Ilaro Journal of Women in Technical Education and Employment (Ilaro J Wom Tec Edu Emp)
The Federal Polytechnic, Ilaro. Ogun State, Nigeria.
ISSN: 2734-3227. Volume 1 – Issue 2. December 2020
https://fpiwitedjournal.federalpolyilaro.edu.ng

ESTIMATING THE EFFECT OF MONEY SUPPLY ON ECONOMY GROWTH

Adijat Bukola Aiyelabegan[1]*, Akeem Olanrewaju Adeoye[2] and Sikiru Suleiman[3]
[1,3] Department of Statistics, Kwara State Polytechnic, Ilorin.
[2]Department of Statistics, The Federal Polytechnic, Offa.
*Aiyelabeganadijat45@gmail.com

Abstract
This study looked at the effect of money supply on the growth of Nigeria economy and the problem facing the implementation of the monetary policies in Nigeria between 2004 and 2017. The data used was obtained from Central Bank of Nigeria (CBN)'s 2018 statistical bulletin. The objective of this work is to empirically investigate the impact of the monetary variables associated with money supply on economic growth in Nigeria. The statistical technique used for this analysis is the Ordinary Least Square (OLS), and various tests such as Normality test, Multicollinearity, Homoscedasticity, Autocorrelation were carried out on the data to investigate whether OLS assumptions are meant. The test results revealed that all the assumption hold autocorrelation that was present in the error term, this was corrected using Cochran-Orcutt procedure. The results from the analysis indicate that the monetary variables; Board Money Supply (BMS) and Liquidity Ratio (LR) have a direct impact on the real Gross Domestic Product (GDP) in the model while the Cash Ratio (CR) is not.

ARTICLE HISTORY

Received: May 18, 2020
Revised: June 8, 2020
Accepted: August 13, 2020

Keywords: OLS, Monetary Variables, GDP, Economic Growth.

Citation
Aiyelabegan, A.B., Adeoye, A.O.. & Suleiman, S. (2020). Estimating the Effect of Money Supply on Economy Growth, *Ilaro Journal of Women in Technical Education and Employment,* 1(2), 8-12.

1.0 Introduction
Since its establishment in 1959, the Central Bank of Nigeria (CBN) has continued to play the traditional role expected of a Central Bank, which is the regulation of the stock of money in such a way as to promote the social welfare (Ajayi, 1999). This role is anchored on the use of a monetary policy that is usually targeted towards the achievement of full-employment equilibrium, rapid economic growth, price stability, and external balance (Fasanya et al, 2013; Adesoye et al, 2012 Adeoye et al, 2014). Thus, inflation targeting and exchange rate policy have dominated CBN's monetary policy focus based on assumption that these are essential tools of achieving macroeconomic stability (Aliyu and Englama, 2009). An excess supply of money which will result in an excess demand for goods and services and in return lead to increase prices and or deterioration of the balance of payment position. Typically, in periods of high inflation, the horizon of the investor is very short, and resources are diverted from long term investment to those with immediate returns and inflation hedges, including real estate and currency speculation. In light of the foregoing, all modern economies now consider monetary management as an integral part of their responsibilities (Owoye and Onafowora, 2007, Odozi, 1995, Iyaji et al, 2012). The question is what is the effect of money supply on the Nigeria economy?

The aim of this study is to assess the effect of the money supply on economic growth in Nigeria through fitting a linear regression model based on some selected monetary variables. Also, to investigate the impact of these monetary variables on economic growth in Nigeria;

2.0 Material and Methods

The data used for this paper was based on money supply components (Liquidity Ratio (LR), Broad Money Supply (BMS) and Cash Ratio (CR)) and Gross Domestic Product (GDP) between 2004-2017 extracted from 2018 CBN statistical bulletin. In this study, the dependent variable is GDP while the monetary variables are used as explanatory variables.

i. Multiple Regression Analysis

Multiple linear regression (MLR) is a method used to model the linear relationship between a dependent variable and two or more independent variables (Draper et al, 1966). It can be defined as

$$Y = \beta X + \varepsilon \quad (1)$$

Where, Y is $n \times 1$ vector of n observation on dependent variable; X is a $n \times k$ matrix of n observations on each of the k explanatory variables; β is a $k \times 1$ vector of regression coefficients; ε is a $n \times 1$ vector of random error components or disturbance term.

