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# Money Supply and Inflation Effects on Economic Growth in Nigeria

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# Abstract:

Covering a time span from 1990 to 2018, this study aims to check the effects of money supply and inflation on Nigerian economic growth by collecting data from Nigeria Statistical Bulletin. This research design uses dependent variable (RGDP) and the independent variables (INF, INTR MS and CPI). The estimated regression model shows a negative and significant relationship between coefficient of inflation and Real Gross Domestic Product (RGDP) at a significant level of 0.0011. Money Supply and RGDP is found to be negatively associated. R square value found to be 78%. This ensures goodness fit of this model.

At 5% significant level, the level regression passed the overall significant test (F-test), indicating that none of the estimated coefficient is equal to zero and that a linear association exists between the dependent variable (RGDP) and other independent variables (MS, INF, INT and CPI). The DW statistics of 1.96 indicate the absence of auto-correlation.

Keywords: Money supply, inflation, economic growth, Nigeria, Co-Integration

# 1. Introduction

Monetary authorities use monetary policy in order to facilitate national economic goals. The objective of monetary policy is to ensure price stability in order to achieve the macroeconomic goals of internal and external balances. The monetary authorities try to achieve this goal by changing money supply and or the rate of interest with the intention of managing the volume of money in the economy. Maintenance of price stability has been one of the macroeconomic challenges being faced by many countries in general and Nigeria in particular. As a macroeconomic objective, ensuring stability in prices has been very difficult for most economies. Two key determinants that can facilitate economic growth through employment creation, increase in per capita income, poverty reduction and improve standard of living are money supply and mild inflation (Phibian, 2010).

Thus, the causal relationship between money supply and prices on output indicates their effects on monetary policies as well as the effectiveness in achieving the right economic outcome. This has led to the adoption of several monetary policies such as inflation targeting among others. The aim of inflation targeting is to keep the price levels at a target rate as a mean of achieving desired outcomes (Ogunmuyiwa& Francis, 2010).

The consequences of inflation and money supply either as individual variable or otherwise on growth have been investigated by studies such as Odedokun (1996); Levine (1997), Cusogand Philips (1998), Moosa (1982), Teriba (2006), Moser (1995), Balakrishanan (1991), Gailwe and Polan (2005), Lucas (2000), Kalder (1959), Bessler (1984), Morooney (2002), among others.

These studies have generated a lot of controversies, while some indicate the presence of a negative association between money supply and inflation effects on growth some found a positive association at different level of significance and thus the relationship remain inclusive.

# 1.1. Research Problem

Inflation has been a perennial economic problem in Nigeria with its drastic effect penetrating every sector of the Nigeria economy. The continuous and persistent upward movement of money supply aggregates (M1 and  $M_2$ ) has been partly attributed to the method of financing government deficit which usually induce monetary expansion, exchange rate depression and rising inflation, CBN (1994). If the supply of money is not carefully regulated and managed, it will have a critical impact on the welfare and standard of living of the populace. The government through their monetary authority (i.e., Central Bank of Nigeria) is therefore confronted with the huge task of formulating and implementing the monetary policies with the view of controlling or directing the level of money supply among other objectives. This is to avoid any pitfall which can results from a mistake in the formulation or implementation of the monetary policies which can give rise to a negative multiplier effects on the economy.

# 1.2. Research Hypotheses

H<sub>1</sub>: Money supply has significant effect on Gross Domestic Product in Nigeria.

- H<sub>1</sub>: Consumer Price Index (CPI) has significant effect on the Gross Domestic Product (GDP) in Nigeria.
- H<sub>1</sub>: Inflation rate has significant effect on the Gross Domestic Product (GDP) in Nigeria.

#### 2. Literature Review

#### 2.1. Theoretical Review

#### 2.2.1. Empirical Literature

Friedman (1963) for instance opined in his work 'Inflation: Causes and Consequences' that maintaining a tight monetary policy for a long period of time could control inflation. The Monetarist model perspective is that historical behaviour of money to output would give a glimpse of the present change in the rate of secular price. Chaltipa et al (2015) investigated the possible existence of the quantitative theory of money in the Czech Republic.

Friedman and Kutuner (1992) study on the United State of America between 1960-1990 indicated the relationship between the amount of money and output becomes less strong with increasing time period while the explanatory power of the interest rate has stronger impact than the amount of money in the interpretation of changes in output.

