Monetary Policy and Economic Growth in Nigeria: An Ardl-Bound Testing and ECM Approach

Aderemi Timothy Ayomitunde
Olabisi Onabanjo University, Nigeria
Ogundare Oladiran Olaniyi
Sejoro Mauton Zannu
Yaba College of Technology, Nigeria
Balogun Abayomi Stephen
Property Tax Directorate, Kwara State Internal Revenue Service, Nigeria

Abstract
      The aim of this study is to examine the relationship between monetary policy and economic growth in which the past studies have shown conflicting results in Nigeria. Data was collected from the Central Bank of Nigeria Statistical Bulletin from 1990 to 2017 and Autoregressive Distributed Lag (ARDL) model and Error Correction Model (ECM) were utilized to address the objective of the study. Consequently, the result of ECM term indicates that about 16% of the total disequilibrium in the previous year due to shock was corrected in the current year. There is a significant negative relationship between exchange rate and economic growth in the short run. Also, there is a significant positive relationship between monetary policy rate and economic growth in the short run. In addition, economic growth and credit reserve ratio have a negative relationship in both short run and long run. Economic growth and inflation rate have a significant positive relationship in both short run and long run. Therefore, this study makes the following recommendations for the policy makers and future researchers in Nigeria: the policy makers in Nigeria should increase the level of broad money supply in the country since both the broad money supply and inflation lead to economic growth in the short run and the long run. Also, the apex bank in Nigeria should embark on the use of appropriate monetary policy variables that will address non-performance of credit requirement ratio, monetary policy rate and exchange rate in contributing to the nation`s economic growth.

Keywords: Monetary Policy; Economic Growth: ARDL; ECM.

Introduction

Monetary policy is one of the macroeconomic policies that cannot be overemphasized in any economy. Generally, monetary policy is normally used deliberately by the monetary authority to regulate the supply of money and the credit level with a view to achieving some broad economic objectives which might be conflicting in most of times. Primarily, some of objectives of monetary policy in most countries are stability of price, employment generation, maintenance of balance of payments equilibrium, economic growth, and sustainable development. In Nigeria, formulation of monetary policy is centered on the stability of price level and exchange rate in order to ensure a sustainable economic growth and competitive external sector (Sanusi 2012).

It is worth of note that fluctuations in some critical macroeconomic variables such as price level, interest rate, unemployment rate and exchange rate could adversely retard economic growth, this could spell doom for the welfare of people in the country. Over time, attempts to ensure efficient coordination of macroeconomic variables in Nigeria have led to the formulation of various policies by the monetary authorities. For example, the monetary authorities through Central Bank of Nigeria devise the means of managing macroeconomic variables via the money supply and the cost of credit in circulation. In a situation when an economy is expanding too quickly, Central Bank withdrawals some money from circulation and this invariable increases the cost of credit in order to discourage borrowing. Meanwhile, the Central Bank introduces expansionary monetary policy when an economy is slowing down to lower the interest rates with a view to encouraging borrowing for the productive activities in the economy.

However, it has been established in the literature that monetary policy plays a paramount role in achieving macroeconomic objectives in both developed and developing economies (Anna, 2012; Ezigbo, 2012: Senbet, 2011: Ajisaje and Folorunso, 2002). In Nigeria, despite the fact that available evidence is in support of monetary policy in propelling economic growth, yet the literature is controversial. For instance, it has been argued in some quarters that monetary policy rather than fiscal policy impacted a strong and significant influence on the growth of the Nigerian economy (Ajisafe and Folorunso, 2002; Adefeso and Mobolaji, 2010). In another perspective, studies have also reported significant role for fiscal policy (Medee and Menbee, 2011; Philip, 2009). Meanwhile, some scholars argued that none of the two policies is superior as each policy has important role to play in the economy (Enahoro, 2013; Effiong, 2012; Ogege and Shiro, 2012; Sanni et al, 2012). In view of the above inconclusive results of the past studies there is a critical need for further studies on impact of monetary policy on economic growth in the recent time.

