a positive and significant relationship with money supply in Nigeria. Precisely a one unit increase in GDP will lead to 3.09 units increase in money supply in the long run. This relationship is consistent with economic theory and also statistically significant since its t-statistics which is 2.5262 is greater than 2 (rule of thumb). It is also in line with the studies of Abakpa (2018), Ifionu and Akinpelumi (2018) and Odior (2013). Furthermore, the result of the short run relationship as presented in Panel B of Table 4.3 shows that the coefficient of GDPG is positive and statistically significant both in the current period and at lag one and two. This implies that in the short run GDP growth exerts a positive effect on Money supply.

The estimated coefficient of monetary base (MB) is 0.3687. This reveals the existence of a positive direct relationship between monetary base and money supply in Nigeria. Thus a one unit increase in monetary base will lead to 0.3687 units increase in money supply in the long-run. This relationship is consistent with more multiplier theory in economics and earlier studies of Abediyan (2020), Lone and Yadav (2016) and Shrestha (2013). The estimated t-statistic for monetary base is 3.2793. This shows that the positive influence of monetary base on money supply in Nigeria is statistically significant. A similar result was obtained in the short-run as shown in Panel B of table 3 above where the estimated coefficient for monetary base (MB) at the current period was positive and statistically significant.

Furthermore, monetary policy rate (MPR) is estimated to be negatively related to money supply in the long-run with its coefficient being -1.4811. Thus, an increase in monetary policy rate will lead to a fall in money supply. Again this relationship is consistent with a prior economic theory. However, the result of the t-statistics which is -1.1778 revealed that the negative effect of monetary policy rate on money supply is not statistically significant. The amount of currency outside the control of the banking system occasioned by the public preference for cash balances may be responsible for this result. This was also the case in the short – run as shown in panel B where the estimated coefficient of MPR was negative and statistically insignificant.

Furthermore, the result of the unrestricted error correction version of ARDL model [**CointEq (-1)**] showed that the coefficient of the error correction term (-0.58) is negative and statistically significant at 10%. This implies that following short run disequilibrium, 58% of disequilibrium errors from the previous year's shock converge back to long run equilibrium in the current year.

Finally, the coefficient of multiple determinations (R^2) is estimated to be 0.7523 implying that inflation rate (INF), gross domestic product growth (GDPG), Monetary base (MB) and Monetary policy rate (MPR) explained about 75.23% of the total variations in stock of broad money supply (MS) in Nigeria. This shows excellent goodness of fit and the excellent goodness of fit of this model is further corroborated by the high estimated F-statistics which is 4.34 and is statistically significant at five percent. The Durbin – Watson statistic is estimated to be 1.97 implying that the model is free from the problem of auto correlation. A similar result of no autocorrelation was obtained using Breusch Godfrey serial correlation LM Test. See Table 4 below.

Table 4: ARDL Model Diagnostic Tests

Type of Test	F-Statistics	Prob
Serial Correlation	0.379	[0.690]
Heteroscedasticity	0.378	[0.966]
Normality	2.337	[0.310]

Source: Computed by Author using E-views 9.0

Table 4 above presents the ARDL Diagnostic test. From the above, since the statistics of serial correlation, heteroscedasticity and Normality are not statistically significant then the model can be adjudged to have passed these tests.

5. Conclusion and Recommendations

The focus of this present research effort was to investigate the determinants of money supply in Nigeria for the period 1981-2019. Specifically the study examined the relationship between money supply and inflation rate, gross domestic product growth, monetary base, monetary policy rate in Nigeria using auto regressive distributed lag (ARDL) bounds testing technique. The major empirical findings of the study revealed the following:

- i. There exist a positive significant relationship between inflation rate and money supply in Nigeria both in the short and long run. This indicates that inflation rate is a major determinant of money supply in Nigeria.
- ii. There exist a positive and significant relationship between gross domestic product growth and money supply in Nigeria. This implies that money supply in Nigeria is significantly determined by Gross domestic product growth.
- iii. The result further revealed that monetary base is a major determinant of money supply in Nigeria in the short run. Its estimated coefficient was positive and statistically significant.
- iv. Monetary policy rate on the other hand exerted a negative but insignificant influence on money supply in Nigeria indicating that variations in money supply is not significantly

influenced by monetary policy rate. The reason as stated earlier may be due to large currency outside the control of central bank monetary policy rates since broad money supply is comprised of money within and outside the banking system.

Based on the above empirical findings, the study recommends the following policy actions

i. If the Central Bank wants to achieve better economic stability through the management of money stock, policy measures should be targeted at controlling the monetary base, GDP growth and inflation rate as these were found to be important statistical variables determining the quantity of money stock in Nigeria.

ii. Since the result from our estimated model provided evidence that monetary policy rate is not a major significant determinant of money supply in Nigeria. There is the need for the government through the monetary authorities to deepen the financial system in Nigeria through improved financial infrastructures, financed markets and services. This would in turn improve the banking habits of the people and also reduce the high level of preferences for cash transaction balances by public.