Victor and Stephen (2000) investigated the possibility of the existence of a significant long run relationship between money and nominal GDP and between money and the price level in the Venezuelan economy between 1950 and 1996. By using time-series econometric techniques toanalyseannual data for the Venezuelan economy. Employing unit roots test and cointegration with structural breaks indicated a peculiar characteristic of the Venezuelan experiencewhich suggest that structural breaks might be important. Association among money growth, inflation, currency devaluation and economic growth had been studied by Hussain (2016) during the period (1954-2013). Inflation and economic growth relationship had been investigated by Malik and Chowdhury (2001). The sensitivity of inflation to fluctuations in growth rates was found to be higher than that of growth to fluctuations in inflation rates. In Bahran, Ehigiamusoe (2013) investigated the association between money supply and GDP in for the period of 13-years using co-integration, error correction model and granger causality techniques. Their study indicated the presence of a long run – equilibrium between real GDP to real money supply in the short run as well as in the long run.

A significant impact of money supply has been observed by Hussein and Haque (2017) and Charitipa et al (2015). For Pakistan from 1977 to 2017, a study has been conducted with similar objective by Saidu (2017). Money supply growth and its implications had been studied by Ariyo (1990) for Nigerian economy. A quasi-experimental research design had been adopted by Bakare (2011). Monetary policy on Nigerian macro-economic variables had been studied by Amassoma et al (2011). Period from 1986 to 2009 has been used over here. Ogunuyiwa and Francis (2012) adopted causality test to examine the impact of money supply on Nigerian economic growth between 1980 to 2012. Raji, Yusuf and Tantan (2014) in their study on the real money supply and fiscal deficit in Nigeria used data on such variables as CPI, GDP, money supply, Fiscal deficit and interest rate for the period 1970 to 2010 They used these variables. Their findings by using ARDL, granger causality, VECM estimation techniques shows a unidirectional, causality running from real money supply to inflation, government deficit to price level in the short run and also between price level and interest rate. The ARDL confirms the existence of long run relationship among the variables.

# 3. Methodology

# 3.1. Source of Data and Identification of Variables

The study used secondary data obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin within the period 1990 to 2016. The variables used in the study are real gross domestic product (RGD) which is the dependent variable. The independent variables are inflation rate (INF), money supply (Ms), interest rate (INT), and consumer price index (CPI).

# 3.2. Model Specification

To empirically analyze the effects of money supply and inflation on economic growth, the RGDP was used as an index for economic growth while taking into account all other macroeconomic variables relevant to the study. The model following Ebere (2017) is specified in an explicit form as:

 $RGDP_t = f(INF_t, MS_t, INTR_t, CPI_t).$ (3.1)

Where:

RGDP = Real Gross Domestic Product, INF= Inflation Rate, MS= Money Supply, INTR= Interest Rate and CPI= Consumer prices index,

To take cognizance of all other factors that determine economic growth apart from the predictor variables specified in the equation above, the random error term was introduced to account for the unexplained variations in the dependent Variable. Thus, the new equation was stated as:

 $RGDP_t = \alpha_0 + \alpha_1 INF + \alpha_2 Ms + \alpha_3 INTR + \alpha_4 + \varepsilon_t$ (3,2)

 $\varepsilon_t$  is the stochastic element, a real random term which explains the variation in the regress and not explained by the regressors while  $\alpha_0$ ,  $\alpha_1$ ,  $\alpha_2$ , and  $\alpha_4$  are the parameter coefficients

#### 3.2.1. A-Priori Expectation

Based on economic theory, the independent variables are expected to have the following signs in relation to the dependent variables:  $\alpha_0$ ,  $\alpha_1$ ,  $\alpha_2$ , and  $\alpha_4 > 0$ 

#### 3.3. Estimation Techniques

The study employed the use of both descriptive and analytical tools such as Unit Root Test.E-view 10 has been used here.

# 4. Data Analysis and Results

#### 4.1. Descriptive Analysis

The Table1 shows that among the variables of the interest, MS has the largest variation between the minimum and the maximum values, where the maximum value is 30.341 and the minimum value is -20.702 respectively. Inflation rate has a mean value of 1.349 and median value of 1.013. The table also shows that inflation rate has the maximum value of -23.01.

Consumer Price Index (CPI) has a mean value of 2.152 and a median of 2.276, with a maximum value of 5.059 and a minimum value of 0.981. The INTR has a maximum value of 3.146 and a minimum value of 0.981.

