

Impact of Money Supply and Inflation on Economic Growth in Nigeria (1973-2013)

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Abstract: *This study empirically examined the impact of money supply, inflation, and interest rate on Economic Growth in Nigeria using time series data from 1973-2013. VAR Model and Granger Causality test within error correction framework were used. The results of the VEC model provides an evidence in support of a positive impact of broad money supply while inflation and interest rate exhibits a negative impact on growth most especially in the long run. The short run parsimonious results revealed that with the exception of inflation, broad money supply and interest rate were negatively related to economic growth. For the test of causality, it was revealed that none of the explanatory variables granger causes economic growth, implying that money supply, inflation and interest rate have not influenced growth. The study therefore, recommended for an expansionary monetary policy, zero interest based finance capable of attracting investment in the real sector of the economy and arresting the inflationary tendency associated with monetary policy.*

Key Words: *Economic Growth, Inflation, Interest rate, Causality*

Jel Classification Code:

I. Introduction

Money supply and mild inflation rate are key determinants of high economic growth rate capable of creating employment opportunities, poverty reduction, higher per capita income and standard of living that culminate into economic development (Phibian, 2010). Over the years, the achievement of this macroeconomic objective has been futile for many years in Nigeria. This might be attributed to lack of proper understanding of the relationship among the variables. Therefore, understanding the causal connections between money supply and price on output as well as their relationship becomes imperative. This is predicated on the fact that such relationship reveals the appropriate monetary policies as well as their effectiveness in achieving desired economic performance. In an attempt to achieve this, several monetary policies were adopted by Nigeria; these include exchange rate targeting regime 1959-1973, monetary targeting, inflation targeting among others. In a specific term Inflation Targeting introduced by Charles Soludo in 2007 aim at keeping the price levels at a target rate as a means of achieving desired economic outcomes (Ogunmuyiwa and Francis, 2010).

In view of the above, the paper sets out to empirically investigate the Impact of money supply and inflation on economic growth in Nigeria for the period of 1973-2013. However, while earlier studies have focused on either the impact of money supply on economic growth or inflation on economic growth in Nigeria, the present study differs by measuring the impact of the monetary policy variables (money supply and inflation) in a single framework. Apart from this, most of the earlier empirical studies focused on the short run impacts, underestimating the fact that long run behaviour of variables might deviate totally from the short run behaviour of variables. Therefore making achievement of proper mixed of monetary aggregate with level of interest necessary for a targeted level of inflation that is growth driving elusive (Osuala et al, 2013 ; Taiwo, 2011 and Ogunmuyiwa *et al*, 2010). The present study accounts for this shortcoming, by investigating both the short run and long run relationship between monetary policy indicators and economic growth. In addition, apart from the fact that most of the related empirical works uses data spanning over a short period, works conducted in Nigeria on these macroeconomic variables do not considered causal connections among the variables of interest, thus making inferences drawn in such circumstances having a long term negative impact on policy implementation and outcomes (Adesoye, 2012; Osuala, 2013).

In the light of this, the paper is collapsed into five sections including this introduction as section one. Section 2 reviews the related literatures and conceptual framework, while section 3 examines methodology. Section 4 deals with discussion of results while section 5 concludes with recommendations.

II. Literature Review And Conceptual Framework

In order to place our argument and discussions in proper theoretical and empirical perspective, we conceptualized the economic variables that are involved in this work and review the relevant literature.

2.1 Conceptual Framework

To start with, money supply is the total amount of all forms of money in circulation in a given country at a given period of time (Johnson, 1987; Jhingan, 2005; Abdullahi, 2009). Total money supply can be grouped into two

broad categories as defined by Central Bank of Nigeria: These are near money (*M1*) and broad money (*M2*) (CBN, 2003). *M1* indicates currency in circulation plus current account deposits with commercial banks while *M2* is *M1* plus savings and time deposits.

Interest rate on the other hand, is regarded as Bank rate or monetary policy rate (*MPR*) and it is one of the intermediate monetary policy instruments at the control of Central Bank to control money supply and thus inflation rate (Anyaele, 2003). If the apex Bank feels to curtail money supply by reducing the power of participants (commercial banks), it will increase interest rates, while in case of an expansionary monetary policy, the reverse will be the case. Inflation generally entails a sustained rise in the price of goods and services in an economy (Medee and Nembee, 2010; Andy, 2001). Precisely, it is a situation in which the value of money is declining i.e when prices are raising rapidly (Aderinto and Abdullahi, 1988). Todaro (1985) defined economic growth as a long-term rise in capacity to supply increasingly diverse economic goods and services to its population; this growth capacity is based on advancing technologies, the institutional and ideological advancement that it demands. Economic growth occurs whenever there is a quantitative increase in country's input and output over a period of time (Johnson, 1987; Kayode, 1996).

2.2 Theoretical Framework

Over the years, theories on the nexus between monetary policy and economic growth have flourished resulting in to different strands of opinions among different schools of thought. This was predicated on the fact that high economic growth rate capable of translating into economic development required a proper mixed monetary policy variables, hence this has generated a lot of attention among the various schools of thought ranging from Classical to Neo Classical, Keynesian to Neo Keynesian etc. In the present study, theoretical framework would be reviewed in two phases: impact of money supply on economic growth on one hand and impact of inflation on economic growth on the other.

