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MONETARY POLICY MANAGEMENT AND ECONOMIC GROWTH IN NIGERIA: NEW LESSONS RELEARNED

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ABSTRACT

This research study examines the existing links between monetary policy management and economic growth in Nigeria within the period 1960-2018. An autoregressive distributed lag (ARDL) approach was employed to evaluate the cointegration as well as the short-run and long-run estimates. The findings showed that a long-run relationship exists between monetary policy and economic growth within the periods understudied. Concerning the estimated parameters, the results reported that interest rate, deposit rate and liquidity ratio positively drive short-run output growth whereas, monetary policy rate, Treasury bill rate, and cash reserve ratio have a direct impact on short-run output growth in Nigeria. Meanwhile, in the long-run, monetary policy rate and deposit rate enhance real income growth, while Treasury bill rate and cash reserve ratio negatively affect output growth of the Nigerian economy. On the policy front, there is need for the apex bank to harmonize the expansionary part of the monetary policy with the contractionary part during the implementation process of the recent Economic Recovery and Growth Plan (ERGP) in 2017 aimed at turning the slump situation around and also projecting a strong growth rate in GDP at 4.5%.

Keywords: Monetary policy instruments, income growth, sectoral outputs, ARDL, Nigeria.

INTRODUCTION

The present state of the Nigerian economy has generated a lot of concerns despite the different policies implemented by the government to stabilize her economic activities. One of the recent governmental plans with the hope of achieving an aggressive growth gave birth to the launching of the Economic Recovery and Growth Plan (ERGP) in March 2017 with an aggression to turn the slump situation around.

However, the recent statistics published by the National Bureau of Statistics indicate that the plan is off-target (Kazeem, 2019). According to the institution, its projection of strong GDP growth at 4.5% in 2019 shows that the economy actually grew by 2.01% in 1st quarter, fell to 1.94% in 2nd quarter, again rose to 2.28% in quarter three and marginally dropped to 2.27% in 4th quarter (National Bureau of Statistics, 2020). Although the 2019's overall growth rate of 2.3% was marginally higher than 1.9% recorded in 2018 (African Development Bank, 2020), however, only three sectors (i.e. mining and quarrying; arts, entertainment and recreation; and financial and insurance) out of the nineteen sectors experienced positive shift (Owolabi, 2020; National Bureau of Statistics, 2020). A pictorial glance of the sectoral's output performance in 2019 against 2018 is depicted in Figure 1.

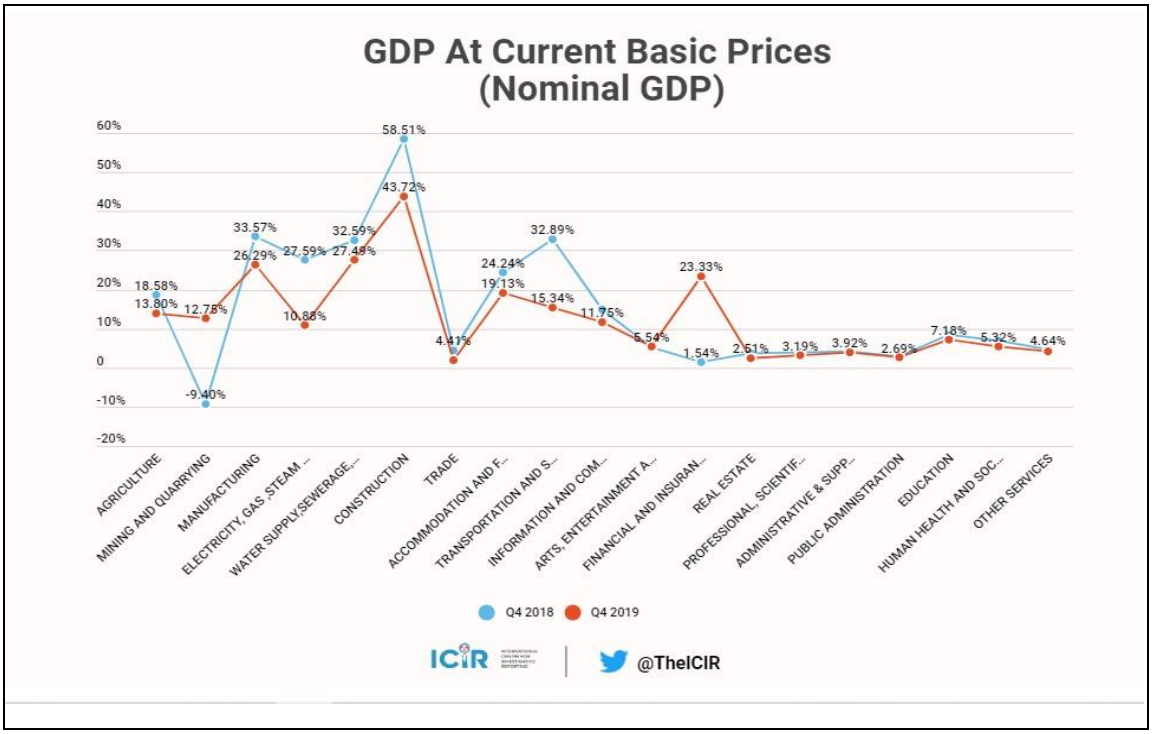

Figure 1: Gross Domestic Product of Various Sectors in Nigeria Source: International Centre for Investigative Reporting (2020)

Among the pressing challenges causing distortion in the Nigerian economic growth over the last years are bad leadership, over reliance on oil income, unstable price, unemployment, infrastructure deficit, poor power outage, poor healthcare facilities, poor education, insecurity, and most importantly poor monetary policy management.