	INF	RGDP	СРІ	INT	MS
Mean	1.349	22.881	2.152	2.109	25.492
Median	1.013	22.884	2.293	2.276	25.094
Maximum	4.823	25.204	5.059	3.146	30.341
Minimum	-2.301	20.947	-0.604	0.981	20.702
Std. Dev.	2.411	1.107	2.269	0.626	2.912
Observation	27	27	27	27	27

Table 1: Descriptive Statistics Source: Author's Computation

#### 4.2. Correlation Matrix

Correlation analysis was first applied to estimate the relationship between the different variables in the study. The correlation matrix in Table 2 basically reflects the relative strength of the relationship between the variables used in the study. According to Gujarati (2004); multicollinearity could only be a problem if correlation coefficient between regressors is above 0.80. The correlation analysis indicates that all variables are not highly correlated, hence no problem of multicollinearity.

	RGDP	INF	INTR	MS	СРІ	
RGDP	1.000000	0.067600	0.455546	-0.048774	0.190334	
INF	0.067600	1.000000	-0.210893	0.092946	-0.103849	
INTR	0.455546	-0.210893	1.000000	0.137360	0.111778	
MS2	-0.048774	0.092946	0.137360	1.000000	0.046534	
CPI	0.190334	-0.103849	0.111778	0.046534	1.000000	
Table 2 Completion Coefficients Matrix						

*Table 2: Correlation Coefficients Matrix Source: Author's Computation (2018)* 

#### 4.3. Time Series Properties of Data (Unit Root Test)

To guard against spurious regression, result this study takes the step in checking the properties of the variables with the use of the Augmented Dickey-Fuller (ADF) test developed by Dickey and Fuller (1981).

#### 4.3.1. Decision Rule

Reject the null hypothesis when the p-value is less than or equal to a specific significance level, often 0.05 (5%), or 0.01 (1%) and even 0.1 (10%).

Variables	Order of	ADF Test Statistics	Critical ADF Test	Remark
	Integration		Statistic	
RGDP	I(1)	-5.095347	-2.954021	Stationary
INF	I(1)	-4.604422	-2.951125	Stationary
INTR	I(1)	-3.013906	-2.951125	Stationary
MS2	I(1)	-3.289828	-2.951125	Stationary
CPI	I( <sub>0</sub> )	-5.898623	-2.954021	Stationary

Table 3: Summary of Unit Root Test

Note: \* Significant at 5%; Mackinnon Critical Source: Author Computation E-Views 10 From Table 3 above, RGDP, INF, INTR and MSare stationary at first difference that is; I(1) while CPI was stationary at level; I(0). Also, the probabilities were found to be significant since they are less than 0.05.

#### 4.4. Co-integration Test

Since the unit root properties of the series indicated the stationarity of the variables at I(1) and I(0), estimating the relationship between the dependent variable (RGDP) and its regressor (INF, INTR MS and CPI) using cointegration analysis was deemed necessary.

Hypothesized				
No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None*	0.973567	256.8797	125.6154	0.0000
At most 1*	0.818905	133.3527	95.75366	0.0000
At most 2*	0.613246	75.25572	69.81889	0.0172
At most 3	0.423782	42.95684	47.85613	0.1336
At most 4	0.394554	24.21368	29.79707	0.1916

Table 4: Unrestricted Co-Integration Trace Test

\* Denotes Rejection of the Hypothesis at the 0.05 Level

\*\*Mackinnon-Haug-Michelis(1999) P-Values

The Max-Eigen value test in Table 5 indicated two co-integration equations at the 0.05 level. This confirms the existence of a stable long-run relationship among the dependent variable (RGDP) and the independent variables (INF, INTR MS and CPI). This implied that the parameters are stable and thus, OLS is applicable.

Hypothesized				
No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None*	0.973567	123.5270	46.23142	0.0000
At most 1*	0.818905	58.09702	40.07757	0.0002
At most 2	0.613246	32.29888	33.87687	0.0762
At most 3	0.423782	18.74316	27.58434	0.4346
At most 4	0.394554	17.06084	21.13162	0.1691

Table 5: Unrestricted Co-Integration Rank Test (Maximum Eigenvalue) Max-Eigenvalue Test Indicates 2 Cointegratingeqn(S) at the 0.05 Level \* Denotes Rejection of the Hypothesis at the 0.05 Level \*\*Mackinnon-Haug-Michelis(1999) P-Values

Variables	Coefficient	Std. Error	t-Statistic	Prob.
С	3.124283	1.076816	2.901407	0.0070
INF	-1.191322	0.205211	5.805361	0.0011
INTR	-1.358923	0.466521	2.912890	0.0068
MS	-9.944384	12.01486	-0.807674	0.0006
CPI	-1.748938	0.242115	8.049649	0.0169
R-Squared	0.781923	Mean dependent var		1.375713
Adjusted R-Squared	0.721700	S.D. dependent var		3.815169
S.E. of regression	654.4209	Akaike info criterion		4.597804
Sum squared resid	12419734	Schwarz criterion		4.628595
Log likelihood	-280.6048	Hannan-Quinn criter.		5.608551
F-statistic	4482.997	Durbin-Watson stat.		1.967765
Prob(F-statistic)	0 000000			

