

## Analysis of the Determinants of Money Supply in Nigeria (1981-2015)

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### Abstract

The study is based on the analysis of the determinants of money supply in Nigeria between 1981-2015. The study employed six (6) macroeconomic variables; money supply, consumer price index, gross domestic product, interest rate, exchange rate and foreign direct investment. The annual times series data for the variables were obtained from Central Bank Statistical Bulletin of Nigeria for the 2016. The study made use of descriptive statistics, the Augmented Dickey Fuller Test was conducted for the unit root and the Auto Regressive Distributed Lag (ARDL). The ARDL revealed the short run coefficients of the model and also the long run through the bound test, the Error Correction Mechanism was also employed to correct the deviation of the variables to equilibrium in the long run with the speed of adjustment at -0.39. Pairwise Granger Causality test was also conducted. The result showed that both short-run and long run relationship exist among the variables under study and a unidirectional causation from GDP to M2 and bidirectional causation between INRT and M2. The views of this study concludes that money supply is endogenously determined in Nigeria supported the Post Keynesian Endogeneity of money supply. The study recommends that Nigerian government should employ step by step approach in coordinating the country's monetary policy, channel(s) of the country's money supply to productive venture and not on meeting huge payments of salary and other recurrent expenditure.

### 1. Introduction

#### 1.2 Background to the Study

In recent time, the interdependences among money supply, interest rate, prices level and output (income) have generated lots of interest among the academics, economists and policy makers globally and each time answers seem to have been obtained, they serve as platforms for further questions and studies. Based on the forgoing, a global view of this study shall be made to the domestic level.

Various assertions have been downplaying the position of money in an economy and have constrained the stance of money to that of a means to economic development without seeing it intrinsically as an end in itself which could react to volatility in macroeconomic variables, while some agreed that variation in money supply is the most important determinant of economic factors such as inflation and economic growth and that countries that devote more time to studying the behavior of aggregate money supply barely experience much variation in their economic activities (Harding and Pagan, 2001). Others are skeptical about the role of money or gross national income (Ebele and Omotayo, 2015).

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The great debate on the issue of endogeneity or exogeneity of money supply especially when the society have the feeling that Central Bank of a country determines the money supply of a country, which have significant bearing on the conduct and behavior of monetary policy in a given economy. As in many other countries, the financial system and the policy tools have been undergoing changes over time in Nigeria, which has been adopting financial liberalization policy (Shrestha, 2009).

Due to keen interest with respect to this study on the determinants of money supply and also the related macroeconomic variables, there are diverse opinions from recognized financial bodies and also individuals the world over. The European Central Bank (ECB) made their points by stating their position of trending matter; that money supply originates in the behavior of the central bank and banks. A common distinction made in this respect is the supply of “outside money” provided by the central bank – consisting of banknotes and banks’ reserves with the central bank and “inside money” created by banks, consisting mainly of deposits. (European Central Bank, 2011).

Furthermore, it is clear that money supply does not operate in a vacuum nor have no principles or regulations guiding its direction in an economy because of its significant influence in determining the operation of an economy, therefore the need to capture what determines money supply is highly necessitated. (Anyanwu and Kalu, 2015).

The Nigerian economy has witnessed substantial growth since the country’s attainment of political independence in 1960. The real value of gross domestic product (GDP) rose greatly from \$2,489 million in 1960 to \$4,219 million in 1970 and therefore heaved to record about \$31,546 million in 1980. Following the foreign exchange crisis ranging from 1981–1986, accompanied by the downfall of international crude oil prices, the magnitude of growth skewed from the path it would have otherwise taken to a different direction. Economic growth witnessed a steady fall between 1980 and 1984 thereafter regained momentum taking an upward trend there from. The growth in money supply was substantial as broad and narrow money have exhibited upward trend overtime. Money supply, M1 and M2 grew rapidly from 16.3 and 19.4 per cent in 1995 to 48.1 and 62.2 per cent in 2000, respectively. The growth in monetary aggregates was due to factors such as: rapid monetization of oil inflows, minimum wage adjustments and the financing of government’s fiscal deficits through the banking system. Credit to the private sector, by contrast, declined sharply from 48.0 per cent in 1995 to 23.9 per cent in 1997 and thereafter increased gradually to 30.9 per cent in 2000. However, it stayed within the prescribed limits in only three (3) out of the six-year time frame (1995-2000). (Babatunde and Shuaibu, 2011).

The African Economic Outlook in 2011 showed that Nigeria is making progress with economic reforms that are delivering strong economic fundamentals through prudent macroeconomic policies and strengthening of the financial institutions and transformation of the economy structurally, albeit slowly and unevenly. The reform effort, aided by revenue from high oil prices, has led to significantly improved macroeconomic outcomes,

including weaker inflation and strong gross domestic product growth. Real gross domestic product growth rose from 7.0 per cent in 2009 to an estimated 8.1 per cent in 2010. The robust growth in 2010, in the aftermath of the global financial and economic crisis, underscored the resilience of the Nigerian economy and to some extent, the prudence of its economic policies. Medium-term prospects are also bright, with real GDP growth projected to remain strong and stable at 6.9 per cent in 2011 and 6.7 per cent in 2012(Oni, Emoh and Ijasan,2014).

