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Money Supply and Economic Growth in Nigeria: An Econometric Analysis (1985-2011)

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Abstract
This Paper provides further evidence on 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. Thus, greater emphasis should be on the improvement of the monetary policies, instruments and institutions in Nigeria if their contribution to Nigeria's economic growth is to be maximized.
Keywords: Money, Money Supply, Monetary Policy, Economic Growth, National Output (GDP).

1.Introduction

At independence in 1960, Nigeria had great potential of being a prosperous nation given its abundant human and natural resources. The outlook was further brightened by the oil boom in the 1970s. Consequently, government had to implement series of ambitious Development Plans aimed at ensuring rapid economic growth and development. Initially, at least up to the early 1970s, the overall economic performance was impressive: The rate of growth of GDP for instance averaged about 8.8 percent between 1970 and 1974 (Inam, 2005). The massive inflow of foreign exchange earnings mainly from improved petroleum prices as well as high rate of domestic and foreign investments in industry, construction and services helped to sustain the GDP growth rate at reasonably high levels (Inam, 2005). With the huge earnings from crude Oil experts, government became the prime mover of the economy through direct participation in basic production of goods and services as well as in the provision of infrastructure. However, the fortune was not sufficiently capitalized upon to ensure an enduring economic performance. Thus, the Nigerian economy began to show signs of distress in the early 1980s. Since then the performance of the economy has been quite epileptic (Inam, 2005).

Money supply more or less influences or affects Economic growth positively or negatively. From 1959, there have been two major phases in the pursuit of monetary policy, namely: direct monetary control phase and the market mechanism phase. These phases were all aimed at regulating the supply and cost of money optimally such that certain desired national objectives (such as increased and sustainable output) were achieved. It has been observed that the quantity of money supplied in an Economy influences the Gross Domestic product or output overtime. For instance, Sanusi (2001) asserts that lags in economic growth over

time are caused by capital inadequacy traceable to the failure of monetary policy amongst other factors. Odedokun (1994) also asserts that financial intermediation promotes economic growth. Could this therefore imply that money supply affects economic growth in Nigeria?
This paper thus seeks to investigate the relationship between money supply and economic growth in Nigeria using data between 1985-2011. Specifically, it seeks to find out the nature and direction of causality between money supply and economic growth in Nigeria. The paper is divided into five sections, section 1 is the introduction, section 2 contains the literature review while section 3 contains the methodology and the model specification. In section 4, the result are presented and discussed in detail. Section 5 contains the policy implications and conclusion of the paper.

2. Literature Review

2.1Theoretical Literature Review

Money Supply refers to the total stock of monetary media of exchange available to a society for use in connection with the economic activity of the country (Ahuja, 2010). According to the standard concept of money supply, it is composed of the following two elements: Currency with the Public and Demand deposits with the Public. Two things must be noted with regard to the money supply in the economy. First, the money supply refers to the total sum of money available to the public in the economy at a point of time. That is, money supply is a stock concept in sharp contrast to the national income which is a flow representing the value of goods and services produced per unit of time, usually taken as a year secondly, money supply always refers to the amount of money held by the public (Ahuja, 2010).

Economic growth is defined and measured as either: an increase in real gross domestic product (GDP) accruing over some time period, or an increase in real GDP per capita occurring over some time period (McConnell and Brue, 2005). With either definition, economic growth is calculated as a percentage rate of growth per quarter (3-Month period) or per year. The second definition takes into consideration the size of the population. Real GDP per capita (or per capita output) is found by dividing real GDP by the size of the population (McConnell and Brue, 2005).

Several theories abound on the role of money in economic growth. These theories include: the simple Harrod-Damar growth model, the Neoclassical growth model including the Tobin model, the Gurley-Shaw models, the Mckinnon and Shaw model. However, for the purpose of this paper, the relevant theory is the neoclassical growth theory. According to traditional neoclassical growth theory, output growth results from one or more three factors: increase in labour quantity and quality (through population growth and education), increases in capital (through saving and investment), and improvements in technology (Todaro and Smith, 2009).

The starting point of any theory of growth must be an aggregate production function, a specification of the relation between aggregate output and the inputs in production (Blanchard, 2009). The simple Neoclassical aggregate production function expresses Aggregate output (Y) as a function of capital (K) and Labour (L). This can be stated thus:

$Y = f(K, L)$. …… …(1)

However, for the purpose of this study, the researcher proposes a framework based on the conventional simple neo-classical aggregate production function in which money (M) constitutes an input. Thus,

$Y = f(L, K, M)$……..(2)

2.2 Empirical Literature Review

There is a preponderance of empirical studies on the Money Supply–growth nexus. For instance, Nouri and Samimi (2011) investigated the impact of monetary policy on economic growth in Iran using data spanning the period of 1974 to 2008. employing the Ordinary Least Squares (OLS) technique, their findings indicated that there is a positive and significant relationship between money supply and economic growth in Iran.