In the same vein, the recent economic crisis coupled with double digit inflation and interest rates in Nigeria has now deepened further debate on the effectiveness of monetary policy among economic analysts. Therefore, this study intends to fill this gap by determining the appropriate policy instruments of monetary policy that has the capacity to catalyze economic growth in the country. Similarly, the uniqueness of this study also lies in the adoption of latest econometric technique in which the majority of the past studies have not fully explored.

Objective of the Study

The objective of the study is to examine the short run and the long run relationships between monetary policy and economic growth in Nigeria from 1990 to 2017.

Literature Review

This section presents a critical review of the empirical literature regarding the subject matter of this study.
Enahoro (2013) opined a decrease in financial indiscipline in both financial and fiscal systems in Nigeria is as a result of fiscal and monetary policies. This leads to efficiency in operations of financial institutions in the country. The study therefore concluded that fiscal and monetary policies made the Nigerian government to manage budgetary allocation in such a way to address the lapses in the financial system in the country. Amassoma, Wosa and Olaiya (2011) assessed the link between monetary policy and macroeconomic variables in Nigeria from 1986 to 2009 using a simplified Ordinary Least Squared technique and co-integration tests. They argued that the implementation of monetary policy has been improved over the years. Meanwhile, monetary policy had a significant positive relationship with money supply and exchange rate but an insignificant relationship on stability of price. Sanni et al (2012) enunciated that both the monetary and fiscal policies were not superior to each other. It was the appropriate policy mix that could ensure a better economic growth.

Moreover, Effiong (2012) put forward that monetary and fiscal policy mix could bring about a significant role on the development of stock market in Nigeria while examining the linkage between fiscal, monetary policies and the development of the Nigerian stock market. In another perspective, Umar (2013) investigated the nexus between monetary policy and exchange rate in Nigeria between 1980 and 2011 with the application of Granger causality test and Error Correction Model (ECM). The author concluded that the supply of money and exchange rate had a significant positive relationship with each other. However, reverse was the case of the relationship between monetary policy rate, liquidity ratio and exchange rate. Falade and Folorunsho (2015)

utilized error correction mechanism to estimate the relative effectiveness of fiscal and monetary policy instruments on sustainable economic growth in Nigeria from 1970 to 2013. The authors submitted that the current level of exchange rate and its immediate past level, domestic interest rate, current level of government revenue and current level of money supply are the appropriate policy instrument mix to expand economic growth in Nigeria in both the short and long run.

Ogege and Shiro (2012) corroborated that both monetary and fiscal policy led to economic growth while addressing the dynamics of monetary and fiscal policies on economic growth in Nigeria. While investigating the relationship between the monetary and fiscal policy interactions in Nigeria between 1970 and 2008, Chuku (2010) used a vector auto-regression (VAR) model. It was discovered that monetary and fiscal policies have a counteractive interaction from 1980 to 1994, whereas no symmetric pattern of interaction was noticed between the two policies at other periods.

In conclusion, literature on monetary policy and economic growth is ongoing in Nigeria, and empirical studies are inconclusive in the country. Hence, the relevance of this study.

Methodology and Estimation

The data for the empirical analysis in this paper are extracted from secondary sources. To be explicit, data for exchange rate, broad money supply, inflation rate, government expenditure, revenue and real were sourced from CBN statistical Bulletin. E-Views software was employed for the running of the data.

Empirical Model

RGDP = F (Exch, BMS, MPR, CRR, Infl) ------------------------------------1

If model 1 is linearized to form model 2

$$LnRGDP_t = \propto_i + \beta0 LnExch_t + \beta1 LnBMS_t + \beta2 Infl_t + \beta5 MPR + \beta LnCRR + \mu_i ----2$$

The adoption of ARDL in this work is motivated by its advantageous positions over other econometric models like Granger causality, Engle and Granger (1987) and Johansen and Juselius (1990) which often stipulate that the variables should be of the same order of integration before it can ensure best estimate. Therefore, the variables of interest have different orders of integration that is the reason why this study utlized Autoregressive Distributed Lag (ARDL) model in addressing its objective.