The great debate between the Neo-Classical and Post Keynesian economists about the determination of money supply is the major driving force that prompted this study, the Neo-Classical economists stood to their ground that money supply in an economy is exogenously determined by the monetary authority of a nation while the Post-Keynesian economists' notion debunked the view of the Neo-Classical economists about the determination of money supply in an economy. Their view reverses the simple neoclassical notion that the supply of money in an economy is determined through the apex bank initiatives which primarily depends on factors outside the financial markets that is the working of an economy. The Post Keynesian school of taught contend that the supply of money both in terms of its volatility and credit availability is determined by factors within the financial markets and the composition of money supply has been altered by the advent of Automated Teller Machines (ATMs).

Based on the foregoing, the problems of developing economies, most especially Nigeria are many and prevailing for a long time. However, this study is of paramount importance to the Nigerian economy and the economies of other developing nations that may have some common features to that of Nigeria. Thus the main objective of this study is to analyze the determinants of money supply. This will be achieved by major examining the effects indicators like the consumer price index (CPI), money supply and interest regimes.

## **2.LITERATURE REVIEW**

### **2.1 Conceptual Issues**

#### **2.1.1 Money Supply**

In economics, money supply or money stock is the total amount of money available in an economy within a specific period of time. There are several ways to define "money," but standard measures usually include the currency in circulation and demand deposit. Money supply data are usually recorded and published by the apex or central bank of each country(Oni, *et al.*, 2014).

In addition to this, it should be noted that the supply of money at any moment is the total amount of money in the economy at a point in time (Jhingan, 2006). In Nigeria, the narrow money supply (M1) is defined as currency outside bank plus demand deposits of commercial banks plus domestic deposits with the central banks less federal government deposits at commercial banks. In simple terms, M1 is defined as;

$M1 = C+D$ , Where: M1 = Narrow money supply, C = Currency outside banks, D = Demand deposits.

With this break down on money supply, researchers like Ajayi (1978) contends that M2 is the appropriate definition of money in Nigeria because M2 includes not only notes and

coin and bank current accounts, but also 7-days bank deposits and some building society deposits. In the Nigerian context broad money (M2) is defined as M1 plus quasi money. Quasi-money as used here is defined as the sum of savings and time deposits with commercial banks (Ebele and Omotayo 2015).

### **2.1.2 Money Supply Endogeneity**

The Post-Keynesian notion of the endogeneity of money supply reverses the simple neoclassical notion that the supply of money is determined through the central bank initiatives that depend on factors outside the financial markets. Post-Keynesians, on the other hand, contend that the supply of money both in terms of its fluctuations and credit availability is determined by factors within the financial markets. According to this argument the monetary authority is unable to control the volume of money stock in the economy simply because the creation of money is demand determined (Ahmad *etal.*,2006).

### **2.1.3 Determinants of Money Supply in Nigeria**

The supply of money in Nigeria based on its composition appears to be determined basically by the behavior of two main economic factors. First, is the behavior of the banks concerning the amount of reserves that they decide to keep at any point in time? This amount given the fact that banks maximize profits in the long run is influenced by the banks foresight and their perception of the economic activities surrounding them. Secondly, the behavior of the non-bank public in dividing their money between currency and demand deposits, the larger the non-bank public's marginal currency deposits and money supply resulting from it, the larger the monetary base or high-powered money. The direct tools include: Aggregate credit ceiling, exchange ceiling, deposits ceiling, special deposits or directives, stabilization securities. While the indirect tools include: Stabilization securities: Open Market Operations(OMO), Cash Reserved Requirement(CRR), Liquidity Ratio(LR), Minimum rediscount Rate (MMR) or Discount Window Operation(DWO), Parity Changes(PC), Selective Credit deposits(SCD), moral suasion. The design and shift of the monetary measures and determinants being taken by the apex bank of Nigeria in recent times have been either expansionary or contractionary policy to suits its objectives at any particular time.

## **2.2 Theoretical Framework**

There is a great theoretical debate on the process of money supply: whether it is exogenous or endogenous in a given economy. The neoclassical school of thought including monetarism considers money supply as exogenous, generated not by market forces but by central banks of a country. Financial institutions and the role of historical change in the financial system have no significance in determining money supply in an economy (Pollin, 1996). Keynesians, like monetarists, also view the money supply as exogenous and subject to control by the central bank. In contrast, Post-Keynesians view the money supply as an endogenous matter, arguing that money demand creates its own supply automatically through the accommodation by the central bank (Shrestha, 2009).

To sum it up, below are theories that deal with money supply endogeneity or exogeneity

### **2.2.1 Horizontalism View of Money Supply Endogeneity**

The main proponents of the horizontalist view can be found in the writings of Kaldor (1982) and Moore (1988). The proponents of this view opined that the money supply process based on their view implies that loans create deposits, so deposits are endogenously determined. Changes in the money supply are a result of, and not a cause of, changes in money income, and vary in relation to prices and output. Based on the premise that money supply in an economic system is endogenously determined (Nayan,Kadir, Yusuf and Ali,2015).