Theoretical propositions on the impact of money supply on economic growth are traceable to the Classical and Keynesian monetary theory, which is also known as Quantity theory of money. The Classical monetary theory is hinged on Irving Fisher equation of exchange or what he called value theory. Irving Fisher in his statement as cited by Jhingan (2005) postulated that "Other things remaining unchanged, as the quantity of money in circulation increases, the price level also increases in direct proportion and the value of money decreases and vice versa". This implies that the quantity of money is the main determinant of the price level or the value of money. Any change in the quantity of money produces an exactly proportionate change in the price level. The Fisher equation of exchange states that the quantum of money multiplied by the velocity of money is equal to the price level multiplied by the amount of goods sold. It is often replicated as $MV = PQ$, *M* is defined as the quantity of money, *V* is the velocity of money (the number of times in a year that a currency goes around to generate a currency worth of income), *P* represents the price level and *Q* is the quantity of real goods sold (real output).

On the contrary, the attack of Keynes on the classical quantity theorists brought about a reformulated quantity theory of money, which brought about a transition from monetary theory of prices to monetary theory of output. Keynes integrated monetary theory with value theory and link theory of interest into monetary theory. In the Keynes statement as cited by Jhingan (2005), "it is through the theory of output that value theory and monetary theories are brought into just a position with each other". Keynes disagrees with the older quantity theorists on their conclusion that there is a direct and proportional relationship between quantity of money and prices. He made it clear that, the effect of change in the quantity of money on prices is indirect and non-proportional and changes in the money supply affect only the absolute price level but exercise no impact on the relative price level. Keynes believes that so long as there is unemployment, output will change in the same proportion as the quantity of money and there will be no change in prices; and when there is full employment, prices will change in the same proportion as the quantity of money. Looking at the theories relating to Inflation-Growth relationship, a number of theories and postulations were put forward by Classical, Keynesian, Neo-Keynesian, Monetarist, and Endogenous growth theorists, each with their respective contribution to the inflation-growth relationship.

Keynesian and Neo-Keynesian theory provided a more comprehensive model for linking Inflation to Growth under the aggregate supply-aggregate demand (*AS-AD*) framework. The aggregate (*AS-AD*) framework postulated a positive relationship between inflation and growth where, as growth increased, so inflation does. According to this model, in the short-run, the (*AS*) curve is upward sloping rather than vertical, which is its critical feature. If the *AS* curve is vertical, changes on the demand side of the economy affect only prices. However, if it is upward sloping, changes in *AD* affect both price and output, (Dornbusch, *et al.*, 1996). This holds that many factors drive the inflation rate and the level of output in the short-run. These include changes in: expectations, labour force, prices of other factors of production, fiscal and/or monetary policy.

In moving from the short-run to the hypothetical long-run, the above-mentioned factors, and its 'shock' on the 'steady state' of the economy are assumed to balance out. Producers feel that only the prices of their

products have increased while the other producers are operating at the same price level. However in reality, overall prices have risen. Thus, the producer continues to produce more and output continues to rise.

Vikesh and Sabrina (2004) also believed that inflation could positively impact economic growth; the positive relationship could be due to agreements by some firms to supply goods at a later date at an agreed price. Therefore, even if the prices of goods in the economy have increased, output would not decline, as the producer has to fulfill the demand of the consumer with whom the agreement was made.

Another theory, which suggests that inflation, could positively affect economic growth could be linked to “Tobin effect”. Tobin (1972), suggested that inflation causes individuals to substitute liquidity for interest earning assets, which leads to greater capital concentration and promotes economic growth. In effect, inflation exhibits a positive relationship to economic growth. He further argued that, because of the downward rigidity of prices (including wages), the adjustment in relative prices during economic growth could be better achieved by the upward price movement of some individual prices.

On the contrary, Adam Smith posited negative impact of inflation on economic growth. Adam Smith, provides a for classical growth model. The link between the change in price levels (inflation), and its “tax” effects on profit levels and output were not specifically articulated in classical growth theories. However, the relationship between the two variables is implicitly suggested to be negative, as indicated by the reduction in firms’ profit levels through higher wage costs, (Vikesh and Sabrina, 2004). Friedman further supported this view most especially in a situation in which growth in money supply is higher than the economic growth rate. However, inflation does have real consequences for other macroeconomic variables. Through its impact on capital accumulation, investment and exports, inflation can adversely influences a country’s growth rate, (Dornbusch, *et al.*, 1996).

The negative relationship between inflation and growth is important, as it quite often occurs in practice, as ascertained by empirical literature. This phenomenon is regarded as stagflation, when inflation rises as output falls or remains stable. The economy does not move directly to a higher inflation rate, but follows a transitional path where inflation rises then falls. Under this model, there is a short-run trade-off between output and the change in inflation, but no permanent trade-off between output and inflation. For inflation to be held steady at any level, output must equal the natural rate, (Jhingan, 2005).

However, this work adopted Quantity theory of money as advanced by Keynes and his contemporaries as its theoretical base and guide, because the theory gives the ground upon which the relationship between money supply, inflation and economic growth can be tested, for both short and long-run analysis in Nigeria.

III. Empirical Review Of Relationships Among Money Supply, Inflation, Interest Rate And Economic Growth

Many empirical studies have investigated the impact of money supply and inflation on economic growth in Nigeria; some conclude on the positive impact while others revealed a negative impact in their findings; many others argued that there is no any significant relationship among the three variables. For the sake of easy exposition, empirical evidences gathered so far are grouped into two sub-sections. The first sub-section provides empirical evidences on the impact of money supply on economic growth, while the second sub-section dwells on empirical relationship between inflation and economic growth, as well as the the long and short-run empirical evidences on the impact as well as causality, among money supply, inflation, interest rate and economic growth.