Since the inception of the Central Bank of Nigeria (CBN) in 1958, the institution has implemented different monetary policy instruments using various combinations of direct controls and indirect controls (market based) (Chuku, 2009). For instance, the era of direct controls in monetary policy management in Nigeria was characterized with a lot of structural changes such as shift from agricultural base to petroleum, civil war of 1967 to 1970, oil boom of the 1970s, glut of early 1980s as well as the introduction of the Structural Adjustment Policy (SAP) in 1986. During this period,

monetary policy management was not effective because of lack of autonomy for CBN and the political influence of the ministry of finance, which made the bank to rely on the use of the instrument of sectoral credit allocation, credit ceilings, cash reserve requirements and the imposition of special deposits. This made it difficult to realize monetary targets as there were a lot of distortions and bottle necks in resource allocation (Nnanna, 2001; Chuku, 2009; CBN, 2015).

Based on the aforementioned, this study reinvestigates the impact of monetary policy management on the Nigerian economic growth from the time of independence (1960 to 2018). Most of the existing studies only analysed the effect of monetary policy management on the overall output level without considering the rate of growth and the output growth rate of its sectoral composition, which has rendered most of their submissions uncertain and inconclusive. Even though, these studies recognised the efforts of the government through different monetary policies towards ensuring higher economic growth, however, the desired results has not been achieved as half of her citizens still live in abject poverty according to the World Data Lab (2019). Thus, study further decomposed the empirical output growth model into output vector of agriculture, industrial, service, oil and non-oil sectors for robustness of our results. The outcomes of this study assist in ascertaining the relative effectiveness of monetary policy management as it affects expenditure decisions in the monetary and financial system which causes variations in the relative asset yields and in wealth, and thereby influence the volume and structure of asset that people would want to hold. Apart from the introductory part, the study includes literature review, methodology, results and discussion of results, conclusion and policy options.

BRIEF REVIEW OF LITERATURE

The review of studies on the effects of monetary policy management on economic growth, documented empirically in different economies are presented in this section. Rodriguez and Diag (1995) estimate a six-variable VAR-output growth, real wage growth, exchange rate, inflation, monetary growth and the Solow residuals. They observe that output growth could mainly be explained by own shocks but is negatively affected by increases in exchange rate. Rogers and Wang (1995) obtain similar results for Mexico. In a five-VAR model-output growth, government spending, inflation, real exchange rate and money-growth, most variations in the Mexican output is due to own shocks. They also note that exchange rate depreciations lead to a decline in output. Buckle, Kim and McLellan (2003) evaluate the impact of monetary policy on New Zealand business cycles and inflation variability and the output/inflation variability trade-off for the period 1996 – 2001. Employing VAR technique, findings indicate that monetary policy was less effective in reducing inflation and output variability.

Coenan Orphanides and Wieland (2005) carried out a study on price stability and monetary policy effectiveness when nominal interest rates are bounded at zero for the European Central Bank in 1980s and 1990s. The paper employed stochastic simulations of

small structural rational expectations model to investigate the consequence of the zero bound on nominal interest rate. It was found that if the economy is subject to stochastic shocks similar in magnitude to those experienced in the US, the consequences of the zero bound are negligible for target inflation rates as low as 2%. However, the effects of constrain are nonlinear with respect to the inflation target and produce a quantitatively significant deterioration of the performance of the economy with targets between 0 and 1 percent.

Ali, Irum, and Ali, (2008) and Khosravi and Karimi, (2010) employ Autoregressive distributed lag model approach to analyse the impact of fiscal and monetary policy on economic growth. Using South Asian data: Bangladesh, India, Pakistan, and Sri Lanka for the period 1970 – 2007, Ali et. al. (2008) reveal that money supply has a positive and significant impact on economic growth in the short and long run but fiscal policy has an insignificant effect on economic growth in the short and long run. The results of Khosrari et al. (2010) covering the period 1960 – 2006 show that the impact of exchange rate and inflation on economic growth in Iran is negative. In addition, government spending has a significant positive effect on growth. Meanwhile, Sayera (2012) employs Vector Error Correction Model and Granger Causality test to investigate the relative importance of monetary and fiscal policies in altering real output growth in Bangladesh. Results show that both monetary and fiscal policies have significant and positive impact on real output. However, monetary policy has a stronger impact than fiscal policy in altering output growth.

Ridhwan, Groot, Nijkemp and Rietrield (2010) carried out a study on the impact of monetary policy on economic activity in France. Using vector Auto-Regressive technique the findings reveal that capacity intensity financial deepening, inflation rate and economic size are important in explaining the variation in outcomes across regions and overtime. Amassoma (2011) examines the effect of monetary policy on macroeconomic variables in Nigeria for the period 1986 – 2009. The study uses a simplified ordinary least square method. Findings show that monetary policy have a significant influence on exchange rate and money supply while monetary policy is observe to have an insignificant effect on price stability. Orji (2006) investigates the efficacy of monetary policy in ensuring price stability in Nigeria between 1980 and 2004. His study uses the ordinary least square to analyze the series included in the study. Results show that only money supply and domestic credit has significant effects on consumer price index.