### **2.2.2 Structuralism View of Money Supply Endogeneity**

This approach focuses on the interaction between the monetary authority's policy reaction function and the asset and liability management activities of banks (Palley, 1996). Although Structuralism consider money supply to be upwardly rising, they emphasize that banking system can effectively circumvent reserve constrained placed by apex bank in the long run through innovation of banking services and financial instruments by providing more liquid financial assets. (Ahmad *et al.*,2006)

According to their view, although economic agents and firms play a vital role in the economic system, the central bank is a significant player and has the privilege to deny accommodation of reserve needs and consequently resist credit expansion (Panagopoulos and Spiliotis, 2008). Cited in (Nayan,*etal.*,2015).

### **2.2.3 Liquidity Preference (LP) View of Money Supply Endogeneity**

According to liquidity preference view on money endogeneity, it is the relative interest rates that reconcile the decision to borrow with the decisions to hold increased deposits. Arestis and Howells (1996) criticize accommodative view that increase in deposits due to approval of loans by banking system would always be held by the public because of 'convenience lending'. Moreover, concluded that it is the changes in relative interest rate that reconcile the demand for additional loans with the demand for additional deposits at a particular point in time (Ahmad, *et al.*, 2006).

### **2.2.4 Circuit Theory of Money (CTM) Supply Endogeneity**

The concept of monetary circuit as defined by Gnos and Rochon (2003) refers to the firms' successive outlays (for productive factors) and receipts (from sales) and to the resulting formation and cancellation of money incomes. In this model, banks have the task of financing the production process through the creation of money and of selecting business plans (Realfonzo, 1998). In this process, firms, through access to credit, buy factors of production which cut across land, capital and labor and direct the production process, making decisions on the quantity of output. Workers play their role as suppliers of labor services. Clearly in this model, money (or credit) plays a crucial role in ensuring the smooth function of the economy (Nayan,*etal.*,2015).

Haven explored the theories associated with the endogeneity of money supply, the theory that will principally be adopted for this study is the "Horizontalism theory of endogeneity of money supply and partly the liquidity preference view of the endogeneity" because they

are highly related and most befitting in justifying this study.

### 2.3 Empirical Review

Ahmad *et al.*, (2006) studied the long run and short run endogeneity of money supply in Pakistan. Using Standard Granger Causality test, the study demonstrates that money supply in Pakistan for the period 1980-2003 is not exogenously determined in the short run. The empirical results support the Structuralists' view as well as Liquidity Preference view on money endogeneity.

A much correlated study can also be seen in the study by Shrestha (2009) who carried out an empirical analysis of money supply in Nepal, 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. The relative contribution of different components of money supply has been computed and the money supply as well as money multiplier function has been estimated. Empirical results showed that disposable high powered money is found to be a major contributor to the change in monetary aggregates without any significant structural break. However, the degree of controllability of high powered money is not strong, and neither CRR nor Bank Rate has been effective monetary policy tools so far

Bakare (2011) in his study, he examined the determinants of money supply growth and its implications on inflation in Nigeria. He employed quasi-experimental research design approach for the data analysis. The results of the regression showed that credit expansion to the private sector determines money supply growth by the highest magnitude in Nigeria. The results also showed a positive relationship between money supply growth and inflation in Nigeria which of course has theoretical bases.

Ahmed and Suleiman (2011) carried out a study on the long run relationship between money supply, real GDP and price level in Sudan covering a period from 1960-2015. He used the regression and granger causality test. He found no causal relationship between GDP and money supply but GDP, money supply and consumer price index are co-integrated in the long run.

Adeleke and Sola (2012) carried out a study on money supply and inflation in Nigeria. Using a times series data from 1970- 2008. And used the variables money supply, exchange rate, oil revenue, inflation rate, interest rate and employed the techniques for their analysis which are OLS, VAR, granger causality, impulse response function. Based on the result, it revealed money supply, exchange rate were stationary at level, while oil revenue were stationary at first difference. And the causality result indicates a unidirectional causality between money supply and inflation rate as well as between interest rate and inflation rate.

Bolagi (2012) examined the precise relationship between price, money and output, his study examined the co-integration causality between price, monetary aggregate and real output in Nigeria from the period 1970 to 2009. The test of stationary revealed that money and price gaps are stationary at level, while real output is found stationary at first difference. The Johansen co-integration test revealed presence of one co-integrating vector and causality is found to significantly run from money supply to price.

According to Akinbobola (2012) who examined the dynamics of money supply, exchange rate and inflation in Nigeria with samples which covers quarterly data from 1986:01 to 2008:04. The model was estimated using Vector Error Correction Mechanism (VECM).

The choice of his model could be attributed to similar reason like Olubusoye (2008) and Rahman *et al.*, (2008). The empirical results confirms that in the long run, money supply and exchange rate have significant inverse effects on inflationary pressure, while real output growth and foreign price changes have direct effects on inflationary pressure.

Furthermore, on the endogenous nature of money supply, Badarudin, Khalid and Ariff (2012), investigates the nature of money supply in Australia over two monetary policy regimes. The Post Keynesian theory on endogenous money was tested with the aim of investigating whether endogenous money supply, if it did exist, followed the accommodationist, structuralist or liquidity preference viewpoints. Interestingly, they found that money supply is endogenous in Australia even when the central bank targeted monetary aggregates during the period 1977 to 1993 and it was quarterly data that was applied. They applied the Vector Error-Correction Model for long and short run causality. Based on their findings, loans cause money supply in the long-run and there is bidirectional causality in the short-run.

