The Link between Money Supply and Economic Growth in Nigeria: An Econometric Investigation

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Abstract
The study aims at examining the link between money supply and economic growth in Nigeria. The researcher applied the cointegration and VAR model in a simple regression framework. Money supply (proxied by M2) has a short and long run positive and significant link on Real Gross Domestic Product in Nigeria. On ADF test results, it shows the two series were non-stationary at their levels, but they were stationary at first difference, this means the series M2 and RGDP were integrated at order one I(1). When the ADF test shows that the residuals are free of unit roots, it means that residuals are stationary and cointegrated at degree zero I(0), which means there are cointegration between M2 and RGDP and so there is an equilibrium relationship between the two variable in the long run. On causality, there is a causality running from M2 to RGDP and not vice versa. This shows that there is unidirectional causality from money supply (M2) to Real GDP in Nigeria during the period of study. With this, we can infer that changes in money supply help to explain the changes in RGDP in Nigeria. As such the study recommends that Economic growth (RGDP) can be achieved if monetary policy is emphasized both on short and long run by Nigeria monetary authorities. Policy redirection in favor of more responsible use of monetary policy to affect the economy as well as combat corruption in the country should be employed.

Keywords: Money Supply, Real GDP, Cointegration, VAR, Nigeria

1. INTRODUCTION

The link between Money supply and economic growth has received tremendous attention than any other subject matter in the field of monetary economics in recent times (Ogunmugiwa & Ekone, 2010, and El-seoud, 2014). This is as a result of the pertinent nature of economic growth among the macro-economic goals of nations either developed or developing. Persistent concern has always been given among scholars including Mckinnon (1973), Shaw (1973), Fry Mathieson (1980), Odedokun (1997), Levine (1997) and Asogu (1998) to the link between money supply and output.

In view of this, there has been a lot of rebut in the academia on the effect of money supply on economic growth. Monetarists argue that the changes in the amount of money lead to unexpected changes in nominal income because of the stability of money, where Friedman assumes that it is the most stable function. While the Keynesian assumes that the role of money supply is very limited because of the liquidity trap and the investment elasticity of interest is low, so the positive changes in income leads to raising money demand for transactions and raising the amount of money, and this means, the direction of causality comes from income to money and not the opposite.

However, in Nigeria, empirical evidence has proved that some linkages exist between the stock of money and economic growth. Since 1970, Nigeria has been controlling her economy through variation in her stock of money. Between 1970 and 2014 Real money supply growth rate have been maintaining an irregular trend, it rose from 18.25% in 1970 to 46.1% in 1980. While it decreased to 8.6% in 1996 due to the banking system crises, but it peak up again to 38.0% in 2009 and stood at 19.9% in 2014. Despite a number of challenges faced by Nigeria such as drop in Oil Price (the main stay of the economy), Stock Market Crash, Banking Sector Crisis, Political challenges, Militancy in the Niger Delta and Boko Haram in the North Eastern part of the country, the country have continued to record significant growth over the

decades. The economy has consistently posted positive growth throughout this period; where real GDP growth rate raised from 22.1% in 1970 to 36.78% in 1980, but it declined to 11.36% and 9.57% in 1990 and 2003 respectively and stood at 6.22% in 2014 (CBN, 2014). The changes in real GDP and money supply in the study period could indicate that there is a causality linkage between economic growth and money supply. The study aims at examining the link between money supply (M2) and the output expressed in real GDP in Nigeria for the period 1970-2014.

2. REVIEW OF RELATED LITERATURES
I. Money Supply as a Concept
According to Ezirim (2005), four approaches have attempted to conceptualize money supply and the compositions of a nation's money stock. These approaches include:

❖ **The Conventional Approach**
This approach views money supply from a functional standpoint, i.e. in the light of what money uniquely does. Accordingly, money has been seen as "a generalized means of purchasing power that is acceptable as payment for goods and services" (Cooper and Fraser, 1990). Thus what constitute the money stock of any country would be those mediums that facilitate readily the exchange mechanism and command general acceptability. These would basically include currency (C) and chequeable demand deposits (DD) created by deposit money banks. In Nigeria, this is defined as M1. Thus

$$M_1 = C + DD \tag{1}$$

❖ **The Chicago Approach**
The second approach is that championed by the monetary theorist of Chicago University. As propounded by one of their leading spokesmen, Milton Friedman "money is a temporary abode of purchasing power". The basic argument is that, since there seems to be an imperfect synchronization between income receipts and expenditure streams over time, then money must not only function as a medium of exchange, but also as a temporary store of purchasing power. By implication, the total money stock must not be restricted to M1 as expressed in equation (1) above. But must include any other asset that commands liquidity akin, or near to currency. These other assets have been described as quasi or near monies. Thus, they included in the money supply basket, the fixed interest-bearing time deposits of deposit money banks. This originated the M2 definition of total money stock. Therefore,

$$M_2 = M_1 + TD_1 \tag{2}$$

Where M1= as defined in (1) above
TD1= Fixed interest bearing time deposits of commercial bank
In Nigeria, there is a little variation, not in principle but in content, of what has been described as M2. For Central Bank of Nigeria the M2 definition of money includes M1 plus quasi money defined as savings and time deposits with deposit money banks. In which case the modified M2 can be expressed as

$$M_2 = M_1 + TD + SD_1 + TDL \tag{3}$$

Where, M1 and TD1= as defined above
SD1= Savings Deposits with Deposit Money Banks
TDL = Total Deposit Liabilities of Merchant Banks

❖ **The Gurley and Shaw Approach**
This school of thought introduced another dimension to the definition of money and money supply. Apart from broadening the content of the money stock they added a cardinal element of assigning weights to the various components. Accordingly, they define currency (C) and demand deposits (DD) as claims against financial intermediaries (central bank and deposit money banks in this case). However, they do not constitute the only claims against these institutions. There are other claims against financial intermediaries, which are close substitutes for money. Such close substitutes include, according to the approach, deposit money banks time deposits, savings deposits, credit institutions shares, bonds, etc. They argue that all these are viable alternatives to liquid stores of value to the public. Thus, the money stock is broadened as expressed below:

$$M_3 = C + DD + TD_1 + SD_1 + S + B + \ldots \tag{4}$$

Where, S= Shares of credit institutions, B= Bonds

The approach further views money supply as a weighted sum of the above components as expressed in (4) above and goes ahead to assign weights to each component on the basis of their substitutability with money.

❖ **The Central Bank Approach**

Finally, we have the widest view of money as through it were one and the same thing as credit funds lent to borrowers. This view has been favored by central banks of most developed countries, which earned it the name, **the central bank approach.** the federal reserve system of the united states seems to favor this viewpoint in their definition of money or money supply as L which comprises M3 plus non-bank public holdings of U.S. savings bonds, short-term U.S. Treasury securities, commercial papers and bankers acceptances, net of money market mutual holding of these assets. Thus we define money supply (M4) as expressed:

$$L = M_4 = M_3 + SB + TS + CP + BA + M_3H \ldots \tag{5}$$

Where

SB= Savings Bond
TS= Short Term Treasury Securities
CP= Commercial Papers
BA= Bankers Acceptance
M3H=Net of Money Market Mutual Holding of Assets

II Theoretical Review

Quantity Theory of Money (QTM)

Fisher's (1911) exchange equation (MV=PT) is considered the famous classical mathematical formulas. It expresses the relationship between the amount of money and the general price level, where (M) is the amount of money, (V) is the money velocity, (P) is the general price level, and (T) is the volume of transactions. He assumes that output will be fixed at full employment, velocity of the money will be fixed too, and thus the equation shows only the relationship between the amount of money and the general price level, especially in the long run. Fisher's has explained his theory in terms of his equation of exchange:

$$PT = MV + M'V' \tag{6}$$

In order to find out the effect of the quantity of money on the price level or the value of money, we write the equation as

$$P = \frac{MV + M'V'}{T} \tag{7}$$

Cambridge Cash Balance Theory

The neo-classical economists(Cambridge school), point out, the money supply affects both prices and output in the short run, but in the long the money supply only affects the general price level and not output. They reformulated the exchange equation to new equation called the **equation of Cambridge**. Which states that "the amount of nominal money demand and then money supplies (at money market equilibrium) are proportional linked directly to the nominal per capita income or output"; this equation had the following formula:

$$Ms = Md = KY \tag{8}$$

Where (Md) is money demand, (Ms) Money supply, (K) is the liquidity preferences, and (Y) is nominal income (Pigou, 1917).