3.1 Empirical Evidences on the Impact of Money Supply on Economic Growth

In analyzing the relationship between money supply and economic growth in Nigeria for the period of 9 years from (1995-2004) using simple regression technique by Isiaka *et al.*, (2011) results showed that there exist long-run insignificant positive relationship between money supply and *GDP*. Contrary to their results, Amassona *et al.*, (2011) investigated effect of money supply on some Macroeconomic variables in Nigeria. Using simplified *OLS* with annual data spanning from (1986-2009), with the conclusion that there exist an inverse relationship between the two variables for the period under review. Looking at the impact of injection and withdrawal of money stock on economic growth in Nigeria, Taiwo, (2012) adopted Ordinary Least Square (*OLS*) of as estimation technique over a period of (1970-2008). The results revealed that monetary aggregate injection has positive effect on economic growth while withdrawal of money stock showed a negative impact on the *GDP* of Nigeria. In a recent study, by Chinuba, Akhor, and Akwaden in 2015 estimating a time series data covering a period of 1981-2008 with simple *OLS* on the Nigeria economy, the result supply that money supply exerts a considerable positive impact on economic growth. An investigation into the long-run and short-run impact of money supply on economic growth of Nigeria for the period 1986-2006 by Omotor, (2010) using *VAR* Model, the results provide evidence in support of the long run positive impact of money supply on growth in income but has no impact in the short-run. Adeyeye *et al.*, (2006) empirically studied the impact of interest rate and money supply proxy by bank loan on the *GDP*. The result showed that although, Bank loan is significant

but has negative impact on economic growth. Ordinary least square method was employed on secondary annual data spanning from 1970-2003 to arrive at the conclusion. Suleiman, (2010) studied the impact of money supply on economic growth of Nigeria, the study made use of ordinary least square method by applying secondary annual data for a period of 37 years from 1970-2007 and concluded base on the result that money supply has negative impact on the real GDP of Nigeria for the period under review

3.2 Empirical evidences on the Impact of Inflation on Economic Growth.

Christian *et al.*, (2010) estimated inflation threshold in WAMZ case of Ghana and Nigeria; non linear (conditional least square techniques) was employed in the work for a period of 34yrs from 1975 to 2008. The result shows that there exists a statistically positive impact of inflation on economic growth in the two countries but the causality test conducted with lags shows no causality between the two variables in each country. Similar to this is work of Aminu and Amono, (2012) which conducted an empirical investigation into the effect of inflation on the growth and development of Nigeria Economy. The work employed Cobb Douglas Production function with ordinary least square method and concluded that inflation posses a positive impact on economic Growth, secondary annual data from 1973-2010 was used to derive the conclusion.

Osuala, (2013) carried out an empirical study on the impact of inflation on economic growth over a period of thirty-one years. The VAR results revealed a statistically significant positive impact of inflation on economic growth in Nigeria while the causality test shows that there is no causality in between the two variables. In the same vein, Taiwo (a), (2011) investigated the impact of inflation and investment on economic growth in Nigeria with the use of ordinary least square (OLS) method and annual secondary data from 1981-2006, the investigation based on inflation-GDP revealed that inflation has negative and significant impact on economic growth, meaning that as inflation increases economic growth falls.

In a more elaborate study, Ogunmuyiwa *et al.*, (2010), carried out an analyzes of the nexus between money supply, inflation, interest rate and economic growth, in Nigeria over a period of 1980-2006, using co-integration and vector error correction technique. The result revealed that money supply exerts an insignificant positive impact on GDP; while interest rate is observed to be positively and significantly related to economic growth. However, no causality was found to exist between the variables in both the short and long run.

Similarly, Adesoye, (2012) examined the causality between price, monetary aggregate and real output in Nigeria from the period 1970 to 2009 using the inflationary gap model that emanates from the quantity theory of money. The econometric findings suggest that output gap was strong indicators of controlling monetary aggregate in Nigeria, which indicates positive impact of money supply on economic growth. Contrary to the work of Ogunmuyiwa *et al.*, (2010), on the nexus between inflation and economic growth in Nigeria, Omoke, (2010), using secondary data from 1970-2005, the result shows that inflation has positive impact on economic growth and causality is discovered to be running from Inflation to economic growth.

IV. Methodology

4.1 Source of Data

Annual time series data covering 1973-2013 were used, the data were sourced from world Bank Data Bank, Central Bank of Nigeria (CBN) publications; National Bureau of Statistics (Various Issues). The period chosen for the study encompasses the period of major reforms in Nigeria's economic history (Pre and Post SAP Eras). Equally, the period marked the era in which Nigeria currency was changed from pound to Naira in 1973 with its economic implication on price volatility.

4.2 Model Specification and Variable Measurement

Different factors have been identified to be responsible for changes in economic growth (Output). Based on the theoretical exposition and following the extant literatures as evidenced in the works of Mishra, *et al.*, (2010), Ogunmuyiwa *et.al* (2010) and Taiwo (2012), the Vector Error Correction Model (VECM) is used in the present study. In line with Engle and Granger [YR], there exist both short-run and long-run parameters in VECM once the variables are co-integrated of the order 1(1). Hence, the short-run analysis of the system should include the error correction term with a view to modeling the adjustment for deviation from its long-run equilibrium. The VECM specifications employed in this study are presented in four endogenous variables as stated below in four equations labeled equation (1) to (4).