Michael and Ebibai (2012) used Ordinary Least Square method to examine monetary policy and economic growth in Nigeria between 1980 and 2011. Findings reveal that monetary policies played an indispensable role in Nigeria's economy by regulating and stabilizing the value of money in circulation in order to create an enabling environment for investment which will foster economic development. Investigating the use of fiscal policy and monetary policy in controlling economic activities in Nigeria between 1960 and 2011, Sanni, Amusa, and Agbeyangi (2012) employ Error Correction Model (ECM) and found out that monetary policy instruments exert more influence on Nigeria. The study of Ogege and Shiro (2012) look at the dynamics of monetary and fiscal policy as a tool for

economic growth. The study adopts Vector Error Correction Model (VECM) and uses Nigerian data covering the period 1970 – 2010. The results show that both the monetary and fiscal policies contribute to the growth of the Nigerian economy. In the same vein the ordinary least square test of Uniamikogbo and Enoma (2001) for Nigeria in the period 1986 – 1997 shows that both policies contribute significantly to growth.

Fasanya, Onakoya, and Agboluaje (2013) examine the impact of monetary policy on economic growth for the period 1975 – 2010 using the error correction model. Results from their study show that inflation rate, exchange rate and external reserve are significant monetary policy instruments that drive growth in Nigeria. Apere and Karimo (2014) apply the Vector Autoregressive method to investigate monetary policy effectiveness, output growth and inflation in Nigeria between 1970 and 2011. Results from the VAR analysis indicate that monetary policy are the key determinants of output growth in the long run while output growth is more important in controlling inflation in the short run.

Adigwe, Echekoba, and Onyeagba (2015) and Obadeyi, Okhiria and Afolabi (2016) investigate the impact of monetary policy on economic growth in Nigeria. Using ordinary least square for the period 1980 – 2010, Adigwe et al. conclude that monetary policy exerts a positive impact on economic growth. However, the ordinary least square results of Obadeyi et al. (2016) for the period 1990 – 2012 show that monetary policy impact negatively on economic growth. In a similar study, Ogunmuyiwa and Ekone (2010) apply ordinary least square, error correction model and Granger Causality methods on data covering the period 1980 – 2006. Results from their study reveal that money supply is positively related to growth but the result is however insignificant.

Onanuga, Tella and Osoba (2016) examine the effect of output gap uncertainty on monetary policy rate in Nigeria over the period 1991:Q1 – 2014:Q4. Applying generalized method of moments econometric technique, result shows that monetary policy is less responsive to uncertainty of real output gap and inflation. To empirically realised the impact of monetary policy on economic growth in Nigeria, Anowor and Okorile (2016), use time series data covering the period 1982 and 2013. The study employ the error correction model approach and Cash Reserve Ratio (CRR) led to approximately seven units increase in the country.

Ageliki and Stephanos (2014) examined the impact of monetary shocks on regional output in four South Eurozone countries over the period 1980-2009. The study quantifies the importance of Optimal Currency Area (OCA) criteria for the monetary policy transmission mechanism at the regional level. The study employs a Bayesian PVAR Model to measure the impact of monetary policy shocks on regional output of 58 regions of four South Euro-Zone countries i.e. Greece, Spain, Italy and Portugal. The results provide evidence of different regional responses of regional GDP on monetary policy shocks.

The empirical literature on the impact of monetary policy management on economic growth is relatively few and the outcomes can best be described as inconclusive. Studies like Khabo (2002), Rafiq and Mallick (2008), Bhniyan (2008), Akujuobi (2010), Anowor and

Okorie (2010),Nouri and Samimi (2011), Baghebo and Stephen (2012), Fasanya, Onakoya and Agboluaje (2013), Usman and Adejare (2014), Nibeza and Tumusherure (2015), Ayub and Snah, (2015), Adigwe, Echekoba and Onyeagba (2015), Nasko (2016), wrote on the impact of monetary policy on economic growth, while few researchers like Ojo, (2000), Janjua, 2005) and Hassan, (2012) wrote on monetary policy management. This study reinvestigates how the management of monetary policy instruments influenced economic growth in Nigeria from the period 1960-2018.

THEORETICAL MODEL, METHOD AND DATA

The theoretical foundation of the Solow version of the neo-classical growth theory is employed to model the links between monetary policy management and economic growth in Nigeria. This is found relevant for explaining the factors responsible for output growth in an economy most especially from the monetary policy angle. According to the Solow version of the neo-classical growth model, the functional relationship between inputs and outputs are expressed in a typical Cobb-Douglas production function. The functional model is stated as:

$$Y = f(K, AL) \qquad (1)$$

The production output represent by Y is determined by capital K ; labour L ; and total factor productivity A . The factors inputs are constituted by both capital and labour. Assuming a non-functional form of the model, it presumes a constant return to scale which is expressed as:

$$Y = K^{\square} AL^{\square} \text{ (Note: } \square + \square = 1) \qquad (2)$$

More, so, the factor intensity parameters can also be re-written as: $\square = 1 - \square$,

therefore, the equation is expressed as:

$$Y = K^{\square} AL^{1-\square} \qquad (3)$$

As earlier noted, the above equation presumes a constant return to scale based on the postulation of the classical growth model. The economic implication of this assumption is that economic growth increases at a rate proportional to the factor inputs growth. Meanwhile, the Solow version of growth model presumes output growth increasing at a diminishing rate as the total amount of capital used rises. Therefore, an unvarying share of the existing stock of capital decreases in value (thereby becoming productively ineffective) in each time period.