Keynesian Theory of Money

Keynes (1936) rejected the Quantity Theory of Money in the short run because their assumptions (Y was fixed at full employment and V was fixed) do not apply in uncertainty real world with high level of unemployment. Keynes argues that changing in money supply is not the only reason for changing in the general price level, but there is another variable affects the price level which is the employment of production factors. In the case of absence of full employment, the increasing in money supply will lead to increasing total spending, and then increased the total output. When the economy reaches to full employment, the increasing in money supply only leads to higher prices. Thus, the money supply is non-neutral when the economy operated at less than the full employment level, where there is indirect effect of money supply on economic activity, through the influence of money supply on interest rates, and then investment and output.

III. Empirical Review

Several studies have confirmed the significance of money supply and economic growth in Nigeria. Asogu (1998) examined the influence of money supply and government expenditure on Gross Domestic Product. He adopted the St Louis model on annual and quarterly time series data from 1960 - 1995. He finds money supply and export as being significant. This finding according to Asogu corroborates the earlier work of Ajayi (1974) Nwaobi (1999) while examining the interaction between money and output in Nigeria between the periods 1960- 1995. The model assumed the irrelevance of anticipated monetary policy for short run deviations of domestic output from its natural level. The result indicated that unanticipated growth in money supply would have positive effect on output. A clear examination of the above shows that there is no general agreement on the determinant of economic growth in the Nigerian economy. Findings of Iyoha (1969, 1976) and Taiwo (1990) shows that there is a clear relationship between money and economic growth.

Ogunmuyiwa and Ekone (2010) investigate the impact of money supply on economic growth in Nigeria between 1980 and 2006, by applying econometric technique OLS, causality test and ECM for time series data, the results reveal that although money supply is positively related to growth but the result is however insignificant in the case of GDP growth rates on the choice between contractionary and expansionary money supply.

Inam, (2014) examined the role of money supply on economic growth in Nigeria between 1985 - 2012. Using augmented Cobb-Douglas production function and relying on co-integration/Error-Correction Methodology, it is found that money supply does not only have a positive impact on economic growth in Nigeria, but such impact is strongly and statistically significant. Others in Nigeria who have confirmed a strong relationship between money supply and growth include (Odedokun 1996; Okedokun 1998; Ojo 1993; Chete 2002 ; Saidu 2007; Owoye and Onafowora 2007).

For cross country studies, Abbas (1991) tests the causal relationship between money and output in some Asian countries, and he finds that there is mutual relationship between money and income in Pakistan, Malaysia and Thailand. While the study of Kalumia and Yourogou (1997) find strong causal relationship directed from money to income in five countries in West Africa, which means non-neutrality of money.

Tan and Baharumshah (1999) examine the causal relationship between money, output and prices in Malaysia; they find that money is non- neutral in the short run, which means there is unidirectional relationship from money to output and not the opposite. While in the study of Hussein and Abbas (2000) tested the causal relationship between money, income and prices in Pakistan, they find unidirectional relationship from income to money and not the opposite, which indicates that the real factors, but not nominal play effective role in the growth of national income in Pakistan.

Vector and Stephen (2000) explore whether a significant long run relationship exist between money and nominal GDP and between money and the price level in the Venezuelan economy. They apply time-series econometric techniques to annual data for the Venezuelan economy for (1950-1996). An important feature of their analysis is using unit roots test and cointegration with structural breaks. Certain characteristics of the Venezuelan experience suggest that structural breaks might be important. Since the economy depends heavily on oil revenue, oil price shocks have important influences on most macroeconomic variables. Also since the economy possesses large foreign debt, the world debt crisis that exploded in 1982 had pervasive effects on the Venezuelan economy. Radical changes in economic policy and political instability might have also significantly affected the movement of the macro economy. They find that long run relationship existed between narrow money (M1) and nominal GDP, the GDP deflator, and the CPI when one made allowances for one or two structural breaks.