$$\Delta(LNGDP)_t = \alpha_0 + \sum_{i=1}^n \alpha_i \Delta(LNGDP)_{t-i} + \sum_{i=1}^n \beta_i \Delta(LNMS)_{t-1} + \sum_{i=1}^n \delta_i \Delta(LNINF)_{t-1} + \sum_{i=1}^n \alpha_i \Delta(LNRITR)_{t-1} + \mu_{1t} \dots (1)$$

$$\Delta(LNMS)_t = \alpha_0 + \sum_{i=1}^n \alpha_i \Delta(LNGDP)_{t-i} + \sum_{i=1}^n \beta_i \Delta(LNMS)_{t-1} + \sum_{i=1}^n \delta_i \Delta(LNINF)_{t-1} + \sum_{i=1}^n \alpha_i \Delta(LNRITR)_{t-1} + \mu_{2t} \dots (2)$$

$$\Delta(LNINF)_t = \alpha_0 + \sum_{i=1}^n \alpha_i \Delta(LNGDP)_{t-i} + \sum_{i=1}^n \beta_i \Delta(LNMS)_{t-i} + \sum_{i=1}^n \delta_i \Delta(LNINF)_{t-i} + \sum_{i=1}^n \alpha_i \Delta(LNRINTR)_{t-i} + \mu_{3t} \dots (3)$$

$$\Delta(LNRINTR)_t = \alpha_0 + \sum_{i=1}^n \alpha_i \Delta(LNRINTR)_{t-i} + \sum_{i=1}^n \alpha_i \Delta(LNGDP)_{t-i} + \sum_{i=1}^n \beta_i \Delta(LNMS)_{t-i} + \sum_{i=1}^n \delta_i \Delta(LNINF)_{t-i} + \mu_{4t} \dots (4)$$

Where:

- GDP = Economic Growth
- MS = Money Supply
- INF = Inflation
- RINTR = Real Interest Rate

To capture economic growth, real GDP was used as its proxy, while M_2 which is M_1 plus savings and time deposit was used to measure money supply, annual Consumer Price Index (CPI) was employed as a proxy for inflation. As a measure of rate of interest, annual real interest rate was used. All the variables are expressed in their natural log form with the exemption of variables in their rates. From equation (1) through (4), the variables in the left hand side of each equation are expressed in their first difference, while those on the right hand side are optimum lagged difference of the four variables and one period lagged error term (ECM) of the co-integrating equation are included. $\alpha_0, \alpha_1, \beta_1, \delta_1, \alpha_1$, are intercept terms respectively while the disturbance terms are denoted by $\mu_{1t} \dots \mu_{4t}$. It should be noted that there are two sources of causality using VECM framework i.e from the ECM term and through the lagged dynamic terms. In the present study two tests of causality between economic growth and macroeconomic variables are carried out, i.e the short-run Granger non-causality test and long-run causality through Wald test.

4.3 Estimation Procedure

First, the time series properties of the variables used in the model were investigated to confirm their order of integration to avoid spurious regression. For robustness, both Augmented Dickey Fuller and Phillip Peron unit root tests were conducted. The test for the unit root of the series is carried out using the following equation:

$$\Delta Y_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 t + \sum \alpha_i \Delta Y_{t-i} + \mu_t \dots (4)$$

Where: $\beta_0, \beta_1, \beta_2$ and α_i are parameters to be estimated while μ_t is the error term which is assumed to be normally and identically distributed.

Immediately after the above, a co-integration test was carried out using Johansen co-integration test procedure, and this was followed by estimation of Vector Error Correction Model. We also examined the short-run and long-run causation test between Economic Growth and other captured macroeconomic variables. To test for long-run causality, the null hypothesis the co-efficient of ϕ_{t-1} is zero is tested in each equation in order to determine whether the explanatory variables on the right-hand side Granger cause the dependent variable on the left-hand side. In equation (1) through (4), this test is carried out by testing the null hypothesis is $\alpha_{GDP}, \beta_{MS}, \delta_{INF}$ and $\alpha_{RINTR} = 0$, against the alternative hypothesis $\alpha_{GDP}, \beta_{MS}, \delta_{INF}$ and $\alpha_{RINTR} \neq 0$.

Moreover, in equation (1) through (4), four short-run Granger causality tests (a Wald F-test for short-run non causality) are performed by setting the co-efficient of all order-lagged differences of each of the variables on the right-hand side equal to zero. In equation (1) for instance, a test for short-run non-causality from money supply (M_2) to Economic Growth (GDP) is conducted by testing whether the coefficients of the lagged differences of the (MS) are all equal to zero. The same thing is done regarding the short-run causality from other variables such as INF and RINTR on GDP.

V. Data Presentation And Discussion Of Results

5.1. Data Presentation

The analysis and interpretation of results commence with investigation of the properties of the data used. This begins with unit root test using both PP and ADF unit root tests. The table below presents the result of the unit root test carried out on each of the series. Table (1) indicates that all the variables are stationary at first difference I(1). Therefore, since our series are stationary at I(1) value, the application of VAR has theoretical support.

Table 1: Unit Root Test Results

| Variables | ADF Test results | | PP Test Results | | Order of integration |
|---------------|------------------|----------|-----------------|-----------|----------------------|
| | Constant | Trend | Constant | Trend | |
| GDPDR | -5.3167* | -5.8672* | -5.3774* | -5.8481* | I(1) |
| BMGDP | -3.0821* | -3.2142* | -2.9503* | -3.2795* | I(1) |
| INFD | -6.3243* | -6.2311* | -6.3261* | -6.2306* | I(1) |
| INTR | -6.3301* | -6.9005* | -6.3327* | -7.0218* | I(1) |
| ΔGDPGR | -8.3508* | -8.2199* | -16.9770* | -17.7960* | I(1) |
| ΔBMGDP | -4.4946* | -4.4894* | -5.5763* | -5.5557* | I(1) |
| ΔINFD | -7.7103* | -7.6068* | -13.6466* | -13.4134* | I(1) |
| ΔINTR | -7.8929* | -7.7796* | -14.4241* | -14.1972* | I(1) |

Note: For ADF and PP, the null hypothesis is that the variable has a unit root (i.e non stationary), (*), (**), and (***) represent significant at 10%, 5% and 1% respectively while Δ denotes difference operator and order of integration.