Similar studies that have established the existence of a positive relationship between Money Supply and growth include: Acemoglu and Zilibotti (1997); King and Levine (1993); Sims (1972); Watchel and Peter (1995); Lagan (1956); Friedman and Schwartz (1963); and Mansor (2005).

Within the Nigerian context, a number of studies have investigated the money supply-growth nexus. For instance Ogunmuyiwa and Ekone (2010) investigated the impact of money supply on economic growth in Nigeria using annual data for the period 1980 to 2006. Applying Econometric technique (Ordinary Least Squares (OLS), Granger Causality test and Error correction Model), the results revealed that although money supply is positively related to growth, the result is however insignificant in the case of GDP growth rates on the choice between contractionary and expansionary money supply. Similar studies in Nigeria that have found a positive relationship beween Money Supply and economic growth include: Ojo (1993); Odedokun (1996); Okedokun (1998); Owoye and Onafowora (2007); and Saidu (2007).

3.0 Methodology

3.1Model Specification

This study adopts a multivariate co-integration regression analysis in order to find out if there is any long-run relationship between Output (GDP) growth and money supply. This is done in order to avoid spurious correlation and regression results often encountered in non-stationary time series data.

In order to justify the choice of the explanatory variables, a simple multiple regression model is specified to investigate or determine the impact of these investigatory variables on GDP. Specifically, this study proposes a framework based on the conventional simple neo-classical aggregate production function in which money constitutes an input as in equation 3.1.1

$Y_t = f(L_t, K_t, M_t)$…… (3.1.1)

By taking the differential of equation 3.1.1 and appropriately manipulating or re-arranging the resulting expression, more technically, we shall arrive at the growth equation 3.1.2.

$Y_t = b_0 + b_1L_t + b_2(1/y)_t + b_3M_t + U_t$…… …..(3.1.2)

where:

Y_t = Growth rate of real GDP
L_t = Growth rate of the Labour Force
I/y = the Share of real gross investment (I) in the real GDP (Y)
M_t = Growth rate of real Broad Money Supply
U_t = Stochastic error term at time t
t = the time period
$b_0 - b_3$ are parameters of the model representing the coefficients of the explanatory variables.

A Priori Expectations

b_1, b_2 and $b_3 > 0$

It is important to note that economic growth is measured as the annual growth rate of the real GDP; Labour force growth is proxied by population growth which in turn, is calculated as the annual growth rate of population size; the Investment/GDP ratio is computed as gross nominal fixed capital formation divided by the nominal GDP. Summarily, in all cases, the annual growth rate of a variable is computed as the first –difference of its natural logarithm.

3.2 Data

The series employed are annual observations of Gross Domestic Product (GDP), Labour Force (Proxied by population), Gross Fixed Capital Formation and Broad Money Supply (M2) for the period 1985 to 2011. They were sourced from various issues of the Central Bank of Nigeria (CBN) Statistical Bulletin.

3.3 Estimation Techniques

3.3.1 Unit Root Test

The Unit Root Test involves testing for the order of integration of each time series (variable) A series is said to be integrated of order I(1) if it needs to be differenced once to become stationary. The same holds for an I(2) series which will need to be differenced twice to become stationary. Thus a stationary series is integrated of order zero I(0) (i.e, no differencing is necessary). Both the Augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1979,1981), and the Philips-Perron (Philip and Perron,1988) "unit root" tests are employed to determine the order of integration of each series.

3.3.2 The Co-Integration

This involves testing for the existence or otherwise of co integration between series that have the same order of integration. The existence of co-integration between series implies the existence of a long-term relationship between such variables and vice versa. This study employs the maximum likelihood test procedure established by Johansen and Juselius (1990) and Johansen (1991).

3.3.3 The Error Correction Model

If the existence of Co-integration is established amongst the series, then an Error Correction Mechanism (ECM) first used by Sargan (1964) and later popularized by Engel and Granger(1969) is constructed to correct for any dis-equibrium in the short run. In an ECM, the dynamics of both short-run (changes) and long-run (levels) adjustment processes are modeled simultaneously, thereby offering the possibility of revealing information about both the short-run and long-run relationship.