Abdul-Raziq and others (2003) test the impact of real GDP, government spending, price level, and international reserve on the money supply in Qatar. They find significant relationship between real GDP and money supply; this means that the changes in GDP in Qatar help in explaining the changes in money supply and not the opposite. Hussein (2005) studies the causal relationship between money growth, inflation, currency devaluation and economic growth in Indonesia during the period (1954-2002) He find out that there is short run bi-directional causality between money supply growth and inflation and between currency devaluation and inflation. For the complete sample period, the causality running from inflation to narrow money supply growth was stronger than that from narrow money supply growth to inflation.

Obaid (2007) tests the causality relationship between money supply (M3) and real GDP in Egypt during the period (1970-2006), by using Granger test. He concludes that there is no causality between the nominal money supply and nominal GDP during the study period, while when he used the real money supply and real GDP, he finds that there is mutual causality relationship between real money supply and real GDP in Egypt (non-neutral money), and thus the monetary policy is an effective policy on the real GDP in Egypt, the mutual causality relationship could help to forecast the GDP behavior within assumed volume of money supply by the economics policy making in Egypt

El-seoud (2014) tested the relationship between money supply and GDP in Bahrain for the period of 13years. Using Cointegration, Error Correction model and granger causality techniques, the findings reveal the existence of a long run equilibrium between real GDP and real money supply while the Error term and F-test indicate unidirectional causality running from real GDP to real money supply in the short run as well as in the long run.

3. METHODOLOGY

I. Data
The data used for the study is basically secondary in nature. This data is obtained from the publications of the Central Bank of Nigeria Statistical Bulletin (2014). Data were collected for the period of 1970 – 2014 on economic growth which is the explained variable and money supply (M2) as explanatory variable.

II. Estimation
The study employed pre estimation analysis such as descriptive statistics and stationarity test. This is to reveal the behavior of the data on the variables. The econometric tools of the regression analysis   were used to analyze the data. These tools include VAR for testing the short run relationship between the variables, co-integration for testing the long run relationship between the variables, and granger causality test for testing the direction of the causality linkage.

III. Specification of Model

Leaning on the theoretical models earlier reviewed, the model of this study includes real gross domestic product as the dependent variable and monetary policy variable of money supply is the explanatory variable. We hypothesize that real gross domestic product in Nigeria is a function of the explanatory variables. This is algebraically expressed in equation nine,

$$RGDP = f(M_2) \qquad\qquad (9)$$

Equation ten presents the estimable version of equation (9)

$$RGDP_t = \psi_0 + \psi_1 M2_t + \zeta \qquad\qquad (10)$$
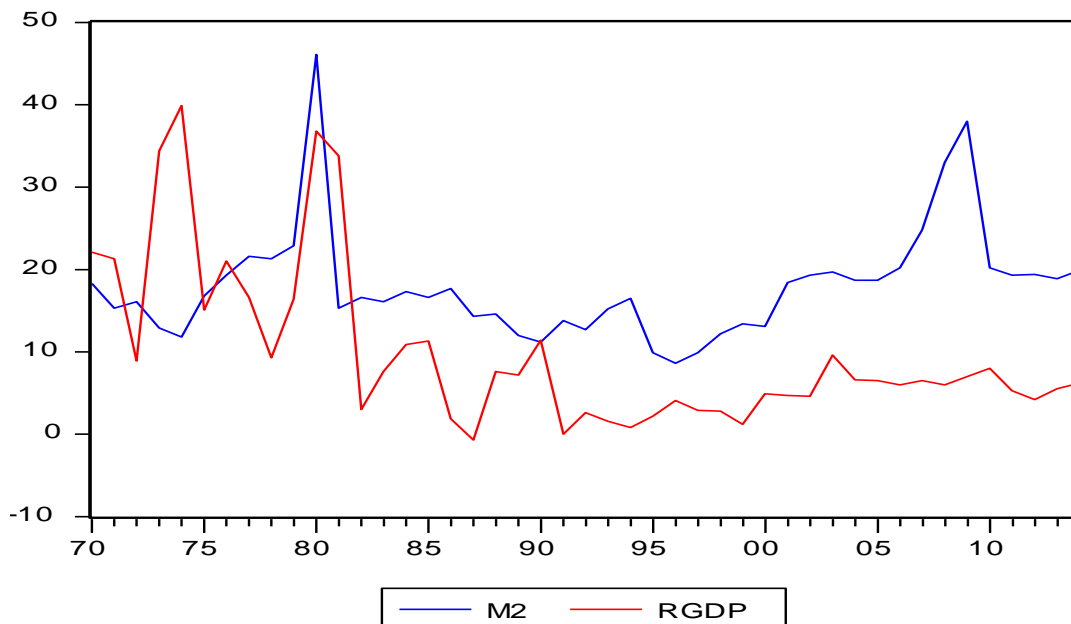
Where,
RGDP = Real Domestic Product Growth Rate
M2   = Money Supply Growth Rate
ζ = Error Term