The study made by Chigbu and Okoronta (2013) investigates the exogeneity of the money supply using annual data from 1970-2008. The tests applied investigated the plausibility of the classical hypotheses. They employed the two stage least square method, the Johansen's co-integration procedures and the Granger causality approach. Their findings showed that there exists a long run relationship between money supply and the included variables. The real interest rate and real income granger cause the growth of money.

Dragos (2013) carried out a study on the influence of money supply and interest rate on inflation: comparing Chinese and USA economies. The data covered the range from 1987-2011. The variables includes money supply, inflation rate and interest rate and he used multiple regressions for his analysis. Based on his findings it showed that inflation has strong connection with the other variables. A wide range of cross sectional data was employed for two countries that is China and USA.

David and Ann (2014) examined the dynamics between money supply and inflation in Nigeria using the Toda- Yamamoto causality test and the error correction methodology from the period of 1980-2012. Causality is found to run from money stock to output and inflation within the confines of the Nigerian economy. The estimated inflation elasticity of money stock is 1.002. Accordingly, increase in money supply is proportionately matched by the increase in inflation rate in Nigeria.

Raji, Jusoh and Jantan (2014) they carried out a study on real money supply and fiscal deficit in Nigeria covering the period from 1970-2010 the used the variables CPI, GDP, money supply, fiscal deficit and interest rate. They used the ARDL, granger causality, VECM. It shows in the short run, there is a unidirectional, causality running from real money supply to inflation, government deficit to price level and also between price level and interest rate. ARDL confirms the existence of long run relationship among the variables.

Olulu and Ogbulu (2015) in their study on money supply and asset price in Nigeria ranging from 2008-2013. They used two variables for their analyses which are broad money and asset price and the employed regression, VECM, Granger Causality, Impulse Response Function and variance decomposition and the result shows both positive and negative shock all in line with the a priori expectations of signs.

In the work carried out by Ahmed, Muzib and Saha (2015) who studied the money supply

process in Bangladesh, they empirically examined the money supply process on the basis by the mainstream of Post- liberalization period covering the sample period of 1972/73-2009/10. It also examined how M1 and M2 will be affected by the speed of adjustment that is equal to the difference between deposit interest rate and nominal interest rate. The money supply function for Bangladesh has been empirically tested by using annual time series data. We have found that remittance is the most significant factor that highly influenced on narrow and broad money supply in Bangladesh.

Obassaju, and Bowale(2015) examined the relationship between nominal rates of interest, nominal money supply, prices and real output using quarterly data on these variables from 1980:1 to 2012:4. The study adopted a vector error-correction mechanism to test for the short - and long – run relationships and found out that nominal money supply has no contemporaneous effect on real output in Nigeria but does have significant impact on the latter in the long-run thereby refuting the money neutrality hypothesis.

In the research work carried out by Elhendawy (2016) to find if money supply is exogenously or endogenously determined in the period 1990-2014? The VECM results clearly indicate the existence of a positive long run relationship between domestic credit, Inflation and money supply and there is a negative long run relationship between deposits and money supply. In particular, if the domestic credit rises by 10 percent, this would trigger an increase in the money supply rate by 4.6 per cent, indicating that money supply in Egypt is endogenously determined.

More recently carried out work to the best of my knowledge was the work carried out Kaplan and Gungor (2017) who studied the relationship among money supply, interest rate and inflation rate in Turkey after the 2008 financial crisis. In accordance with this purpose, 2008:1- 2015:12 period money supply, interest rate and inflation rate monthly data are used. Commonly in applied studies, the relationship between these variables is analyzed with Cholesky Decomposition Method of Variance based Vector Auto Regression Model (VAR). In analysis of the study, both Cholesky and Pesaran and Shin's proposal method is used. According to Cholesky Variance Decomposition result at the end of the month, when all changes in inflation is explained by inflation, this rate is 85 per cent according to Generalized Decomposition Method of Variance result.

### **3. METHODOLOGY AND DATA**

The data were sourced from Central Bank of Nigerian Statistical Bulletin for the year 2016.

#### **3.1 Model Specification and Estimation**

To test the hypotheses, a general model of Auto Regressive Distributed Lag (ARDL) on the broad money supply, price level, income and interest in Nigeria was developed. The ARDL model employed for the purpose of this study is to see how money supply is influenced by consumer price index, gross domestic product and interest rate respectively and also their relationship (causal) which will be found from the Granger Causality.