By minimizes the sum of squared deviations of $\varepsilon i's$

$$\varepsilon'\varepsilon = (y - \beta X)'(y - \beta X) \quad (2)$$

Differentiate equation (2) with respect to β and equate to zero, we have the following normal equation

$$(X'X)\hat{\beta} = X'y \quad (3)$$

Since it is assumed that rank (X) =k (full rank), then X^1X is positive definite and unique solution of normal equation is

$$\hat{\beta} = (X'X)'(X'y) \quad (4)$$

which is termed as ordinary least squares estimator (OLSE) of β.

ii. OLS Assumptions

The following tests were used to test validity of the OLS model

(a) Normality Test

1. Shapiro-Wilk test uses the test statistic, W defined as

$$W = \frac{\left(\sum_{i=1}^{n} aie_{(i)}\right)^2}{\sum_{i=1}^{n} (ei - \overline{e})^2} \quad (5)$$

Where e_i pertain to the i^{th} largest value of the error terms and a_i values are calculated using means, variance, and covariances of the e_i.

2. Doornik-Hansen test statistic, DH is defined as the sum of squared transformations of skewness and kurtosis which approximately follows a χ^2 distribution, given as

$$DH = z_1^2 + z_2^2 \sim \chi^2_{(2)} \quad (6)$$

(b) Multicollinearity

Multicollinearity test can be conducted using Variance Inflation Factor (VIF), given as

$$VIF = \frac{1}{1 - R_i^2} \quad (7)$$

Where R^2_i is the coefficient of determination between each pairs of the predictors. This gives the proportion correlation between the variables.

(c) Autocorrelation

Durbin Watson (DW) statistic is a test for autocorrelation in the residuals from OLS model. It is defined as

$$DW = \frac{\sum_{t=2}^{n}(e_t - e_{t-1})^2}{\sum_{t=1}^{n} e_t^2} \tag{8}$$

Where e_t is residuals, and *DW* can be approximately given as

$$DW = 2(1-\hat{\rho}) \tag{9}$$

Where, $\hat{\rho}$ is sample autocorrelation of residuals. This test aimed to determine whether there is dependency among the successive values of the error term.

(d) Heteroskedasticity

This test was conducted using Breusch-Pagan procedure to determine whether the residuals has equal variance.

3.0 Results and Discussion

The results from the analysis are furnished in table 1.

Table 1. Model 1_OLS, using observations 2004-2017 (T = 14)

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	236466	27986.4	8.4493	<0.00001	***
LR	830.16	378.682	2.1922	0.05313	*
BMS	0.0621193	0.0112428	5.5253	0.00025	***
CR	-369.474	749.027	-0.4933	0.63247	

Mean dependent var	406584.9	S.D. dependent var	128664.1
Sum squared resid	1.84e+10	S.E. of regression	42927.15
R-squared	0.914374	Adjusted R-squared	0.888686
F(3, 10)	35.59560	P-value(F)	0.000012
Log-likelihood	-166.8515	Akaike criterion	341.7029
Schwarz criterion	344.2592	Hannan-Quinn	341.4663
Rho	0.507949	Durbin-Watson	0.980674

Dependent variable: GDP

From the Table 1, the estimates of two predictors (LR and BMS) of the fitted OLS model are statistically significant while the estimate of CR is not significant. The R-squared is 0.9144 which imply that about 91.4% variation in GDP can be explained by the predictors. Also, Durbin-Watson statistic of 0.9806 which is less than 1, shows is an evidence of positive serial correlation. This may be cause of alarm as positive error of one observation increases the chances of a positive error for another observation.

However, since there is present of autocorrelation in the error term, Cochran-Orcutt (1949) estimation was used to remove the autocorrelation from the error term. Hence, the Table 2 provides the estimates for the new model as follows.

Table 2. Model 2_Cochrane-Orcutt, using observations 2007-2017 (T = 11)

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	242780	6952.89	34.9178	<0.00001	***
LR_2	350.332	194.716	1.7992	0.11502	
BMS_2	0.144491	0.0120665	11.9745	<0.00001	***
CR_2	-183.978	210.713	-0.8731	0.41155	

Statistics based on the rho-differenced data:			
Mean dependent var	440144.2	S.D. dependent var	125387.8
Sum squared resid	1.64e+09	S.E. of regression	15320.80
R-squared	0.989559	Adjusted R-squared	0.985084
F(3, 7)	503.2495	P-value(F)	1.55e-08
Rho	-0.274533	Durbin-Watson	2.216637

Dependent variable: GDP
rho = -0.558766

From Table 2, it can be seen that Durbin-Watson statistic can be approximately taken as 2 which indicates that there no serial correlation in residuals. Only the estimates of BMS in model 2 is statistically significant while the rest are not. Also, the R-squared value of 0.9896 shows that model 2 has improved when compared with model 1 since model 2 can account for about 98.9% variation in GDP. Finally. P-value (F) = 1.55e-08 show that the model adequate, that is no evidence of lack of fit.