ARDL Model Specification

In a general form, ARDL model can be specified as follows

$$\Delta LnRGDP_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \ \Delta Ln \ RGDP_{t-1} + \sum_{i=0}^{p} \beta_2 \ \Delta Infl_{t-1} +$$
$$\sum_{i=0}^{p} \beta_3 \Delta \ LnExch_{t-1} + \sum_{i=0}^{p} \beta_4 \Delta \ LnBMS_{t-1} + \sum_{i=0}^{p} \beta_5 \ \Delta \ LnMPR_{t-1} +$$
$$\sum_{i=0}^{p} \beta_6 \ \Delta \ LnCRR_{t-1} + ECM_{t-1} + \sum_{i=1}^{p} \beta_7 \ \ Ln \ RGDP_{t-1} +$$
$$\sum_{i=0}^{p} \beta_8 \ Infl_{t-1} + \sum_{i=0}^{p} \beta_9 \ LnExch_{t-1} + \sum_{i=0}^{p} \beta_{10} \ LnBMS_{t-1} +$$
$$\sum_{i=0}^{p} \beta_{11} \ LnMPR_{t-1} \ \sum_{i=0}^{p} \beta_{12} \ LnCRR_{t-1} + \ \mu i$$ ---3

Where RGDP is used to proxy economic growth.

Infl is used to denote inflation rate.

Exch is used to represent exchange rate

BMS means broad money supply.

MPR is used to represent monetary policy rate

CRR is used to capture credit requirement ration

ECM means error correction model

μ_i is error term.

t =1990-2017. L is natural logarithm

Meanwhile, term β_1-β_6 is measures short run parameters/ coefficients meanwhile β_7-β_{12} measures long run parameters. It is expected that $\beta_1 - \beta_{12} > 0$.

Results

Table 2: Descriptive Statistics of Annual Data Series (1990-2017)

Descriptive Statistics	LExch	LRGDP	Infl,	LBMS	MPR	CRR
Mean	4.300743	42.44046	18.71679	28.24124	13.65393	7.733214
Median	4.815250	31.28159	12.55000	28.34417	13.50000	8.150000
Maximum	5.857933	346.1660	72.84000	30.73363	26.00000	14.80000
Minimum	2.084156	30.60445	5.380000	24.69091	6.250000	1.000000
Std. Deviation	1.061811	59.52657	17.42350	1.901245	3.888777	4.086862
Skewness	-0.709526	5.003169	1.958346	-0.258470	0.903222	-0.157772
Kurtosis	2.095351	26.03362	5.646040	1.794715	5.148707	1.846396
Jargue-Bera	3.304115	735.7866	26.06566	2.006593	9.193549	1.668764
Probability	0.191655	0.000000	0.000002	0.366669	0.010084	0.434143
Sum	120.4208	1188.333	524.0700	790.7547	382.3100	216.5300
Sum. Sq. Deviation	30.44095	95672.15	8196.619	97.59776	408.3099	450.9660
Observation	28	28	28	28	28	28

Source: Authors` Computation (2019)

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It could be deduced that total number of 28 observations were considered in this study. Exchange rate deviates from its mean by 59.52657but ranging between 2.084156 and 5.857933. Real GDP deviates from its mean by 4.8295 but ranging between 30.60445and 346.1660. Inflation rate deviates from its mean by 17.42350 but ranging between 5.380000 and 72.84000. Broad money supply deviates from its mean by 3.888777but ranging between 24.69091and 30.73363. Monetary policy rate deviates from its mean by 3.888777but ranging between 6.250000and 26.00000 Credit reserve ratio deviates from its mean by 4.086862but ranging between 1.000000 and 14.80000.exchange rate, broad money supply and credit reserve ratio are negatively skewed while other variables are positively skewed. However, values of Kurtosis of variables like exchange rate, broad money supply and credit reserve ratio are not far from 3.