3.3.4 Granger Causality Test

The Granger causality test is used to detect the nature and direction of influence or causality between two variables. If two variables are co-integrated then the causality of the co-integrated variables are captured in a vector error correction model (VECM).

4.0 Analysis and Discussion of Results

4.1 Unit Root Tests

Table 4.1a Result of Unit Root Test Based on Augmented Dickey-Fuller (Constant, time and trend included)

Variables	ADF statistic	1% critical level	5% critical level	10% critical level	Order of integration
Y_t	-6.370086	-3.724070	-2.986225	-2.632604	I(0)
L_t	-4.932732	-3.724070	-2.986225	-2.632604	I(1)
1/y	-5.716748	-3.724070	-2.986225	-2.632604	I(1)
M_t	-5.766912	-3.768597	-3.004861	-2.642242	I(0)

Source: Computed Result (E-view 5.0)

Table 4.1b Result of Unit Root Test Based on Philip Perron Test (Constant, time and trend included)

Variables	**ADF statistic**	**1% critical level**	**5% critical level**	**10% critical level**	**Order of integration**
Y_t	-6.736806	-3.724070	-2.986225	-2.632604	I(0)
L_t	-4.932625	-3.724070	-2.986225	-2.632604	I(1)
1/y	-6.019786	-3.724070	-2.986225	-2.632604	I(1)
M_t	-4.265180	-3.724070	-2.986225	-2.632604	I(0)

Notes:

(1) The acronyms for variables are as earlier defined in section 3.1 under model specification

(2) The test was performed with trend and intercept and the critical values of the test are at 1%, 5%, and 10% levels of significance respectively

(3) Order (0) and order (1) indicate stationarity of the various variables at level and at first difference respectively.

(4) The Ho is that series is non-stationary against alternative hypothesis H_1 of a series being stationary. The rejection of the Ho for the ADF and PP tests are based on the Mckinnon critical values. The lag lengths were determined in accordance with the Sic.

After comparing the test statistic value against the Mackinnon critical value at 5% level of significance, it was noticed that two out of the four variables in the two tests employed, that is ADF and PP, were stationary at levels. The results of both the ADF and PP test show that Y_t and Mt were stationary at levels while L_t and I/y were stationary at first difference.

4.2 Co-integration Rank Tests

Table 4.2a Unrestricted Co-integration Rank Test (Trace)

Hypothesized				
No. of CE(S)	**Eigen value**	**Trace statistic**	**0.05 Critical value**	**Prob ****
None *	0.720411	60.51926	47.85613	0.0021
At most 1*	0.428204	29.93283	29.79707	0.0482
At most 2*	0.363639	16.51750	15.49471	0.0350
At most 3 *	0.210409	5.669772	3.841466	0.0173

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level
*** denotes rejection of the hypothesis at the 0.05 level**
**** McKinnon-Haug-Michelis (1999) P-values.**

Table 4.2b Unrestricted cointegration Rank Test (Maximum Eigen value)

Hypothesized				
No. of CE(S)	**Eigen value**	**Trace statistic**	**0.05 Critical value**	**Prob ****
None *	0.720411	30.58643	27.58434	0.0200
At most 1*	0.428204	13.41533	21.13162	0.4148
At most 2*	0.363639	10.84773	14.26460	0.1620
At most 3 *	0.210409	5.669772	3.841444	0.0173

Max-eigen value test indicates 1 cointegrating eqn (s) at the 0.0 level
*** denotes rejection of the hypothesis at the 0.05 level**
**** McKinnon-Haug- michelis (1999) P-values**

From the table, the trace statistic indicated 4 co-integrating equations at the 5% level of significance while the maximum Eigen value statistic indicates 1 co-integrating equation at the 5% level of significance. This result suggests that there is co-integration or long–run relationship between the variables tested.

4.3 Error Correction Model Results

The error correction mechanism for the variables that influence real GDP(Y) was estimated to capture the dynamics in the Output equation in the short run and to identify the speed of adjustment as a response to

departures from the long run equilibrium. To obtain a parsimonious dynamic ECM for the Output equation, an initial over-parametised model was estimated which was too difficult to interprete. Thus, it was reduced and simplified into an interpretable parsimonious model of output in Nigeria. The result is presented below.