The standard neo-classical growth model explained the levels of convergence of income per capita by the common technology, saving rate and population growth. They make clear that when a technological backward country gets access to the more advanced technology, a fast rate of growth is possible until the steady state is achieved and both countries share the same per capita income level and growth rate. However, there exist various alternatives of the neoclassical growth models based on the existence of difference assumptions.

As for monetary policy, the monetarist in the 1950s drawing its foundation stone from the quantity theory of money, they presume that velocity of money is generally stable, i.e. nominal income is largely a function of the money supply (Friedman and Schwartz, 1963, 1970; Friedman 1968; Twinoburyo and Odhiambo, 2017). Also, the monetarist still believed in the Phillip curve i.e. the substitution between inflation and output but was restated in terms of real wages and not nominal wages (Gottschalk, 2005). More so, they argued that at the prevailing natural rate and assumptions of sticky wages, the equilibrium in labour market is obtained. Thus, with the nominal rigidities in wages and prices assumption, it means that monetary policy influences real income in the short-run (stabilization). The implication is that an increase in money stock would have temporary increase in real output and employment in the short run, but no impact in long run due to countervailing effect of an increase in the general price. They assumed long-run monetary neutrality in the long run as money supply is inflationary (Twinoburyo and Odhiambo, 2017). Studies that have found support for this evidence empirically are Bernanke and Mihov (1998), Bullard (1999), Nogueira (2009) among others. Therefore, the assumption that monetary policy affects output growth through the total factor productivity *A* as a function of monetary policy (*MP*).

$$A = A_0 e^{MP} \qquad (4)$$

Accordingly, putting the model (4) into equation (3) and taking the natural logarithm of the two sides, this thus becomes:

$$\ln Y = \ln A_0 + \alpha \ln K + (1-\alpha)\ln L + MpP \qquad \text{Note that } \ln e = 1 \qquad (5)$$

Afterward, stating the functional form of equation (5) mathematically including the disturbance term, the time-specific effect is thus specified as:

$$gdp_t = \alpha_0 + \alpha cap_t + \alpha lab_t + \alpha mp_t + \alpha_t \qquad (6)$$

It is important to note that: $\ln Y = gdp$, $\ln A = \alpha_0$, $\ln K = cap$, $\ln L = lab$,and

$MP = mp$. The theoretical model for this study is specified above in equation (6) and monetary policy (mp) is a vector of various policy instruments used by the apex bank. Past studies that have also adopted the neoclassical theoretical growth model are Bernanke and Mihov (1998), Bullard (1999), Nogueira (2009), Twinoburyo and Odhiambo (2017), Gil

and Iglesias (2019) among others. Incorporating the monetary policy instruments into equation (6), the model is rewritten as:

$$gdp = \beta_0 + \beta_1 lqr + \beta_2 M_2 + \beta_3 crr + \beta_4 redis + \beta_5 depr + \beta_6 trebr + \beta_7 intrat + \varepsilon \quad (7)$$

Where: *gdp* represent gross domestic product, *lqr* is liquidity ratio, M_2 represent broad money supply, *crr* is cash reserve ratio, *redis* represent minimum rediscount rate; *depr* is deposit rate; *trebr* is treasury bill rate; *intrat* represents lending rate; β_0, β_{1-7} are parameters; and ε is error term. For insightful economic implications and policy options, the real output growth is further decomposed into its components such as agriculture (agric), industry (ind), service (ser), oil (oil) and non-oil (noil) sectors.

The study used both augmented Dickey Fuller and Phillip-Perron tests to examine the stationarity level of the variables. Afterwards, the study used the Autoregressive Distributed Lag (ARDL) test approach to determine the long-run relationship and the short-run and long-run estimates of variables in equations based on the result of the unit root tests. The autoregressive distributed lag (ARDL) model is found to be more appropriate when the stationarity level of our indicators reported mixed stationarity at levels and first difference.

This study use an annual data time series for the period 1960 – 2018 which was obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin (2019). Table 1 presents the definition and measurements of variables as well as their sources. Also, the descriptive statistics of the variables are presented in Table 2.

Table 1: Variables definition, measurements and sources

Symbol	Definition	Sources
rgdp	RGDP: is an inflation-adjusted economic growth that reflects the real value of goods and services in the economy, it is measured as GDP per capita growth expressed in percentage.	Central Bank of Nigeria (CBN) Statistic Bulletin (2019)
agric	Agriculture Sector	CBN Statistical Bulletin (2019)
ind	Industry Sector	CBN Statistical Bulletin (2019)
ser	Service Sector	CBN Statistical Bulletin (2019)
oil	Oil Sector	CBN Statistical Bulletin (2019)
noil	Non-oil Sector	CBN Statistical Bulletin (2019)

m_2	Broad Money: this will be used as a proxy for monetary policy. M_2 in billion naira, equal currency plus demand and interest bearing liabilities of banks and non-bank financial intermediaries divided by GDP (M_2/GDP).	CBN Statistical Bulletin (2019)
intrat	Interest Rate: It will be measured by lending rate at which funds are given to financial users by the financial institutions.	CBN Statistical Bulletin (2019)
crr	Cash Reserves Ratio	CBN Statistical Bulletin (2019)
tr	Treasury Bills Rate	CBN Statistical Bulletin (2019)
lqr	Liquidity Ratio	CBN Statistical Bulletin (2019)
depr	Deposit lending	CBN Statistical Bulletin (2019)
redis	Rediscount Rate	CBN Statistical Bulletin (2019)
mpr	Monetary policy rate	CBN Statistical Bulletin (2019)

Source: Authors' compilation (2021).