References

- Abakpa, A., Purokayo, S. G. & Asaph, P. P. (2018). Analysis of the determinants of money supply in Nigeria (1981-2015). *International Journal of Scientific Research*. 3(2):21-38. <http://journalijsr.com/content/2018/IJSR70.pdf>
- Adediyin. A. R. (2020). Determinants of money supply in Nigeria. *CBN Journal of Applied Statistics*, 11(2): 181-199.
- Ajayi, S. I. (1978). *Money in a Developing Economy: A Portfolio Approach to money supply Determination in Nigeria*. Ibadan: University Press Ibadan.
- Bakare, A. S. (2011). An empirical study of the determinants of money supply growth and its effects on inflation rate in Nigeria. *Journal of Research in International Business and Management*. 1(5): 124-129.

- Chigbu, E. E., & Okorontah, C. F. (2013). Exogeneity of money supply evidence from Nigeria. *Journal of Research in Economics and International Finance*. 2(4): 62-67
- Chimobi, P., & Uche, C. (2010). Money, Price and Output: Causality Test for Nigeria, *American Journal of Scientific Research*, 8:78-87.
- Denbel, F. S., Yilkal, W. A., & Teshome, A. R., (2016). The Relationship between Inflation, Money Supply and Economic Growth in Ethiopia: Co integration and Causality Analysis. *International Journal of Scientific and Research Publications*. 6(1): 556 – 565
- Friedman, M. (1956). The Quantity Theory of Money-A Restatement, In Friedman, Milton, ed., *Studies in the Quantity Theory of Money*, Chicago: University of Chicago Press. 1-21.
- Hicks. J. (1989). *A market theory of money*. Oxford: Clarendon.
- Ifionu, E. & Akinpelumi, O. F. (2015). Macroeconomic variables and money supply: Evidence from Nigeria. *African Research Review*. 9(4):288-307
- Iyoha, M. A. (1990). *An Econometric Analysis of the main Determinants of Nigeria Money Supply, 1950-1964*, N JESS, Inner way publications vol.(11) pp. 275-283.
- Jhingan, M. L. (2002). *Macro-Economic Theory*. India: Vrinda Publications (P)
- Lodha, S. L. & Lodha, M. (2012). Money stock determinants: high powered money and money multiplier. *Journal of Economics and Sustainable Development*, 3(9):83-96.
- Lone, N. A & Yadav, D. K. (2016). Determinants of money supply in India: A post reform scenario. *Journal of Economics and Finance*. 7(5): 39-48.
- Muhammad, M. A. & Islam M. I. (2010). Money supply function for Bangladesh: An Empirical analysis. AIUB Bus Econ Working Paper Series, No 2010-01,
- Nyong O. M. (2001). The Demand for Money under Rational Expectation of Inflation. *The Nigerian journal of Economic and Social Studies* 43(1): 125-143.
- Ogun. O. & Adenikinju A. (2004). Money supply Mechanism in Nigeria. *African journal of Economic Policy*, 11:
- Odior, E. S. (2013). Pure portfolio approach to money supply determination in Nigeria: A generalized method of moments approach. *Journal of Finance & Economics*. 1(1):10-26
- Pesaran, H.M., Y. Shin and R.J. Smith (2001). Bounds Testing Approach to the Analysis of Level Relationships, *Journal of Applied Econometrics*, 16, 289-326.
- Salami, D. & Kelikume, I. (2013). Is Inflation Always and Everywhere a Monetary Phenomenon? The case of Nigeria, *The International Journal of Business and Finance Research*, 7(2): 105 – 114.

- Sanusi, A. R. (2010). An empirical analysis of the money supply process in Ghana: 1983-2006. *Abuja Journal of Banking and Finance*. 2(1): 115 – 128.
- Shrestha, P. K. (2013). An empirical analysis of the money supply process in Nepal. *NRBEconomic Review*, 17-42.
- Shirvani, H., M & Bayram, S. G (2014). The relative importance of the determinants of the US money supply. *Research in Business and Economics Journal*.1-16 Available at <https://www.aabri.com/manuscripts/131537.pdf>
- Soludo, C. C. (1998). *Macroeconomic Policy Modelling of African Economy*. Acena Publishers.
- Tiwari, S. A. (2016). Money supply determinants in Nepal: A macro analysis. *Economic Literature*. 13:55-60
- Ukoha, O. O. (2013). The Response of the Nigerian Economy to Policy Variables: Issues and the Way Forward. 18th Inaugural Lecture Delivered at Michael Okpara University of Agriculture, Umudike, April 23, 2013.