Hence, the ARDL model takes this form;

$$\Delta \ln M2_t = \beta_0 + \beta_1 \ln CPI_{t-1} + \beta_2 \ln GDP_{t-1} - \beta_3 \ln INRT_{t-1} + \beta_4 \ln EXRT_{t-1} + \beta_5 \ln FDI_{t-1} + \mu_t$$

$$\sum_{i=0}^{\infty} \lambda_{5i} \Delta \ln FDI_{4t-i} + \sum_{i=1}^{\infty} \varphi_{2i} \Delta \ln GDP_{1t-i} - \sum_{i=2}^{\infty} \delta_{3i} \Delta \ln INRT_{2t-i} + \sum_{i=3}^{\infty} \theta_{4i} \Delta \ln EXRT_{3t-i} + \sum_{i=4}^{\infty} \lambda_{5i} \Delta \ln FDI_{4t-i} + \mu_t \dots \dots \dots 3.1$$

From the equations above,  $\Delta$  is the first difference operator,  $\ln$  is the natural logarithm,  $k$  is the optimum lag,  $M2$  is the broad money supply,  $CPI$  is the consumer price index,  $GDP$  is the gross domestic product,  $INRT$  is the interest rate,  $EXRT$  is the exchange rate and  $FDI$  is the foreign direct investment while  $U_i$  is the error term. All the variables are in their natural logarithm. The model was estimated by the use of descriptive statistics, unit root test, ARDL and Granger Causality

#### 4. Data Analysis and Result

##### 4.1 Descriptive Statistics Result

Money supply has a mean value of 8.632403 per cent, while the minimum value is 1.131402 and the maximum value is 16.56555. The standard deviation of 6.123883 per cent implies that there is a deviation from the mean from both sides by 6.123883 per cent. This clearly shows the extent for the deviation from the mean which is wide but to some reasonable extent because the value for the standard deviation is less than the mean value. The skewness value of 0.102945 and the Jarque-Bera probability value of 0.090383 shows that the data for the money supply is positively skewed and normally distributed. The  $CPI$  has a mean value of 2.701356 per cent, this implies that an average 1 per cent change in consumer price index, it increases money supply by 2.701356 percent. The mean value for  $GDP$  is 8.139159; this indicates that a 1 per cent change in  $GDP$  increases money supply by 8.139159. Furthermore, the mean value for the interest rate is 2.872111, which implies that a 1 per cent change in interest rate will increase money supply by 2.872111 per cent. The mean value for the exchange rate is 3.417303, which implies a 1 per cent change in exchange rate, money supply will increase by 3.417303. Finally, the mean value for the foreign direct investment ( $FDI$ ) is 0.902156, this implies a 1 per cent change in  $FDI$  and the money supply will increase by 0.902156.

Table 1: Descriptive Statistics Result

	M2	CPI	GDP	INRT	EXRT	FDI
Mean	8.632403	2.701356	8.139159	2.872111	3.417303	0.902156
Median	4.003690	2.503074	8.450885	2.884801	4.529261	0.993252
Maximum	16.56555	4.288265	10.72251	3.456317	5.259784	2.379546
Minimum	1.131402	1.682688	4.615232	2.240710	-0.446287	-0.356675
Std. Dev.	6.123883	0.731770	2.058605	0.277739	1.842207	0.703281
Skewness	0.102945	0.849127	-0.394370	-0.722648	-0.888366	-0.047762
Kurtosis	1.141534	2.551178	1.792431	3.665879	2.597286	2.451476
Jarque-Bera Probability	4.807393	4.242577	2.860457	3.481879	4.563564	0.426256
	0.090383	0.119877	0.239254	0.175356	0.102102	0.808053

Sum	284.8693	89.14474	268.5923	94.77966	112.7710	29.77116
Sum Sq.						
Dev.	1200.062	17.13562	135.6114	2.468439	108.5992	15.82733
Observations	33	33	33	33	33	33

Conclusion	Positively skewed & normally Distributed	Positively skewed & normally Distributed	Negatively skewed & normally distributed			
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Source: Researcher's E-View 8.0 Result

#### 4.2 Root Tests Results (ADF)

The results obtained are summarized explicitly on table 2, it showed that all the variables for this study were non-stationary at level i.e. 1(0) based on their respective Augmented Dickey Fuller (ADF) test result which is less than the critical value at 5 per cent in absolute terms and also their probabilities were not significant except for consumer price index which is stationary at level with the Augmented Dickey Fuller (ADF) test result of -4.136140 > the critical value at 5 per cent i.e. -3.552973 and also with a probability value of 0.0135 which is statistically significant as captured below.

However, the other five variables which are (M2, GDP, INRT, EXRT, FDI) were all stationary at first difference i.e. 1(1) with the Augmented Dickey Fuller test result > the critical value at 5 per cent. As a result, this necessitated the use of Autoregressive Distributed Lag (ARDL). This is an econometric technique that can be applied even if the variables are 1(0) and 1(1) variables and below is a simple summary of the outcome of the unit root tests.