Table 2: Descriptive statistics

Variables	Measurements	Mean	Std. Dev.	Max.	Min.
rgdp	Real GDP (constant, 2000, N)	1834047	79366.5	6981002	2489
agric	Agriculture (constant, 2000, N)	4252359	25001.4	1754414	1338
ind	Industry (constant, 2000, N)	5006310	33511	1379124	145.6
ser	Service (constant, 2000, N)	5846953	7714.4	2566364	323.4
oil	Oila (constant, 2000, N)	3590101	28094.8	9460983	11
noil	Non-oil (constant, 2000, N)	1475036	51372.6	6366106	2390.3
lqr	Liquidity ratio (%)	2965758	23.805	2507972	0
m2	Broad money supply	3079.88	7784.8	26	267.6
crr	Cash reserve ratio (%)	9.379	8.126	28.02	0
redis	Minimum rediscount rate (%)	25.821	1.871	64.1	3.5
depr	Deposit rate (%)	6.759	2.38	22.5	0
trebr	Treasury bill rate (%)	12.744	1.656	36.09	2.5
intrat	Interest rate (lending, %)	10.8445	2.482	26.9	0

Source: Authors' computation (2021).

ANALYSIS AND DISCUSSION OF RESULTS

The study investigates the impact of monetary policy management on Nigerian economic growth as well as its sectors' contribution since independence till 2018. Prior to the estimation of parameters of monetary policy variables under both direct and indirect monetary control era, the pre-estimation tests (in terms of unit root and cointegration tests) were carried out to identify the appropriate estimation technique for this sub-section. For the unit root test, the conventional unit root test using both the Augmented Dickey Fuller (ADF) and Phillips Perron (PP) were employed to establish the stationary level of the economic variables. The results of the unit root for the economic indicators were presented in Table 3. The tau-statistic results for intercept and trend model were used to find the statistically significance of the variables at 1%, 5% and 10% critical point at levels and first difference. In addition, the lag length for ascertaining the stationarity level of our variables is automatically and optimally chosen by the Schwarz-Bayesian Information Criterion (SIC) whereas few were fixed.

Table 3: Conventional unit root tests

Variables	Level			First Difference		
	ADF	PP		ADF	PP	
rgdp	-1.2205(0)[-3.4892]	-1.2523(2)[-3.4892]	***agric***	-0.7814(0)[-3.4892]	-0.7535(1)[-3.4892]	***ind***
-2.2662(0)[-3.4892]	-2.3046(2)[-3.4892]	***ser***	-0.3014(0)[-3.4892]	-0.4431(2)[-3.4892]	***oil***	-1.1718(0)[-3.4892]
-1.3156(3)[-3.4892]	***noil***	-0.3580(0)[-3.4892]	-0.5162(3)[-3.4892]	***m_2***	3.8945(1)[-3.4907]	5.0628(3)[-3.4892]
lqr	-3.4899(0)[-3.4892]**	-3.4911(3)[-3.4892]**	***crr***	-2.8565(1)[-3.4907]	-2.3017(2)[-3.4892]	***mpr***
-2.7648(0)[-3.4892]	-2.6025(3)[-3.4892]	***depr***	-2.3978(0)[-3.4892]	-2.3398(5)[-3.4892]	***trebr***	-2.8376(0)[-3.4892]
-2.6845(2)[-3.4892]	***intrat***	-2.8773(0)[-3.4892]	-2.7499(1)[-3.4892]			
				-6.9934(0)[-3.4907]***	-6.9934(0)[-3.4907]***	*I*(1
-7.9085(0)[-3.4907]***	-7.9089(1)[-3.4907]***	*I*(1)	-7.6060(0)[-3.4907]***	-7.6061(1)[-3.4907]***	*I*(1)	-6.0070(0)[-3.4907]***
-6.0070(0)[-3.4907]***	*I*(1)	-7.5014(0)[-3.4907]***	-7.5013(2)[-3.4907]***	*I*(1)	-6.3382(0)[-3.4907]***	-6.3664(2)[-3.4907]***
I(1)	-4.0174(0)[-3.4907]**	-4.2230(4)[-3.4907]***	*I*(1)	-	-	*I*(0)
-6.5025(1)[-3.4921]***	-5.8252(3)[-3.4907]***	*I*(1)	-7.9032(1)[-3.4922]***	-9.9711(1)[-3.4907]***	*I*(1)	-9.8341(0)[-3.4907]***
-9.9272(1)[-3.4907]***	*I*(1)	-8.9923(0)[-3.4907]***	-9.3900(4)[-3.4907]***	*I*(1)	-8.6104(1)[-3.4921]***	-10.122(10)[-3.4907]***
I(1)						

Note: *** significant at 1%; ** significant at 5%; * significant at 10%. Calculated at trend and intercept and lag lengths selected automatically using the Schwarz Info Criterion (SIC). rgdp - Real GDP (constant, 2000, N); agric - Agriculture (constant, 2000, N); ind - Industry (constant, 2000, N); ser - Service (constant, 2000, N); oil - Oil (constant, 2000, N); noil - Non-oil (constant, 2000, N); lqr - Liquidity ratio (%); M2 - Broad money supply; crr - Cash reserve ratio (%); mpr – Monetary policy rate (%); depr - Deposit rate (%); trebr - Treasury bill rate (%); and intrat - Interest rate (lending, %).