Source: Author’s computation using E-VIEW 7.1

Having confirming the stationarity of the series, the paper proceeded by testing for the optimum lag. The test for optimum lag was carried out and the result is presented in table (2). From table (2), it can be seen that all the criteria selected an optimum lag of 5 with the exception of LR t-statistics and Schwarz information criteria (SC) that suggested 3 and 1 respectively.

Table 2: Optimal Lag Test

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|--|-----------|-----------|------------------|------------------|-----------|------------------|
| 0 | -517.7520 | NA | 45570491 | 28.98622 | 29.16217 | 29.04763 |
| 1 | -485.1875 | 56.08332 | 18286828 | 28.06597 | 28.94570* | 28.37302 |
| 2 | -469.6029 | 23.37687 | 19401182 | 28.08905 | 29.67257 | 28.64174 |
| 3 | -444.2753 | 32.36309* | 12682779 | 27.57085 | 29.85815 | 28.36918 |
| 4 | -432.8049 | 12.10760 | 19709690 | 27.82250 | 30.81359 | 28.86647 |
| 5 | -402.4887 | 25.26353 | 12597116* | 27.02715* | 30.72203 | 28.31676* |
| * indicates lag order selected by the criterion | | | | | | |
| LR: sequential modified LR test statistic (each test 5% level) | | | | | | |
| FPE: Final prediction error | | | | | | |
| AIC: Akaike information criterion | | | | | | |
| SC: Schwarz information criterion | | | | | | |
| HQ: Hannan-Quinn information criterion | | | | | | |

Source: Author’s computation using E-view 7.1

Consequently, a co-integration test was conducted using Johanson Co-integration test using maximum lag of 5, and the result of which is presented in the table (3).

Table 3: Johansen Co-integration Test Results

| Hypothesis | | Eigen Value | Max | 5%Critical value | Prob. | Trace | 5%Critical value | Prob. |
|------------|------------|-------------|---------|------------------|--------|---------|------------------|--------|
| Nul | Alte | | | | | | | |
| $r=0$ | $r \geq 1$ | 0.79922 | 56.194* | 27.58434 | 0.0000 | 93.911* | 47.85613 | 0.0000 |
| $r \leq 1$ | $r \geq 2$ | 0.49927 | 24.209* | 21.13162 | 0.0178 | 37.717* | 29.79707 | 0.0050 |
| $r \leq 2$ | $r \geq 3$ | 0.24417 | 9.7979 | 14.26460 | 0.2255 | 13.507* | 15.49471 | 0.0975 |
| $r \leq 3$ | $r \geq 4$ | 0.10057 | 3.7100* | 3.841466 | 0.0541 | 3.7100* | 3.841466 | 0.0541 |

r indicates the number of co-integrating vectors. * Indicates rejection of the null hypothesis at 5% level of significance.

Source: Authors’ computation using E-views 7.1

From Table (3), the result revealed that both maximum eigen value and Trace statistics indicates the rejection of null hypothesis of no co-integration among the variables at 5% level of significance. For both methods employed the result shows that there are at least two co-integrating vectors. Hence, the existence of long-run equilibrium relationship among the non-stationary variables justifies the use of VECM.

4.2: Analysis of Inferential Statistics

4.2.1. Long Run Estimates

Having confirming the existence of long run relationships in between the variables in the model, a long run vector error correction model normalizes on dependent variable (GDPGR) was estimated, the result of which is presented below.

Table 4: Long-run Coefficient of the Co-integrating Vector Normalizes on GDPGR

| Gdpgr | CONSTANT | BMGDP | INFD | RINTR |
|-------|-----------|-----------------------|-------------------------|-------------------------|
| 1 | -20.06587 | 0.876081 (3.54629) | -0.309523 (-2.43493) | -1.397814 (-8.96979) |

Note: (*), (**), and (***) are levels of significant at 10%, 5%, and 1% respectively. Figures in the parenthesis are t-values (Adjusted Coefficient)

Source: Authors' computation using E-view 7.1

In the long-run, the normalized co-integration equation in the table (4) above revealed that money supply (*BMGDP*) is positively related to economic growth and significant at 10%, in conformity with our a priori expectation and also in line with the work of Ahmad and Suleiman, (2011), Henri and Henri (2011), and Mishra (2012). This implies money supply is an increasing function of economic growth in the long-run, meaning that as money supply increases, economic growth also does. The above tends to lend support to the relevance of monetary expansion policies included in some developmental programmes like seven point agenda and transformation agenda, executed by the past administrations. The above is in line with economic theory which posits that expansionary monetary policy is a declining function of interest rate (cost of borrowing), which increase personal income, this further leads to increase in aggregate demand and triggered investment which eventually led to increase in economic growth.