Table 6: Estimated Regression Model Dependent Variable: Rgdp Method: Least Squares Sample: 1990 2016 Source: Author's Computation Using E-Views 9

Table 6shows that the coefficient of inflation shows a negative and significant relationship between inflation rate (INF) and Real Gross Domestic Product (RGDP) at a significant level of 0.0011, which is less than 0.05. This relationship is such that for a unit increase in Inflation Rate (INF) there will be a corresponding decrease in Real Gross Domestic Product by 1.19 units. The finding is in tandem to Kazeem(2016).

The co-efficient of interest rate (-1.35) was negative and confirmed with the apriori expectation and statistical significant (P-value 0.0068). Thus, the relationship is such that an increase in interest rate will have a corresponding decrease in real gross domestic product (RGDP) by 1.35 units. Tijani (2017) claims like this.

Trace Test Indicates 3 Cointegratingeqn(S) at the 0.05 Level

This relationship between Money Supply (MS) and Real Gross Domestic Product is such that for a unit increase in MS there will be a decrease in Real Gross Domestic Product by 9.9 units. The findings are in line with that of Olusola, Ajani, and Bamidele (2015). Consumer prices index (CPI) shows that there is a negative and significant relationship with Real Gross Domestic Product. Consumer prices index (CPI) is found to be significant with Real Gross Domestic Product at a significant level of 0.0169, which is less than 0.05. This relationship is such that for a unit increase in Consumer prices index (CPI) there will be a corresponding decrease in Real Gross Domestic Product by 1.7 units. The findings are in accordance to the study of Olusola, Ajani, and Bamidele (2015).

The coefficient of determination  $(R^2)$  is 0.78. This means that about 78% of the total systematic mean variation of the dependent variable is explained by the explanatory variables.

The remaining 22% variations is explained by other elements not included in the model, but are taken care of by the error term, hence the regression model is a good fit.

At 5% significant level, the level regression passed the overall significant test (F-test), this is an indication that none of the estimated coefficient is equal to zero and that there is a linear relationship between the dependent variable and the explanatory variables.

The Durbin-Watson statistic of 1.96 could be approximated to 2 which indicate the absence of auto-correlation. this means that the problem of serial autocorrelation does not exist in the analysis.

#### 4.5. Discussion of Findings

This result indicates that each component of the explanatory variables had variant impact on the dependent variable. Based on the regression analysis the study reveals that money supply (MS), consumer price index (CPI) and inflation rate (INF) has significant effect on Gross Domestic Product in Nigeria. The finding of this study confirms the work of Ariyo (2017) and Adeniyi (2016) that money supply has significant effect on Gross Domestic Product in Nigeria along with Kazeem (2016) that inflation rate has significant effect on Gross Domestic Product in Nigeria.

The t- values obtained shows that all variable employed is statistically significant under 5 percent level of significant. The estimated model is therefore good for policy decision.

#### **5. Summary of Findings**

This study examined the effect of money supply and inflation on Nigerian economic growth during the period 1990 to 2016. At 5% significant level, the level regression passed the overall significant test (F-test), this is an indication that none of the estimated coefficient is equal to zero and that there is a linear relationship between the dependent variable and the explanatory variables. The Durbin-Watson statistic of 1.96 could be approximated to 2 which indicate the absence of auto-correlation. Serial Autocorrelation problem does not arise in this analysis.

# 6. Conclusions

This study has shown the effect of selected macroeconomic variables on money supply in Nigeria. A strong goodness of fit (78%) was found amongst normalized employed variable using historical data during the period from 1990 to 2016, The result therefore confirms the possibility that money is actually reacting to the movement of key macro-economic variables in the nation.

#### 7. Recommendations

Based on the findings of this study, the study recommends that:

- Government should take appropriate steps to coordinate and harmonize monetary policies in Nigeria in order to facilitate the financial integration process
- Both expansionary and contractionary monetary policies should be used effectively in the Nigerian economy to regulate money supply, liquidity ratio and cash ratio, which would help control inflationary and deflationary pressures.
- It is therefore prudent that in seeking to promote economic growth, Nigeria Banks should be committed to the mission of price stability as well as improving the regulatory and supervisory frameworks to secure a strong financial sector for efficient intermediation.
- In other to avoid the inflationary impacts government should control the excessive expansion in broad money supply in Nigeria.

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