Table 2.: Unit Root Tests Results

Variable	ADF Test at Level 1(0)	Critical Value at (5%)	ADF Test at 1 <sup>st</sup> Difference 1(1)	Critical Value at (5%)	Remarks	Probabilities ADF 1(0)	Probabilities ADF 1(1)
M2	-1.14156	-3.55775	-6.044986	-3.56837	1(1)	0.9056	0.0001
	5	9	0				

CPI	-	-	-	-	1(0)	0.0135	-
	4.13614	3.55297					
	0	3					
GDP	-	-	-	-	1(1)	0.9763	0.0138
	0.54121	3.54849	4.135750	3.55775			
	6	0		9			
INRT	-	-	-	-	1(1)	0.6510	0.0042
	1.86367	3.54849	4.633558	3.55775			
	8	0		9			
EXRT	-	-	-	-	1(1)	0.9199	0.0005
	1.06774	3.54849	5.454640	3.55297			
	5	0		3			
FDI	-	-	-	-	1(1)	0.3255	0.0000
	2.50118	3.55297	10.47370	3.55775			
	6	3		9			

Source: Researcher's E-View 8.0 Result

#### 4.3 Auto Regressive Distributed Lag Estimates(ARDL)

The coefficients of the lagged value of money supply [M2 (-1)] and Gross Domestic Product (GDP) were revealed based on the ARDL to be statistically significant at 1 per cent and 5 per cent significance level respectively as manifested by their respective probability values of 0.001 and 0.019. The trend was also significant at 1 per cent with the probability value of 0.008 even thou with a negative coefficient value. The Constant(C) and the coefficient values of Consumer Price Index (CPI), Interest Rate(INRT), Exchange Rate (EXRT) and Foreign Direct Investment(FDI) were revealed to be statistically insignificant with the probability values of 0.270, 0.946,0.951,0.650 and 0.597 respectively. The coefficients of all the variables with respect to this study are in concord with the theoretical expectation except for foreign direct investment that is inconsistent with the theoretical expectation of the study. The coefficients for CPI, GDP and EXRT are 1.0752, 5.6927, 0.88047 respectively are positive. This implies that as CPI, GDP, EXRT increases by 1 per cent, money supply will concurrently increase by 1.0752, 5.6927 and 0.88047 respectively. While a 1 per cent increase in interest rate, money supply will reduce by -0.26291 which is in conformity with the theoretical expectation. While the FDI implies that, a 1 per cent increase in FDI, money supply will decrease by -0.65386. The F-Statistics is 13.6812 which measure the parameter on how the parameter estimates are jointly significant, found a strong statistically joint significance of the whole variables with the probability value of 0.000. This brings to conclusion that the variables chosen are jointly significant in affecting money supply in Nigeria.

Furthermore, the R<sup>2</sup> value is 0.81406(81. 40%).This implies that 81.40 per cent total variation in money supply (M2) was explained by CPI, GDP, INRT, EXRT and FDI with only 18.6 per cent captured in the error. This brings us to the goodness of fit of the regression, which is very high and remains high after adjusting for the degree of freedom as indicated by the R<sup>2</sup> (R<sup>2</sup> =0.75456 or 75.45%). The result of the Durbin-Watson

statistics is 2.1266 which is  $> R^2$  (0.81406) this indicates that the model of this study is non-spurious which implies that the outcome is meaningful. The Durbin-Watson statistics which is 2.1266 and the probability value of the LM version to the diagnostic tests of serial correlation which is 0.31437[0.580], functional form 2.7284[0.112], heteroscedasticity 0.30125[0.587] with the exception of the normality test as revealed by the output indicated that the model has passed the correlation test, functional form test and the heteroscedasticity test.

**Table 3: Autoregressive Distributed Lag Estimates**

Autoregressive Distributed Lag Estimates  
ARDL (1,0,0,1,0,0) selected

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Dependent variable is M2  
34 observations used for estimation from 1982 to 2015

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Regressor	Coefficient	Standard Error	T-Ratio[Prob]
M2(-1)	.60145	.15414	3.9020[.001]
CPI	1.0752	.95360	1.1275[.270]
GDP	5.6927	2.2699	2.5079[.019]
INRT	.36072	5.2608	.068567[.946]
INRT(-1)	-.26291	4.2647	-.061649[.951]
EXRT	.88047	1.9144	.45991[.650]
FDI	-.65386	1.2204	-.53579[.597]
C	-18.9433	15.9854	-1.1850[.247]
T	-1.2568	.43912	-2.8621[.008]

\*\*\*\*\*

R-Squared	.81406	R-Bar-Squared	.75456
S.E. of Regression	3.0763	F-stat. F( 8, 25)	13.6812[.000]
Mean of Dependent Variable	8.3785	S.D. of Dependent Variable	6.2094
Residual Sum of Squares	236.5918	Equation Log-likelihood	-81.2235
Akaike Info. Criterion	-90.2235	Schwarz Bayesian Criterion	-97.0921
DW-statistic	2.1266	Durbin's h-statistic	-.84195[.400]

\*\*\*\*\*

Diagnostic Tests

\*\*\*\*\*

* Test Statistics *	LM Version	* F Version *
* A: Serial Correlation*CHSQ( 1)=	.43960[.507]*F( 1, 24)=	.31437[.580]*
* B: Functional Form *CHSQ ( 1)=	3.4707[.062]*F( 1, 24)=	2.7284[.112]*
* C: Normality * CHSQ( 2)=	39.7838[.000]*	Not applicable *
* D: Heteroscedasticity*CHSQ( 1)=	.31709[.573]*F( 1, 32)=	.30125[.587]*

\*\*\*\*\*

- A:Lagrange multiplier test of residual serial correlation
- B:Ramsey's RESET test using the square of the fitted values
- C:Based on a test of skewness and kurtosis of residuals
- D:Based on the regression of squared residuals on squared fitted values