In relation to inflation (*INFD*) and Interest rate (*RINTR*), both revealed a long-run negative relationship with economic growth at 5% and 1% level of significant respectively. This results are in line with the work of Taiwo (2011a) and Ogunmuyiwa (2012) respectively. This implies that inflation and interest rates do not promote economic growth in the long-run. Inflation in the long-run becomes a threat to national development with it deteriorating impact on the value of money. A continuous decline in the real value and the purchasing power of money discourages long term investment, resulting into declining aggregate demand due to fall in purchasing power of money. In addition, high rate of inflation does not encourage investments in the real sector of the economy but promote investment in low risk businesses with quick return, thus discouraging growth in output. The negative impact of interest rate on economic growth is not surprising, it should be noted that interest rate is the cost of borrowing; hence, a high rate of interest will be disincentive to borrowing. Thereby discourage investment and thus a declining growth rate.

4.2.2. Short-run Estimates

In the short-run, as shown in the table (5), there is a negative and statistically significant relationship between (*GDPGR* (-3)) and its past value during the period of study. This indicates that last three years growth in output achieved has significant negative impact on the present year growth rate at 10% level of significant in line with the work of Ahmad and Suleiman (2011) and Henri and Henri (2011). The conclusion that could be drawn from this result could be that, the last year excess in income has not been properly reinvested into the economy; this could be as a result of alleged massive looting, capital flight, poor management and misappropriation of fund capable of having negative influence on the present year growth rate.

Also negatively related to economic growth in the short-run is broad money supply at lag (4) This implies that money supply did not contribute to economic growth in the short-run as posited by Keynes in his advanced quantity theory of money. This could be due to the fact that financial institutions (commercial banks) that are expected to serve as intermediary between the surplus and deficit unit of the economy are not living up to the expectations. It is worthy of note that over the year, credit rationing has been one of the policies adopted by commercial banks to apportion loanable funds to different sectors of the economy. However, if such a policy is not in favour of the real sector, achieving growth in income on a sustainable basis through increasing monetary aggregates will be elusive. Under this scenario, expansionary monetary policy in form of increasing money supply will not translates into economic growth in the short-run until long-run as supplied by the results. This results is however in conformity with the findings of Ogunmuyiwa and Francis (2010); Suleiman (2010); and Taiwo(a) (2012). Inflation and Interest rates were negatively related to economic growth at 10% level of significant respectively implying that as inflation and interest rate increases, economic growth declines.

Table (5): An Estimated VECM with Economic Growth (GDPGR)

| Dependent Variable | C | ECM(-) | $\sum_{i=1}^n \Delta GDP_{t-i}$ | $\sum_{i=1}^n \Delta MS_{t-1}$ | $\sum_{i=1}^n \Delta INF_{t-1}$ | $\sum_{i=1}^n \Delta RINTR_{t-1}$ | Eqn | C |
|--------------------|-----------------------|------------------------------|---------------------------------|--------------------------------|---------------------------------|-----------------------------------|-----|---|
| $\Delta GDPGR(-3)$ | 0.381043 (1.55983) | - 0.781293** (0.31560) | -0.597853* (0.30846) | -0.008964 (0.24665) | 1.403360 (1.41696) | -0.858065 (0.82511) | (4) | |
| $\Delta MSGDP(-4)$ | 0.934013 (1.24726) | 0.150931 (0.25236) | -2.147477* (1.22053) | -0.607619 (0.97595) | 2.026107 (5.60667) | -1.725213 (3.26483) | (5) | |
| $\Delta INFD(-3)$ | -4.34771 (7.16531) | 0.196165 (1.44975) | 0.668866* (0.44098) | -0.371704 (0.35261) | 1.204895 (2.02570) | -0.488804 (1.17959) | (6) | |
| $\Delta RINTR(-5)$ | 3.537623 (4.17244) | 0.097604 (0.84421) | -0.789226* (0.49742) | -0.242792 (0.39774) | 1.571803 (2.28498) | -1.477593 (1.33957) | (7) | |

The negative impact of inflation on growth in output could be explained by the law of demand, which stated that ‘the higher the price, the lower the quantity demanded’. Therefore a declining level of demand will result into pilling up of inventory and consequently fall in production outputs resulting into declining growth rate. This result corroborates the earlier empirical results by Omoke (2010), Amino and Amono (2012) and Osuala (2013), and contradicting findings of Taiwo(b) (2011) and Abiola *et al.*. On the side of interest rate, fall in economic growth could be attributed to unfriendly and unattractive rental cost of capital charged by loan providers. This finding is in alignment with the works of Taiwo(b) 2011; Irfan and Ume (2011), and Hameed Gul *et al.* (2012).

Further in the results, the statistically significant and negatively signed *ECM* term, further lend credence to the existence of co-integration among the variables under investigation. The *ECM* coefficient is about -0.781293 and suggests that about 78% of last year disequilibrium is corrected in the current year. Hence, when growth rate is above or below its equilibrium level, the speed of adjustment is approximately 78% within the first year to ensure full convergence to its equilibrium level. The adjustment speed is thus very high.

4.2.3 Causality Test Results

Going by the results of Granger causality test as shown in table (7), there is no causality running from any of the explanatory variables to the dependent variable i.e broad money supply (*BMGDP*), inflation rate (*INFD*), and real interest rate (*RINTR*). This implies that for the years under review, real interest rate has not been attractive to have caused money supply for investment purposes in the real sector to the point of granger causing economic growth. This result is similar to the findings of Ogunmuyiwa and Francis (2010) and Ahmad and Suleiman (2011).