Table 3. Normality Test results

Doornik-Hansen test = 6.53505, p-value 0.0381006
Shapiro-Wilk W = 0.857079, p-value 0.0277507

From Table 3, since the p-values are less 0.05 (level of significance) then the null hypothesis is rejected and we conclude that the disturbance term normally distributed.

Table 4. Variance Inflation Factor (VIF)

Predictors	value
LR	2.521
BMS	2.026
CR	1.518

From Table 4, all the VIFs are less than 5, this is an evidence no multicollinearity problem.

Table 5. Breusch-Pagan Test

Test statistic: LM = 3.500272, with p-value = P(Chi-square(3) > 3.500272) = 0.320727

The results from Table 5 shows that the null hypothesis cannot be rejected, and this suggests the absence of heteroscedasticity, that is, the error term has constant variance (homoscedasticity).

Having satisfy some basic necessary conditions of OLS, the new fitted model given as

GDP = 242780 + 350.33*LR + 0.14*BMS -183.98*CR (10)

From equation (10), the value 242780 represents part of GDP not influenced by Liquidity ratio, broad money supply and cash ratio; for any unit increase in liquidity ratio (LR), there will be an increase of about 350.33 in GDP holding other variables constant; Likewise, for any unit increase in broad money supply, there will be an increase of about 0.14 while for any unit increase in cash ratio; there would be a decrease of about 183.978 in GDP holding other variables constant.

4. Conclusion

Based on the analysis, it was observed that the broad money supply and liquidity ratio have a direct impact on real GDP while the cash ratio is not. The relationship that exists between the monetary instruments and real GDP, sheds more light on the adoption of credit supply (nominal money) for promoting economic growth in Nigeria that is, there will be a positive impact on the Nigeria economy if the CBN gives out loan to other commercial banks thereby rendering loans to manufacturers and companies. But the combination of monetary variables like; liquidity ratio and broad money supply may be effective for the purpose of promoting real GDP, as the regression result shows that they have a positive impact with broad money supply statistically significant.

References

Adeoye, B.; Ojapinwa, T. V. & Odekunle, L. A. (2014): Monetary Policy Framework and Pass-Through in Nigeria: A Missing Ring. *British Journal of Arts and Social Sciences* 17(1), 14-32.

Adesoye, A. B., Maku, O. E., & Atanda, A. A. (2012). Is Monetary Policy a Growth Stimulant in Nigeria? A Vector Autoregressive Approach. Munich Personal RePEc Archive (MPRA). 35844, 1-24

Ajayi, I. (1999): Evolution and Functions of Central Banks. *Central Bank of Nigeria, Economic and Financial Review* 37(4), 11-27.

Aliyu, S. U. R., & Englama, A. (2009). Is Nigeria ready for inflation targeting?. Retrieved from: https://mpra.ub.uni-muenchen.de/id/eprint/14870

Central Bank of Nigeria (2018). Statistical Bulletin. Abuja: Central Bank of Nigeria. *Nigeria Economic and Financial Review*. 34(2), 608.

Cochrane, D. & G.H. Orcutt, 1949, Application of least squares regression to relationships containing autocorrelated error terms. *Journal of the American Statistical Association* 44, 32-61.

Draper, N. R., & Smith, H. (1998). *Applied regression analysis* (Vol. 326). John Wiley & Sons.

Fasanya ,I.O, Onakoya ,A.B.O. & Agboluaje, M.A. (2013). Monetary Policy and Macroeconomic Instability in Nigeria: A Rational Expectation Approach. *Journal of Social Sciences* 12, 196-199.

Iyaji, Danjuma, Success Musa Jbrin & Success Ejura Blessing (2012). An Assessment of the Effectiveness of Monetary Policy in Combating Inflation Pressure on the Nigerian Economy. *Erudite Journal of Business Administration and Management* 1(1), 7-16.

Odozi, V.A. (1995). The Conduct of Monetary and Banking Policies By The Central Bank of Nigeria. *Central Bank of Nigeria Economic and Financial Review* 33(1), 9-10.

Owoye, O. & A.O. Onafowora (2007). M2 Targeting, The Macroeconomics of Credit Money, Cambridge:Money Demand and Real GDP Growth in Nigeria: Do Rules Apply? *Journal of Business and Public Affair* 1(2), 25-34.