\*\*\*\*\*

Source: Researcher's E-View 9.5 (Micro-fit)

#### 4.4 Pairwise Granger Causality Test Results

The Pairwise Granger Causality Test which reveals that there is no causation between Consumer Price Index(CPI) and money supply(M2) in both directions and it also revealed that there is no causation among the following variables in either direction:Exchange Rate(EXRT) and Money Supply(M2), Foreign Direct Investment(FDI) and Money Supply(M2), Gross Domestic Product(GDP) and Consumer Price Index(CPI), Exchange Rate(EXRT) and Interest Rate(INRT), Foreign Direct Investment(FDI) and Exchange Rate(EXRT), this is because their probability value are more than 0.05 or 5 per cent level of significance thus in such a scenario, it implies that a null hypothesis will be accepted that the two variables compared do not granger cause each other or there is no causal relationship among them.

Furthermore, the result also reveals one way causation or perhaps unidirectional relationship between some variables, between Gross Domestic Product (GDP) and Money Supply (M2), which means it runs from GDP to money implies that a change in Gross Domestic Product will cause a change in money supply with no opposite reply from money supply to that effect by their probability values of (0.045 and 0.8897). Furthermore, from the result of Consumer Price Index (CPI) and Interest Rate(INRT), there is a one way causation that is it runs from CPI to INRT, also a one way causation exist between Consumer Price Index(CPI) to Foreign Direct Investment(FDI) but flows from CPI to FDI with the probability value of (0.0443), a one way directional relationship also exist between interest rate(INRT) and Gross Domestic Product(GDP) it flows from INRT to GDP, also a one way directional relationship exist between Exchange Rate (EXRT) and Gross Domestic Product(GDP) with the probability value of (0.0142) and finally a unidirectional relationship exists between Foreign Direct Investment(FDI) and Gross Domestic Product(GDP) showing a probability value of 0.0049 but flows from FDI to GDP. Finally, the result reveals a bidirectional causality between two of the variables of interest i.e. it shows a bidirectional causation between Interest Rate and Money Supply with the probabilities (0.0303 and 0.0166) this implies a rise in interest rate will cause changes in money supply and also an increase or decrease in money supply will also cause changes in interest rate with their respective probabilities value. Furthermore, the result does not reveal any further bidirectional relationship among any of the variables under study within the study period as shown on table 4.

### Table 4: Pairwise Granger Causality Tests Result

Pairwise Granger Causality Tests

Date: 03/27/17 Time: 20:57

Sample: 1981 2015

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
CPI does not Granger Cause M2	33	0.25276	0.7784
M2 does not Granger Cause CPI		1.72978	0.1957
GDP does not Granger Cause M2	33	2.62100	0.0405
M2 does not Granger Cause GDP		0.11733	0.8897
INRT does not Granger Cause M2	33	0.59167	0.0302
M2 does not Granger Cause INRT		0.14414	0.0166
EXRT does not Granger Cause M2	33	0.41816	0.6623
M2 does not Granger Cause EXRT		0.48454	0.6210
FDI does not Granger Cause M2	33	3.11788	0.0599
M2 does not Granger Cause FDI		0.14111	0.8690
GDP does not Granger Cause CPI	33	2.46895	0.1029
CPI does not Granger Cause GDP		0.26212	0.7713
INRT does not Granger Cause CPI	33	0.32448	0.7256
CPI does not Granger Cause INRT		4.61906	0.0185
EXRT does not Granger Cause CPI	33	0.70513	0.5026
CPI does not Granger Cause EXRT		2.43625	0.1058
FDI does not Granger Cause CPI	33	0.32402	0.7259
CPI does not Granger Cause FDI		3.49164	0.0443
INRT does not Granger Cause GDP	33	4.77048	0.0165
GDP does not Granger Cause INRT		2.12082	0.1388
EXRT does not Granger Cause GDP	33	4.96954	0.0142
GDP does not Granger Cause EXRT		0.46487	0.6330
FDI does not Granger Cause GDP	33	6.47406	0.0049
GDP does not Granger Cause FDI		0.88003	0.4259
EXRT does not Granger Cause INRT	33	3.29968	0.0517



INRT does not Granger Cause EXRT		0.11005	0.8962
FDI does not Granger Cause INRT	33	0.22114	0.8030
INRT does not Granger Cause FDI		2.29745	0.1192
FDI does not Granger Cause EXRT	33	0.07587	0.9271
EXRT does not Granger Cause FDI		0.27445	0.7620

Source: AUTHORS COMPUTATION: E-VIEW 8.0.

#### 4.5 Discussion of the Long Run Coefficients

The coefficient of the Gross Domestic Product (GDP) was found to be statistically significant at 5 per cent as revealed by its probability value of 0.045. Likewise, the trend is statistically significant with the probability value of 0.017 which is also at 5 per cent. However, the constant and the coefficients of Consumer Price Index (CPI), Interest Rate (INRT), Exchange Rate (EXRT), and Foreign Direct Investment (FDI) were statistically insignificant as indicated by their high probabilities above 0.05 as shown respectively 0.320, 0.268, 0.984, 0.630 and 0.20. The result reveals that all the variables were in consistency with the theoretical expectations of the study except for FDI. This result is in cognizance with the short run regression result.