Table 7: Results of the VEC Granger Causality/ Block Exogeneity Wald Test

| Long-run causality | | Short-run causality | | | | Eqn |
|---------------------|---------------------|---------------------------------------|---------------------------------------|--------------------------------------|---------------------------------------|------|
| Dependent variables | \hat{Q}_{t-1} | $\sum_{i=1}^{n1} \Delta(GDPGR)_{t-i}$ | $\sum_{i=1}^{s1} \Delta(BMGDP)_{t-i}$ | $\sum_{i=1}^{r1} \Delta(INFD)_{t-i}$ | $\sum_{i=1}^{a1} \Delta(RINTR)_{t-i}$ | |
| $\Delta GDPGR$ | 9.1049 (0.6939) | - | 4.5730 (0.3340) | 4.3748 (0.3577) | 5.4252 (0.2464) | (8) |
| $\Delta BMGDP$ | 22.950* (0.0282) | 10.6160* (0.0312) | - | 8.1485* (0.0863) | 5.7169 (0.2213) | (9) |
| $\Delta INFD$ | 14.2570 (0.2846) | 5.3684 (0.2515) | 11.0787* (0.0257) | - | 1.4067 (0.8430) | (10) |
| $\Delta RINTR$ | 14.5651 (0.2661) | 6.8201 (0.1457) | 8.802* (0.0662) | 0.3795 (0.9841) | - | (11) |

*, **, *** denotes statistical significance at 10%, 5% and 1% levels respectively. Figures in parenthesis indicate the degree of freedom.

Source: *Authors’ Computation using E-view 7.1.*

However, unidirectional causality is observed running from economic growth to broad money supply indicating that economic growth granger causes broad money supply. These findings could be hanged on the quantity theory of money where money velocity is a positive function of total money supply. As money revolves and circulates round the economy due to increasing rate of investment, resulting into increase consequently increase money stock. It could also imply that investment opportunities and potentials that are been exploited day-by-day stands as a ground for increasing money stock. View from another perspective, over the years the share of oil revenue formed the larger percentage of the country total national income, the buck of which is been used only to service recurrent expenditures like salaries, subsidies and estacodes. Therefore, it is not out of place to obtain a result in which growth in income causes money supply. This finding is similar to the results of Mishra (2010) and Ahmad and Suleiman (2011).

Further, in the result, bidirectional causality is found to exist between money supply and inflation in line with the classical and Keynesian views. Similar to this result is the findings of Mishra (2010) and Ogunmuyiwa (2010). A situation in which inflation causes aggregate money stock could be attributed to government policy aims at breaching the gap between nominal and real value of money that more money is supplied. While money supply causing inflation has a very strong root in theoretical propositions of the quantity theory of money by the classical and Keynesian economists. It is believed when money supply increases, income also does and purchasing power goes up without a proportional increase supply, will result into rise in the prices of the little available goods. This kind of inflation is regarded as demand-pull inflation.

Finally, a unidirectional causality is also found running from broad money supply to real interest rate. A priori, an increase in aggregate money supply result into falling rate of interest rate. It is believed that an expansionary monetary policy that increases total money stock will tend to drive down the rate of interest and thereby increases investment and boost economic growth through the real sector. The above provides further support to the long run estimates in which money supply has a significant positive impact on economic growth.

4.4.3 Diagnostic Test Results

Table 6: Diagnostic Tests Results

| Tests | Coefficients | Prob |
|--|--------------|--------|
| Stability ¹ | 0.90195 | 0.9258 |
| Autocorrelation ² (LM Stat) | 13.94697 | 0.6027 |
| Heteroskedasticity ³ | 352.98 | 0.3025 |
| Normality ⁴ | 2.9766 | 0.9358 |

¹Stability

²Serial correlation (LM) Test

³Residual Heteroskedasticity Test (No Cross Term)

⁴Jarque Bera (JB) Residual Normality Test

Source: Authors' computation using E view 7.1

In table (7), the Lagranger multiplier (LM) shows that there is no serial correlation at the chosen lag. In addition, the model passes the normality test through the joint Jarque Bera (JB) statistics indicating that residuals have normal and identical distribution. It also passes through the heteroskedasticity test with the chi-square distribution of 352. The adjustment co-efficient is also significant and correctly signed i.e negative which indicates that the restrictions are meaningful. Stability test indicates that the model is stable and adequate for policy recommendation because it satisfies stability condition since the modulus values are less than one (0.9258) even at lag 5.

VI. Conclusions And Recommendations

The paper empirically investigates the impact of money supply and inflation on economic growth in Nigeria from 1973-2013 using Vector Error Correction framework. The stationarity properties of the data employed in the model was first investigated using Augmented Dickey-Fuller unit root test and Phillip-Peron test. The result indicates that the series used in the analysis were 1(0). The results of the co integration test based on Johansen's procedure indicated the existence of co-integration between economic growth, money supply and inflation in Nigeria. The ECM term had the appropriate sign and was statistically significant at 5% probability level indicating the possibility of convergence to equilibrium in each period with intermediate adjustment captured by the difference terms. The findings reveal that some key macroeconomic fundamentals in Nigeria's economy interact in each period to re-establish the long-run equilibrium in economic growth following a short-run random disturbance. The empirical result from the estimation of the long-run co-integration equation normalized on economic growth in the country thus revealing a significant relationship with respect to Money

Supply and Inflation. However, based on the findings of this study, it could be concluded that: money supply has contributed positively to economic growth in the long-run, while in the short-run the opposite has been the case. In addition, inflation has considerably induced economic growth in the short-run while in the long-run it has hampered growth significantly; interest rate has not been friendly to growth, it has hampered and discouraged economic growth significantly in both periods for the years under review (1973-2013). Thus, the nature of the relationship is such that money supply has significant positive impact on economic growth in the long-run as inflation recorded the same in the short-run while, money supply was negative in short-run as inflation in the long-run. Only interest rate revealed significant negative influence on economic growth in both periods. Arising from the above findings, the paper recommends the following policies:

Firstly, government through the apex bank should make sure that Nigerian financial institutions are safe and sound; and fine-tune the interest rates that will not raise the level of inflation or jeopardizes investors' investment objective.