Source: Authors' computation (2021).

The findings of the two unit root tests under the conventional methods follow the same decision on stationary level of variables of interest at varying significant levels. Specifically, liquidity ratio was found to be stationary at levels at 5%. The t-statistics and adjusted t-statistics for ADF and PP respectively were found to reject the null hypothesis "not stationary at level" at 5% McKinnon significance level. Conversely, the unit root test of other variables were found not to reject the null hypothesis "not stationary at level" at 5% McKinnon significance level. They were further subjected to test at first differences which were found significant 5% significance level. The results suggest that at first difference, the time series of the variables (real GDP, agriculture, industry, service, oil, non-oil, money supply, cash reserve ratio, monetary policy rate, deposit rate and treasury bill rate) were stationary and integrated of order one and therefore suggests that after differencing at first levels the series, they converge to their long-run equilibrium or true mean.

Table 4: Cointegration test tesults using ARDL bound approach

Dependent variable: *y*	Functions	F-statistics
Model I ARDL (4, 0, 4, 4, 3, 1, 2, 4)	$F_{rgdp}(rgdp\|m2, lqr, crr, redis, depr, trebr, \text{int}rat)$	
Model II ARDL (4, 0, 4, 4, 3, 1, 2, 4)	$F_{agric}(agric\|m2, lqr, crr, redis, depr, trebr, \text{int}rat)$	4.1909***
Model III ARDL (4, 4, 4, 4, 2, 0, 4, 3)	$F_{ind}(ind\|m2, lqr, crr, redis, depr, trebr, \text{int}rat)$	3.2559**
Model IV ARDL (1, 0, 1, 1, 0, 1, 1, 1)	$F_{ser}(ser\|m2, lqr, crr, redis, depr, trebr, \text{int}rat)$	3.2634**
Model V ARDL (4, 2, 2, 3, 4, 3, 4, 3)	$F_{oil}(oil\|m2, lqr, crr, redis, depr, trebr, \text{int}rat)$	3.8687**
Model VI ARDL (4, 0, 4, 4, 3, 1, 2, 4)	$F_{noil}(noil\|m2, lqr, crr, redis, depr, trebr, \text{int}rat)$	3.4608**

	1%		5%		10%	
	I(0)	*I(1)*	*I(0)*	*I(1)*	*I(0)*	*I(1)*
Critical bound values for the models (k = 7)	2.73	3.90	2.17	3.21	1.92	2.89

3.5235**

Note: ***, ** and * denote rejection of null hypothesis at 1%, 5% and 10% significance levels respectively. rgdp - Real GDP (constant, 2000, N); agric - Agriculture (constant, 2000, N); ind - Industry (constant, 2000, N); ser - Service (constant, 2000, N); oil - Oil (constant, 2000, N); noil - Non-oil (constant, 2000, N); lqr - Liquidity ratio (%); M2 - Broad money supply; crr - Cash reserve ratio (%); redis - Minimum rediscount rate (%); depr - Deposit rate (%); trebr - Treasury bill rate (%); and intrat - Interest rate (lending, %).

Source: Authors' computation (2021).

Afterward, since one of the variables was found stationary at level while others integrate at first difference, the study employed the autoregressive distributed lag (ARDL) test approach being most appropriate technique to test the cointegration and estimate short- and log- coefficients. Summarily, the approach is most suitable for indicators stationary at different order of integration. Table 4 presents the F-statistics values indicating whether there is existence of long-run relationship between monetary policy and Nigerian sectors and overall output growth. The estimates of the normalized equations were found greater than the lower and upper critical bound at 1% significance level for agriculture sector function while other sectors and real GDP were found at 0.05 critical value. This therefore implies that the null hypothesis of no long-run relationship is rejected at 5% significance level. The implication of the above estimation is that there is existence of long-run relationship between monetary policy management and economic growth measured by real GDP growth in Nigeria. The models have equilibrium condition that keeps the variables together in the long-run.