4. EMPIRICAL RESULTS

Figure 1 Graph Showing M2 Growth Rate and RGDP Growth rate

It is noteworthy that both variables M2 growth rate and RGDP growth rate fluctuated violently as can be verified from figure 1. As such non of the variables maintained a stable trend.

Table 4.1 Descriptive Statistic

	RGDP	M2
Mean	9.902222	17.95333
Median	6.500000	16.80000
Maximum	39.90000	46.10000
Minimum	-0.700000	8.600000
Std. Dev.	9.970447	6.888317
Skewness	1.676879	2.166606
Kurtosis	5.037889	8.968670
Jarque-Bera	28.87629	102.0033
Probability	0.000001	0.000000

Observations	45	45

SOURCE: Eview 8.0 Output

The mean value of the RGDP and M2 variables are 9.902222 and 17.95333, while the median of the series are 6.500000 for RGDP and 16.80000 for M2. It should be noted that the median is a robust measure of the center of the distribution that is less sensitive to outliers than the mean. The maximum values of each of the series in the current sample are 39.9000 for RGDP and 46.10000 for M2. On the other hand, the minimum values of the series in the sample are -0.700000 for RGDP and 8.600000 for M2. The standard deviations which are a measure of dispersion or spread in each of the series are 9.970447 for RGDP and 6.888317 for M2 respectively.

The skewness which is a measure of asymmetry of the distribution of the series around its means is seen to be positive for the RGDP and the M2 variables (s=1.676879 for RGDP and 2.166606 for M2) which means that the distribution has a long right tail. The kurtosis statistic that measures the peakedness of flatness of the distribution of each of the series is calculated at 5.037889 for RGDP and 8.968670 for M2. Since all the two variables posted kurtosis of more than 3 the distribution is peaked (leptokurtie).

The Jarque-Bera statistic, which is a test statistic for testing whether the series is normally distributed, measuring the difference of the skewness and kurtosis of the series with those from the normal distribution is reported at 28.87629 with a probability of 0.000 for M2. Under the null hypothesis of a normal distribution, the reported probability indicates that we can reject the hypothesis of normal distribution at 1% level of significance.

Table 4.2 Unit Root Test Results

First Difference for RGDP

ADF Test Statistic	-8.763680	1% Critical Value*	-3.5930
		5% Critical Value	-2.9320
		10% Critical Value	-2.6039

*MacKinnon critical values for rejection of hypothesis of a unit root.

First Difference for M2

ADF Test Statistic	-6.217296	1% Critical Value*	-3.5930
		5% Critical Value	-2.9320
		10% Critical Value	-2.6039

*MacKinnon critical values for rejection of hypothesis of a unit root.

The Augmented Dickey Fuller (ADF) procedure was applied in the testing for existence of unit root or stationarity of time series data and the order of integration of both variables. When the ADF statistic is less than the test critical values at 1%, 5% and 10%, the time series data under unit root test is assumed to be stationary at all the levels. Table 4.2 reveals that the time series data under the Augmented Dickey Fuller (ADF) procedure, achieved stationarity at first difference I(1). Hence, when time series data of the variables are integrated of the same order I(1), the data series tend to cointegrate (Engle and Granger, 1985).