Table 4.3 Parsimonious Error Correction Result of Factors Influencing Output.
Dependent Variable: $D(LOG(Y_t))$

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.020174	0.264693	-0.076218	0.9403
$D(LOG(L_t))$	-10.83075	6.745542	-1.605616	0.1292
D(LOG(I/Y))	0.716063	1.332343	0.537447	0.5988
$D(LOG(M_t))$	-1.245052	0.419989	-2.964491	0.0096
ECM(-1)	-0.732920	0.330849	-2.215272	0.0426

R-squared	0.409584	Mean dependent var	0.232936
Adjusted R-squared	0.252139	S.D. dependent var	1.305844
S.E. of regression	1.129280	Akaike info criterion	3.293355
Sum squared resid	19.12910	Schwarz criterion	3.542288
Log likelihood	-27.93355	F-statistic	2.601449
Durbin-Watson stat	1.869276	Prob(F-statistic)	0.078250

The result of the parsimonious model presented in table 4.3 shows a well defined error correction term ECM(-1) which indicates that about 73% of the discrepancy between the actual and the long run or equilibrium value of GDP is corrected or eliminated each year. The effect of this ECM is not only large but also has a negative sign as expected and is significant at 5% probability level. Thus, this validates our earlier position that the variables under study are indeed cointegrated.

The diagnostic test for the ECM revealed R^2 of 0.409584 implying that the specified explanatory time series explained about 41% of the adjusted total variations in GDP (Y_t). The F-statistic of 2.601 is significant at 10% probability level thus indicating that the R^2 is significant and the model has goodness of fit. The Durbin Watson value of 1.869 however reveals the existence of minor serial correlation.

It is also pertinent to note that, of all the explanatory variables, it is only the growth rate of real Broad Money Supply(M_t) that is significant in the parsimonious results presented in table 4.3. It is significant at 1% probability level and is also negative. This indicates that money supply has an inverse but significant influence on output growth in the short run.

4.4 Granger Causality Results
Table 4.4 Pairwise Granger Causality Test Results

Null Hypothesis:	Obs	F-Statistic	Probability
Lt does not Granger Cause Yt	24	0.26441	0.77044
Yt does not Granger Cause Lt		0.11386	0.89299
I/Y does not Granger Cause Yt	24	0.48122	0.62536
Yt does not Granger Cause I/Y		2.07864	0.15263
Mt does not Granger Cause Yt	24	0.20067	0.81989
Yt does not Granger Cause Mt		1.36302	0.27980

From the Granger results, the null hypothesis that the population growth rate(Lt) does not Granger cause real GDP growth rate(Yt) is accepted. This is because computed F- statistic value is less than the critical table value. Likewise, we accept the null hypothesis that Yt does not Granger cause Lt. Thus independent causality exists between Yt and Lt.

Similarly, we accept the null hypothesis that the Investment/GDP ratio (I/Y) does not granger cause output growth (Yt). This is because computed F- statistic is also less than the critical table value. On the contrary, we reject the null hypothesis that Yt does not granger cause I/Y because computed F-value is greater than critical table value. Thus, unidirectional causality exists between Yt and I/Y with the causality running from Yt to I/Y.

Furthermore, we accept the null hypothesis that Mt does not granger cause Yt because computed F- statistic is also less than critical table value. On the contrary, we reject the null hypothesis that Yt does not granger cause Mt because computed F-statistic is greater than critical table value. Thus unidirectional causality exists between Yt and Mt with the causality running from Yt to Mt.

5. Policy Recommendations and Conclusion

The major focus of this study is to empirically determine the influence of money supply on economic growth in Nigeria. From the findings of this study, the policy options can be easily discerned. While there exists a long run relationship

Among the variables employed for purposes of this research, policy option requires that, in the short run, efforts should be aimed at growing the Nigerian economy, that is GDP, through effective and efficient management of the money supply. Although the error correction results indicate a negative but statistically significant influence of money supply on economic growth in the short run, there exists a long run relationship between both variables. Thus greater emphasis should be on the improvement of the monetary policies, instruments and institutions in Nigeria if their contribution to Nigeria's economic growth is to be maximized.

Nigeria must realize that money plays a critical role in economic growth. Therefore isolating the impact of monetary policy on economic growth is quite difficult because the pursuit of monetary stability is also one of the conditions for attaining a long term and overall sustainable growth of the economy. From all indications, economic growth in Nigeria is presently inadequate to meet the need of the Nigerian populace. Thus, greater emphasis should be on the implementation of sound monetary policies in coordination with

prudent fiscal policies that will create macro-economic stability thereby ensuring a sustainable growth of the economy. However, a good growth performance of the economy will be largely due to a positive interplay of economic, political, social and institutional factors that will serve to transform monetary policies effectively into achieving sustainable growth that will augur well for the welfare of all members of the citizenry.

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