The test is conclusive because the statistics of 6.8659 is outside the bound, this brings to conclusion that the null hypotheses will be rejected because the statistics is above the bounds as captured in appendix XIII and this signifies the long run relationship:

**Table 5: Estimated Long Run Coefficients Using ARDL**

Estimated Long Run Coefficients using the ARDL Approach  
ARDL (1, 0, 0, 1, 0, 0) selected

\*\*\*\*\*

Dependent variable is M2

34 observations used for estimation from 1982 to 2015

\*\*\*\*\*

Regressor	Coefficient	Standard Error	T-Ratio [Prob]
CPI	2.6978	2.3814	1.1329[.268]
GDP	14.2836	6.7730	2.1089[.045]
INRT	-.24540	12.1747	-.020157[.984]
EXRT	2.2092	4.5319	.48747[.630]
FDI	-1.6406	3.2678	-.50205[.620]
C	-47.5309	46.8363	-1.0148[.320]
T	-3.1535	1.2393	-2.5446[.017]

\*\*\*\*\*

Testing for existence of a level of relationship among the variable in the ARDL model

\*\*\*\*\*

F-Statistic	95% lower Bound	95% Upper Bound	90% lower Bound	90% upper Bound
6.8659	2.2322	4.7370	2.700	2.8720

W-statistics 95% lower Bound 95% upper Bound 90% lower Bound 90% upper Bound  
 26.1352 21.0522 28.0222 15.2261 21.8279  
 \*\*\*\*\*

SOURCE: Researcher’s E-VIEW 9.5 (micro fit).

#### 4.6 Error Correction Result

The Error Correction Model (ECM) aims to correct the deviation in the long run equilibrium of a given ARDL model. The adjustment that the one year lagged error coefficient (-0.39) shows that 39 per cent of the disequilibrium error in Nigerian money supply which accumulated in the previous year is corrected in the current year. In effect 39 per cent of the deviation from the long run target of money supply in Nigeria is corrected each year. The probability value of the (p-value) of the error correction coefficient which is (0.016) shows that it is significant at 1 per cent level. This in addition to the fact that the estimated adjustment coefficient has the expected negative sign. This implies that changes in money supply adjust to changes in price level, gross domestic product and interest rate in Nigeria despite structural rigidities. The effects of all these corroborates to the post Keynesian view of the endogeneity of money supply that is determined by the working of the economy. The convergence in the model indirectly means that there is significant long run relationship and that is proven by the equilibrium state of the result of the model. This justifies the long run relationship and how the error correction model solves such a problem.

**Table 6: Error Correction Representation for the Selected ARDL Model**

Error Correction Representation for the Selected ARDL Model  
 ARDL (1, 0, 0, 1, 0, 0) selected  
 \*\*\*\*\*

Dependent variable is dM2  
 34 observations used for estimation from 1982 to 2015  
 \*\*\*\*\*

Regressor	Coefficient	Standard Error	T-Ratio [Prob]
dCPI	1.0752	.95360	1.1275[.270]
dGDP	5.6927	2.2699	2.5079[.019]
dINRT	-.36072	5.2608	-.068567[.046]
dEXRT	.88047	1.9144	.45991[.649]
dFDI	-.65386	1.2204	-.53579[.597]
dC	-18.9433	15.9854	-1.1850[.247]
dT	-1.2568	.43912	-2.8621[.008]
ecm(-1)	-.39855	.15414	-2.5856[.016]

\*\*\*\*\*

SOURCE: Researcher’s E-VIEW 9.5 (micro fit).

### 5. CONCLUSION AND RECOMMENDATIONS

The study revealed that price level, income and interest rate positively affects money supply in Nigeria while interest rate and foreign direct investment has negative impact on

money supply in Nigeria which basically answered the research questions and also the pairwise result revealed that there is no causal relationship between price level and money supply in Nigeria in both directions, but there is a one way causal relationship between gross domestic product and money supply in Nigeria but the relationship runs from gross domestic product to money supply which brings to conclusion that GDP causes Money supply in Nigeria and finally there is a bidirectional relationship between interest rate and money supply in Nigeria this brings to conclusion that interest rate causes money supply and money supply too causes interest rate in Nigeria. The estimated long run test proved that the variables under study are related in the long run. This result therefore showed that money supply is really determined based on to the movement of macroeconomic variables of the nation and the variables also impact on money supply as clearly evident.

## 5.1 RECOMENDATION

Based on the findings this study makes the following recommendations.

The incumbent government of Nigeria should employ a step by step approach systematically in order to coordinate the country's monetary policy so as to encourage financial integration with all sectors of the economy that will enhance positive outcome to the nation

Nigeria should channel her increase money supply in productive sectors and not on payment of salaries and other recurrent expenditures. Because with massive production the country will export and increase the strength of her domestic currency, create employment opportunities, reduce imported inflation and above all promote economic growth and development.

The policy makers and government should maintain a degree of standard because any contrary behavior in these variables will have devastating effect to the economy in the long run such as the direction that Nigeria is moving towards now. The level of the nation's deficits financing is becoming worrisome this is leading to huge debt stock and tends to crowd-out private sector investment.

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