Secondly, expansionary monetary policy is advised to be implemented to guide against higher cost of capital, which make loan unattractive for productive purposes. This may be in form of zero interest base finance on a selective basis could be introduced; this is capable of raising investment in the real sector which will eventually influence economic growth.

Thirdly, SMEs funding and development has been identified as a very good scheme designed to tap the opportunity in the real sector on both short and long-term basis (Ogunmuyiwa and Francis (2010)), therefore, financial institutions should not only make funds available to drive the real sector on short-run basis but also should make the fund's accessibility less stringent.

Fourthly, the result revealed that inflation is a decreasing function of growth in output in the long-run. To curtail this devastating impact, fiscal policy should be design in such a way that could boost real sectors (industrial, mining and agricultural sectors) that have been identified as key to national development. This will boost supply of output and reduce prices. Likewise, monetary policy strategy such as inflation targeting should be pursued vigorously to achieve a minimum and tolerable rate of inflation.

Lastly, there is need for government to fight corruption passionately and tackle security challenge with every sense of commitment, seriousness and political will, as the last year's economic growth at lag 3 showed a negative coefficient (-0.597853) which implies that last year's excess income realized has not been properly reinvested. Hence, a poor state of social infrastructures that have been identified to be germane for an enabling environment required for further investment. This could be attributed to alleged massive looting of public fund, capital flight, money laundry etc.

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APPENDICES

Time Series data for Dependent and Explanatory Variables for the study. World Bank Data from 1973-2013.

Appendix I: A Table of Economic Variables used for the Study (1973-2013).

| YEAR | GDPGR | BMGDP | INFD | RINTR |
|------|---------|--------|----------|----------|
| 1973 | 5.3928 | 11.183 | 5.3468 | 1.5693 |
| 1974 | 11.1607 | 13.223 | 43.9464 | -25.6668 |
| 1975 | -5.2277 | 17.586 | 23.5008 | -13.9682 |
| 1976 | 9.0424 | 19.949 | 14.3532 | -6.8675 |
| 1977 | 6.0241 | 22.853 | 10.7138 | -4.2576 |
| 1978 | -5.7642 | 20.861 | 13.9147 | -6.2895 |
| 1979 | 6.7594 | 22.951 | 11.4888 | -3.3199 |
| 1980 | 4.2048 | 28.625 | 12.4197 | -3.5474 |
| 1981 | -13.128 | 29.458 | 18.4590 | -8.0554 |
| 1982 | -1.0532 | 31.11 | 4.8293 | 4.4913 |
| 1983 | -5.0505 | 32.838 | 13.7675 | -3.3321 |
| 1984 | -2.0215 | 33.023 | 13.2674 | -2.6713 |
| 1985 | 8.3228 | 31.483 | 5.5423 | 3.6867 |
| 1986 | -8.7542 | 31.512 | 11.6300 | -1.4968 |
| 1987 | -10.752 | 25.82 | 67.3982 | -31.9218 |
| 1988 | 7.5425 | 25.96 | 22.9217 | -5.1293 |
| 1989 | 6.4672 | 18.985 | 45.0405 | -16.9600 |
| 1990 | 12.766 | 20.442 | 9.2908 | 14.6482 |
| 1991 | -0.6179 | 24.027 | 17.6048 | 2.0721 |
| 1992 | 0.4337 | 23.24 | 68.0632 | -25.7670 |
| 1993 | 2.0904 | 27.75 | 26.1324 | 4.3745 |
| 1994 | 0.9098 | 28.231 | 31.0091 | -8.0344 |
| 1995 | -0.3075 | 15.87 | 113.0764 | -43.5727 |
| 1996 | 4.9937 | 13.231 | 32.7271 | -9.7120 |
| 1997 | 2.8023 | 14.785 | 1.0131 | 16.6136 |
| 1998 | 2.7156 | 18.663 | -5.6657 | 25.2823 |
| 1999 | 0.4742 | 21.126 | 17.0501 | 2.7679 |
| 2000 | 5.3181 | 21.963 | 35.2295 | -10.3198 |
| 2001 | 4.4111 | 26.67 | -0.3226 | 23.8379 |
| 2002 | 5.3181 | 21.826 | 39.8967 | -10.8122 |
| 2003 | 10.3542 | 20.2 | 11.1409 | 8.6136 |

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| | | | | |
|------|---------|--------|----------|----------|
| 2004 | 33.7358 | 18.256 | -0.1577 | 19.3691 |
| 2005 | 3.4447 | 17.732 | 22.0244 | -3.3404 |
| 2006 | 8.2110 | 19.042 | 17.3378 | -0.3731 |
| 2007 | 6.8284 | 28.059 | 4.7707 | 11.6143 |
| 2008 | 6.2703 | 37.766 | 10.8353 | 4.1905 |
| 2009 | 6.9344 | 43.266 | -4.3206 | 23.7065 |
| 2010 | 7.8397 | 21.026 | 103.8328 | -42.3102 |
| 2011 | 4.8874 | 20.685 | 9.5101 | 5.9415 |
| 2012 | 4.2793 | 21.2 | 9.2712 | 6.8812 |
| 2013 | 5.3944 | 21.512 | 5.8733 | 10.2473 |

Source: www.data.worldbank.org/datacatalog retrieved on 17/10/2014.