Table 4.3 Vector Autoregression Estimation
Standard Errors & T-statistics in Parentheses

	RGDP
RGDP(-1)	0.595839

	(0.15448)
	(3.85698)
RGDP(-2)	-0.048672
	(0.15194)
	(-0.32033)
C	-1.047878
	(3.56403)
	(-0.29402)
M2	0.283784
	(0.17562)
	(1.61588)

R-squared	0.390587
Adj. R-squared	0.343709
Sum sq. resids	2487.860
S.E. equation	7.986945
F-statistic	8.332008
Log likelihood	-148.2609
Akaike AIC	7.081902
Schwarz SC	7.245734
Mean dependent	9.353488
S.D. dependent	9.858993

SOURCE: Eview 8.0 Output

The relative statistic result shows that money supply (M2) variable recorded a coefficient of 0.283784and a standard error of 0.17562 and thus a t-statistic of 1.62. This is significant at 5% level of significance. Thus the M2 variable was positively and significantly related to RGDP during the period of study.

A look at the global statistics shows that degree of relationship between the monetary policy variable (M2) and RGDP was quite low at an adjusted R Square of 0.344. By implication, about 34% of the variations in RGDP were explained by the model. This demonstrates good fit as indicated by the F-statistic of 8.332 which is significant at 1% level. The log-likelihood ratio, Akaike Information Criterion and Schwarz Bayesian Criterion statistic all showed that the model has good forecasting power.

Table 4.4 Johansen Cointegration Test

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.190433	15.88092	15.41	20.04	None *
0.146208	6.796927	3.76	6.65	At most 1 **

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 2 cointegrating equation(s) at 5% significance level

The Johansen test for cointegration between real gross domestic product (RGDP) and the money supply variable (M2) are depicted on table 4.4. The critical assumption was that of linear deterministic trend in the data series namely RGDP and M2. From the table, it can be seen that the economic performance variable (Real GDP) is cointegrated with the money supply at 1% significance level. This indicate that a long-run equilibrium relationship exists between total output (RGDP) of the Nigeria economy and monetary policy variable.

Table 4.5 Pairwise Granger Causality Test
Date: 04/25/16 Time: 23:52
Sample: 1970 2014
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
M2 does not Granger Cause RGDP	43	3.35991	0.04533
RGDP does not Granger Cause M2		0.16223	0.85083

Source: Eview Output 8.0

Table 4.5 depicts the pairwise granger causality test between the variable under consideration when lagged by two periods. The result shows that we cannot accept the null hypothesis that money supply (M2) does not granger cause RGDP at 5% level of significance (prob= 0.04533), thus money supply actually impacts on RGDP. We can only say the same thing for RGDP causing money supply at 10% level is taking as adequate then we can infer the conditions of dual causality between M2 and RGDP variable.

5. CONCLUSION

The study aims at examining the link between money supply and economic growth in Nigeria. The researcher applied the cointegration and VAR model in a simple regression framework. Money supply (proxied by M2) has a short and long run positive and significant linkage on Real Gross Domestic Product in Nigeria. This finding collaborate the works of El-seoud (2014), Inam (2014) and Ogunmuyiwa and Francis (2010). On ADF test results, it shows the two series were non-stationary at their levels, but they were stationary at first difference, this means the series M2 and RGDP were integrated at order one I(1). When the ADF test shows that the residuals are free of unit roots, it means that residuals are stationary and cointegrated at degree zero I(0), which means there are cointegration between M2 and RGDP and so there is an equilibrium relationship between the two variable in the long run. On causality, there is a causality running from M2 to RGDP and not vice versa. This shows that there is unidirectional causality from money supply (M2) to Real GDP in Nigeria during the period of study. With this, we can infer that changes in money supply help to explain the changes in RGDP in Nigeria. As such the study recommends that

- ❖ Economic growth (RGDP) can be achieved if monetary policy is emphasized both on short and long run by Nigeria monetary authorities.
- ❖ Policy redirection in favor of more responsible use of monetary policy to affect the economy as well as combat corruption in the country.

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