Table 5: Short-run estimates of monetary policy and output

Variables	Dependent Variable: Real GDP and Sectors' Output (*y*)					
	Real GDP	**Agriculture**	**Industry**	**Service**	**Oil**	**Non-oil**
Δ(y(-1))	-0.0451	-0.0245	-0.4554**	-0.2020*	-1.3681***	0.0121
	(0.1303)	(0.1170)	(0.1577)	(0.1094)	(0.2172)	(0.1306)
Δ(M2(-1))			5.3112***		1.4879**	
			(1.2787)		(0.7363)	
Δ(lqr(-1))	-0.0364***	-0.0293***	-0.0273**	-0.0313***	-0.0442***	-0.0381***
	(0.0091)	(0.0060)	(0.0100)	(0.0094)	(0.0099)	(0.0073)
Δ(crr(-1))	0.0598**	0.0136	0.1399***	0.0094	-0.0038	0.0276
	(0.0225)	(0.0186)	(0.0388)	(0.0240)	(0.0196)	(0.0229)
Δ(mpr(-1))	0.2617***	0.2455***	-0.2873**		-0.5816***	0.2403***
	(0.0820)	(0.0696)	(0.1264)		(0.1678)	(0.0829)
Δ(depr(-1))	-0.1417***	-0.1452***		-0.0599	0.0680	-0.1435***
	(0.0472)	(0.0401)		(0.0631)	(0.0606)	(0.0478)
Δ(trebr(-1))	0.2143***	0.2127***	0.3171***	0.1577**	0.4350***	0.2124***
	(0.0650)	(0.0565)	(0.1036)	(0.0775)	(0.0970)	(0.0657)
Δ(intrat(-1))	-0.2290***	-0.2325***	0.3453***	-0.0689	0.1023	-0.2159***
	(0.0493)	(0.0422)	(0.0839)	(0.0514)	(0.0666)	(0.0492)
ECT(-1)	-0.2069***	-0.3314***	-0.1592***	-0.2020***	-0.7958***	-0.2493***
	(0.0325)	(0.0456)	(0.0263)	(0.0444)	(0.1101)	(0.0395)

Note: ***, ** &* denotes rejection of the hypothesis at the 0.01, 0.05 and 0.1 level respectively.

Source: Authors' computation (2021).

In regard to the above submission which indicates that there exists a long relationship among the variables, the short-run and long-run estimates using the ARDL method are shown in Tables 5 and 6. It therefore provides answers to the null hypothesis that

monetary policy management insignificantly influenced economic growth during the era of both direct and indirect control. The error correction mechanism measures the rate of adjustment at which the dependent variable changes due to changes in the independent variables. The ARDL test automatically choose the lag length on all variables as the model was set at four to ensure sufficient degree of the freedom based on automatic selection of Akaike Information Criterion (AIC). The coefficient of the error correction term (ECT) is found to be negative and statistically significant at the conventional level for the models of real GDP, agriculture, industry, service, oil and non-oil sectors. Correspondingly, the ECT values implied that the models correct their short-run disequilibrium by 20.69%, 33.14%, 15.92%, 20.20%, 79.58%, and 24.938% speed of adjustment in order to return to the long run equilibrium.

The short-run estimates indicate that lag one of real GDP and agriculture output have negative and insignificant impact on their real current level of activities. This is also similar to the result obtained for manufacturing, service and oil sectors but were found to be significant. However, the coefficient of lag one of non-oil sector is positive and also insignificant. Further, broad money supply was found to have positive and significant impact on the outputs of manufacturing and oil sectors. Likewise, Treasury bill rate was also found to have direct impact on real GDP and sectors' outputs. The parameter estimates of liquidity ratio were negative, indicating that it indirectly influence real GDP and the sectors' outputs. The result is also similar for monetary policy rate. Also, the parameters of deposit rate are negative and significant except for service which is insignificant and oil sector positive and insignificant. As well, lending rate has negative and significant impact on real GDP, agriculture, and non-oil sectors but positive and significant for manufacturing sector.

For the long-run estimates, the results of the estimated parameters are reported in Table 6. The table shows that monetary policy rate has positive and significant impact on real GDP and the outputs of all sectors. Likewise, real GDP, agriculture and non-oil sectors were positively and significantly influenced by deposit rate. Quite the opposite, money supply has negative influence on outputs of service and oil sectors. Also, real GDP, agriculture, manufacturing, service, and non-oil sectors were negatively affected by cash reserve ratio. For Treasury bill rate, it has negative effect on real GDP, agriculture, manufacturing, and non-oil sector. Lastly, low interest rate enhances the output of agriculture, manufacturing, service, and oil sectors. In summary, the outcome revealed that monetary policy management significantly influence the Nigerian economic growth in the short-run compared to the long-run.

Table 6: Long-run estimates of monetary policy and output

Variables	**Dependent Variable: Real GDP & Sectors' Output (*y*)**					
	Real GDP	**Agriculture**	**Industry**	**Service**	**Oil**	**Non-oil**
Money supply (M2)	0.0323	0.1340	-0.1877	0.1817*	-0.9121**	0.0809