Table 2: Unit Root Test

Variables	ADF Test			PP Test		
	Level	1st Difference	Remarks	Level	1st Difference	Remarks
LRGDP	-2.976263*		I (0)	-2.976263*		I (0)
LExch	-2.976263*	-2.981038*		-2.976263*	-2.981038***	
LBMS	-2.976263*		I (0)	-2.976263*		I (0)
LCRR	-2.976263*	-2.981038*	I (1)	-2.976263*	-2.981038	I (1)
LMPR	-2.976263*		I (0)	-2.981038*		I (0)
Infl	-2.976263*	-2.981038*	I(1)	-2.976263*	-2.981038*	I(1)

Source: Author`s Computation (2019)
* %5 level

Unit root tests were estimated in the study to detect stationarity otherwise of all the variables. If variables are not stationary in the analysis, there is high tendency it leads to spurious estimates. Therefore, this study used the standard Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests to examine the stationarity or otherwise of the data. Consequently, the results of the estimated Augmented Dickey-Fuller (ADF) and Philip Perron tests in the above table show that variables such as exchange rate, credit reserve ratio and inflation rate were not stationary in their level form, whereas real GDP, broad money supply and monetary policy rate were stationary in their native form. This implies that the variables in these study are mixture of I(1) and I(0).

Table 3: ARDL Bounds Test

Sample: 1992 2017
Included observations: 26
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	3.868210	5

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79

Source: Authors` Computation (2019)

The dataset is a combination of stationarity and non-stationarity, as such the study utilized Bound Test to determine the existence or otherwise of the long run equilibrium relationship among these set of variables (Pesaran and Pesaran 1997: Pesaran, Shin and Smith 2001). Consequently, table 3 confirms a presence of cointegrating relationship among the variables in the model since the Null hypothesis of no long run relationship could not be accepted because the upper and lower Critical Value Bounds at all level of significance is less than the value of F-Statistic.

Table 3: Parsimonious Short Run and Long Run Regression Estimates
Dependent Variable: LnRGDP

| Short Run	coefficient	T-statistics	Long Run	coefficient	T-statistics
DLBMS	15.20934	1.528700	LBMS	17.62640	0.118240
DLExch	-11.18722	2.097244	LExch	11.71442	0.451914
DMPR	9.503586	3.229469	MPR	-4.627860	1.856683
DCRR	-4.442366	1.838641	CRR	-2.554641	0.754661
DInfl	5.449721	6.690797	Infl	2.896883	3.626512
ECM	-0.164870	3.980444	R-squared	0.699537	
R-Squared	0.882447		A.R-squared	0.519260	
Adj.R-Squared	0.804078		DWstat	1.617889	
DWstat	2.103195				

Source: Authors` Computation (2019)

The ARDL results of both the short and long run relationship between monetary policy and other macroeconomic variables are presented in the above table. From the results it could be deduced that when economic growth

is the dependent variable, no significant relationship exists between economic growth and broad money supply in both short and long run. This implies that broad money supply has a positive but no significant effect and on economic growth. However, there is a significant relationship between exchange rate and economic growth in the short but the relationship becomes insignificant in the long run, therefore interest rate has a negative impact on economic growth. Also, there is a significant relationship between monetary policy rate and economic growth in the short run and the long run. Meanwhile, the relationship between economic growth and monetary policy rate is positive in the short run but negative in the long run. In addition, economic growth and credit reserve ratio have a negative relationship in both short run and long run, the short run is significant at 10% level of significance but long run relationship is not significant. Economic growth and inflation rate have a significant positive relationship in both short run and long run.

Consequently, the coefficient of Error Correction Model (ECM) which shows the speed of adjustments back to equilibrium in the estimated model is negative and significant at 5% level of significance. This implies that an approximately 16% of disequilibrium from the previous year's shock is corrected in the current year. In addition, the model adopted for this work is relatively good because the result of R-Squared in the short run and long run lies between 70% and 88%. This implies that 88% and 70% systematic variation in the dependent variable, economic growth is jointly explained by all the explanatory/ independent variables in the short run and in the long run respectively. Also, the result of the Durbin Watson statistic indicates that the model is free from first order autocorrelation.