	(0.2374)	(0.2282)	(0.2505)	(0.1059)	(0.3275)	(0.0111)
Liquidity ratio (lqr)	0.0111	0.0104	0.0021	-0.0051	-0.0105	0.0089
	(0.0107)	(0.0093)	(0.0107)	(0.0058)	(0.0139)	(0.0111)
Cash reserve ratio (crr)	-0.0564*	-0.0548*	-0.1925**	-0.0260*	-0.0167	-0.0656**
	(0.0304)	(0.0340)	(0.0919)	(0.0152)	(0.0305)	(0.0316)
Monetary policy rate (mpr)	0.7437***	0.7911***	1.6458**	0.1470*	1.1238***	0.7538***
	(0.1945)	(0.1823)	(0.6920)	(0.0809)	(0.3152)	(0.1939)
Deposit rate (depr)	0.1575*	0.1643**	-0.1863	0.0210	-0.2609	0.1470*
	(0.0807)	(0.0668)	(0.1329)	(0.0429)	(0.1831)	(0.0791)
Treasury bill (trebr)	-0.6094***	-0.6275***	-0.7318**	-0.0223	-0.4032	-0.6033***
	(0.2132)	(0.1851)	(0.2885)	(0.0744)	(0.2914)	(0.2170)
Interest rate(intrat)	-0.1176	-0.1186*	-0.6811*	-0.0743*	-0.5712** *	-0.1194
	(0.0734)	(0.0606)	(0.3655)	(0.0441)	(0.1947)	(0.0730)
Constant	1.2388	0.9751	1.5699	0.5629	6.0116***	1.3321
	(1.0936)	(0.9446)	(0.9621)	(0.4534)	(2.1348)	(1.1382)
Adjusted R^2	0.5050	0.5919	0.5420	0.5018	0.6269	0.5867
F-Stat	80.692***	100.64***	69.741***	48.273***	83.538***	77.156***
Serial Correlation	(0.1444)	(0.4210)	(0.1114)	(0.7484)	(0.1832)	(0.1082)
Normality Test	(0.0242)	(0.2617)	(0.0399)	(0.0000)	(0.2198)	(0.0030)
Heteroskedasticity test	(0.1426)	(0.2639)	(0.3764)	(0.1105)	(0.4230)	(0.0898)

Note: ***, ** &* denotes rejection of the hypothesis at the 0.01, 0.05 and 0.1 level respectively.

Source: Authors' computation (2020).

Furthermore, the coefficient of determination (measured by the Adjusted-R^2) is high for the models. The coefficients imply that about 50.5%, 59.2%, 54.2%, 50.2%, 62.7% and 58.7% of the total variations in real GDP, outputs growth of agriculture, manufacturing,

service, oil and non-oil sectors were explained by the monetary variables in the models. The overall test using the F-statistics revealed that all the monetary variables are statistically significant at 5%. As for the diagnostic tests, the estimated ARDL models were tested for serial correlation, normality and heteroskedasticity. The results from these tests are also shown in Table 6. The results revealed that the models passed the serial correlation test indicating that the error terms are not correlated up to order 3. Also, the null hypothesis of normality and heteroskedasticity tests were not rejected at the conventional rate implying that the error terms are normally distributed and have same variance.

DISCUSSION OF FINDINGS

The findings showed that low interest rate enhanced short-run output growth whereas its effect on long-run growth is statistically insignificant. The impact of interest rate on agriculture, manufacturing and non-oil is statistically in the short-run. Concerning the long-run estimates, decreasing interest rate boost non-oil sector growth at 5% significance level but found at 10% for agriculture, manufacturing and service sectors. Monetary policy rate have a counter-cyclical effect on the real GDP and sectors' output growth in short-run and long-run. Specifically, low monetary policy and Treasury bill rates drives short-run output growth positively but high monetary policy and Treasury bill rates have direct link with long-run output growth. As for liquidity ratio, its negative influence on short-run output growth is statistically significant but insignificant on long-run income growth. Also, the short-run impact of money supply on manufacturing and oil sector output growth is statistically noted in the study, but money supply has no significant impact on the overall output growth both in short-run and long-run. The study found that monetary policy management played a significant impact on the Nigerian economy. This conforms with previous studies such as Akujuobi (2010) revealing that cash reserve ratio, treasury bill, monetary policy rate and liquidity rate have significant impact on the economic development of Nigeria. More so, it is in line with existing studies like Ogunmuyiwa and Ekone (2010); Michael and Ebibai (2012); Sanni, Amusa, and Agbeyangi (2012); Fasanya, Onakoya and Agboluaje (2013); Adesoye (2014); Apere and Karimo (2014); Sulaiman and Migiro (2014); Ayub and Snah, (2015); Abdulazeez (2016); Nasko (2016); Nwoko et al. (2016) among others that monetary policy enhance the output growth of the Nigerian economy. This negates the results of Dele (2007) that monetary policy is a source of stagnation that hurt real domestic output.

CONCLUSION

The study investigates the impacts of monetary policy management on the Nigerian economic growth within the periods of 1960 to 2018. Using the autoregressive distributed lag approach, the results found that interest rate, deposit rate and liquidity ratio positively drive short-run output growth whereas, monetary policy rate, Treasury bill rate, and cash

reserve ratio have a direct impact on short-run output growth in Nigeria. Meanwhile, in the long-run, monetary policy rate and deposit rate enhance real income growth, while Treasury bill rate and cash reserve ratio negatively affect output growth of the Nigerian economy. The observed findings of this research study have policy inference on the recent Economic Recovery and Growth Plan (ERGS) in 2017 aimed at turning the slump situation around and also projecting a strong growth rate in GDP at 4.5%. The results are found useful for the achievement of the sustainable development goal (SDGs) most especially obtaining a growth that will promote the poor and ends hunger. Thus, the apex bank must harmonize the expansionary part of the monetary policy with the contractionary part during the implementation process of the ERGP. This will enable the institution to curtail the rate differential of credit demand and supply to both productive and unproductive sectors with the purpose of enabling the former to improve output productivity of all sectors. The government should direct effort towards improving the level of development of financial market. This is because a well-developed financial institution with wide range of both short and long-term finance is necessary for efficiency of the monetary system.

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