3.3 Stability Tests
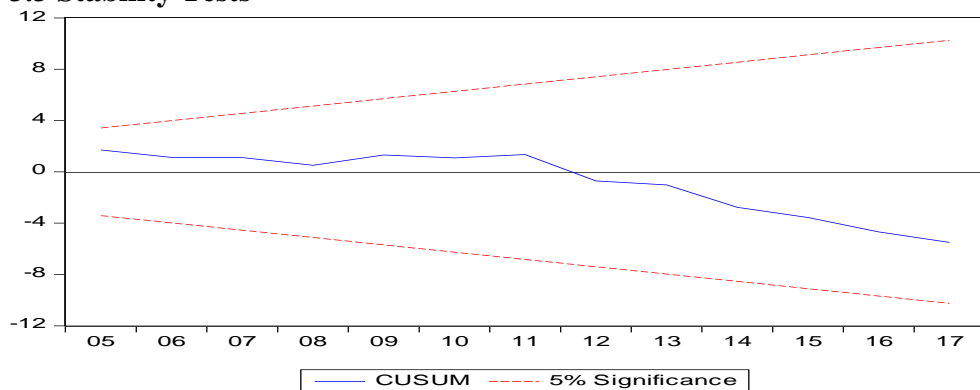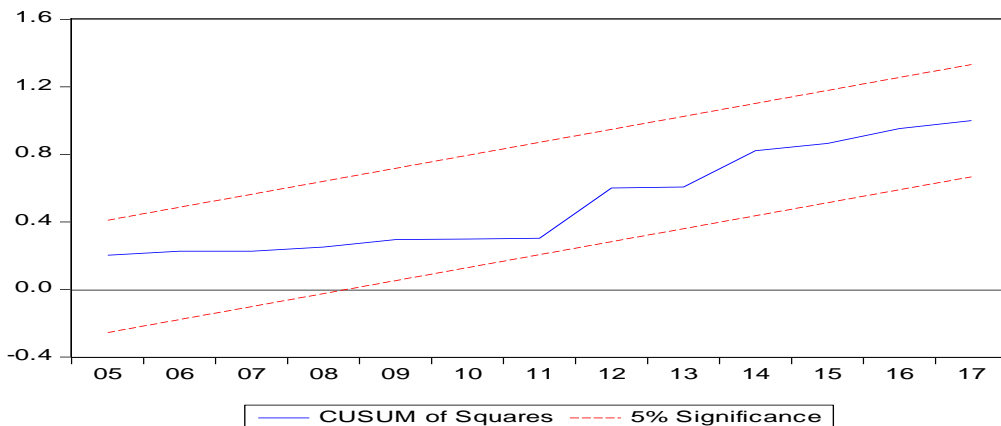
It is important to establish the appropriateness of the short run (parsimonious) model adopted for this work. In view of the above, further attempt was made to subject the data to stability tests using the cumulative sum of recursive residual (CUSUM) and the cumulative sums of squares (CUSUMQ) on the residual of the short run model. The results of cumulative sum (CUSUM) test shows that the residuals of the error-correction model lies within the critical bounds of five percent significant level. This confirms the stability of the estimated parameters over the period 1990-2017. Hence, the model has been reasonably specified.

Conclusion

This paper has examined the relationship between monetary policy and economic growth in Nigeria between 1990 and 2017 using Bound Test, ARDL and ECM model. The findings of this study could be summarized below; the error correction term showed that about 16% of the total disequilibrium in the previous year due to shock was corrected in the current year. There is no significant positive relationship between economic growth and broad money supply in both short and long run. However, there is a significant negative relationship between exchange rate and economic growth in the short but the relationship becomes insignificant in the long run, therefore exchange rate has a negative impact on economic growth. Also, there is a significant positive relationship between monetary policy rate and economic growth in the short run but becomes negative in the long run. In addition, economic growth and credit reserve ratio have a negative relationship in both short run and long run, the short run is significant but reverse is the case in the long run. Economic growth and inflation rate have a significant positive relationship in both short run and long run.

As a result of these important findings that came up, this study therefore makes the following recommendations for the policy makers and future researchers in Nigeria: the policy makers in Nigeria should increase the

level of broad money supply **through the deposit money banks** in the country since both the broad money supply and inflation lead to economic growth in the short run and the long run. Also, the apex bank in Nigeria should embark on the use of appropriate monetary policy variables that will address non-performance of credit requirement ratio, monetary policy rate and exchange rate in contributing to the nation`s economic growth. Also this study serves as a foundation upon which future researchers can buld their studies.

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