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COMPARATIVE ANALYSIS OF MONETARY POLICY MANAGEMENT AND ECONOMIC GROWTH UNDER DIRECT AND INDIRECT CONTROL REGIMES

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Abstract

This study presents an empirical insight on how monetary policy management influence the Nigerian economic growth during the era of direct and indirect control within the period of 1960 and 2018. The choice of this period is explained by the policy changes over the past years and to see at a glance if there is any difference in the effect of monetary policy management on economic growth in the two regimes. Data are also available for the period. We employed the vector error correction model and autoregressive distributed lag tests to evaluate the parameters. The findings confirmed that rediscount rate, Treasury bill rate and interest rate were the most prominent monetary policy variables determining the real level of economic activities in Nigeria during the era of direct control. Also, the impact of these monetary variables on the real GDP exhibits similar influence on the agriculture and manufacturing sectors. During the era of indirect monetary policy control, money supply was the most important determinant of real

output growth in the short-run as well as for manufacturing, service, oil and non-oil sector but third for agriculture sector. In the long-run, money supply played important role in the development of agriculture, manufacturing and oil sectors which was fourth for non-oil sector, and sixth for real GDP and service sector. Meanwhile, monetary policy rate was the second most important determinant of real GDP for both periods. Deposit rate played the third most important determinant of output growth in the short-run whereas cash reserve ratio was the third most important monetary variable in the long-run. The study concludes that monetary policy management during the era of direct control significantly influenced the Nigerian economic growth in the long-run than in the short-run. In the period of the market-based policy direction, the findings show that monetary policy management favours short-run real output growth which does not sustain the Nigerian economic growth in the long-run. Appropriate policies were suggested in the study.

Keywords: Monetary policy tools, sectoral growth, income, quantitative restrictions, market control

INTRODUCTION

Over the last decades, the macroeconomic objectives are achieved through the use of appropriate policy instruments depending on the level of development of the economy, (Nzotta and Okereke, 2009). The primary aim of monetary policy is to ensure that supply of money is in consonance with the growth level of the economy and the decision to apply a monetary policy on the economy depends on the magnitude and flow of money supply in the economy at that particular time. The monetary policies pursued are usually out in form of "Audience" to all banks and other financial institutions. The guideline are general in operation within a fiscal year but could be amended during the course of the year, depending on the changes in internal and external economic circumstances. The Central Bank of Nigeria (CBN) is always empowered to direct the activities of the financial institutions so as to carry out certain duties in pursuit of approved monetary policy of which penalties are prescribed for non-compliance with specific provision of the guidelines.

In Nigeria, monetary policy has been in use since the Central Bank of Nigeria was established and given the responsibility of formulating and implementing monetary policy through the Central Bank Act of 1958. This role has facilitated the emergence of active money market where treasury bills - a financial instrument used for Open Market Operations (OMO) and raising debts for government have grown in volume and value, becoming a prominent earning asset for investors and source of balancing liquidity in the market (International

Financial Statistics, 2016). Federal government borrows large sums of money in money market through weekly issues of Treasury Bills which continued to be the dominant securities for obtaining short term loan as they constituted 71.5, 76.9, 86.9 percent in 1993, 2000,and 2015 respectively (International Financial Statistics, 2016).

In a bid to make the monetary policy more effective, the Central Bank of Nigeria changed from the direct monetary control to an indirect approach and made use of market instruments so as to make the monetary policy management to ensure price stability and promote economic growth (Ojo, 2001). Meanwhile, monetary management in Nigeria was argued to be successful during the period of financial sector reform in 1986 which was characterized by the use of indirect monetary policy tools (Mardi, 2009), however the effectiveness of monetary policy has been undermined by the effects of fiscal dominance and political interference over the years. The government current expenditure expanded without appreciable increase in revenue leading to widening fiscal deficit which were largely financed with bank credit and this has adverse effects on the general price level and economic growth (Soludo, 2007). Also during the era of indirect control, effectiveness of monetary policy is also affected by political interference. In 1999, the instrument autonomy was granted to the CBN but the government has always been interfering by pressuring the CBN to reduce interest rates to assist the real sector of the economy even when economic situations suggest otherwise (Nnanna, 2001; Onyeiwu, 2012). The growth in economy during the era of indirect control has not been a sustainable one since there are still evidence of growing poverty, income and wealth inequality among the populace (Apere and Karimo, 2014).

Also, many instruments of monetary policy have been in use to improve the level of growth in the economy for many years, but despite these, there exist lack of sustainable economic growth which has generated to high unemployment, price instability, unfavourable balance of payment, low domestic savings and low domestic output. Another problem is found in the transmission mechanism of monetary policy which is complex and has various dimensions. In a developed economy the transmission mechanisms can be confirmed or rejected by carrying out empirical verifications, but empirical verification in a developing economy is difficult to carry out due to the undeveloped nature of the financial structure (Ojo, 2000; Beckworth, 2017), thereby making the outcome of monetary policy becomes uncertain. A good example is the narrow money (M_1) used by the Central Bank of Nigeria (CBN) as the intermediate monetary target between 1988 and 1991. At these periods, M_1 was programmed to grow at an average of 14.3% annually but the actual increase in M_1 was 36.7% per annum. From 1991, broad money supply (M_2) became the intermediate monetary target and the actual increase of M_2 was consistently higher than the targets for several years. For example, the

period of 1999 and 2000 witnessed a triple fold growth rate compared with the target. Also in 2001, monetary base growth was more than two times the target while in 2003, the growth rate was 24 percent as against the target of 15 percent. The high rate of money growth fuelled inflation and unreliable growth at this period which was almost 26 percent a year between 1980 and 2001. From 2002 to 2005, the inflation rate was at two digits while output falls (World Bank, 2018). Bank credit to the domestic economy during this period was the main source of the rapid monetary expansion and the actual increases in domestic credit were excessive, for instance, it rose by 31.9%, 129.9%, 201.9%, and 95.2% in 1988, 1992, 1998, and 2001 respectively. Olusoji (2014) noted that the rate of liquidity expansion was associated with poor macroeconomic performance and ultimately the inability of the central bank to properly manage its monetary policy.

At long last, a quite number of studies have been conducted for Nigeria in order to ascertain how monetary policy management influence her overall economic growth. However, these studies only considered the effect of monetary policy on economic growth without taking into consideration of the different monetary policy management regimes (direct and indirect policy eras) as well as the casual feedback of both monetary policy and output growth. For this reason, the need to determine clearly and identify the effect of the different monetary policy regimes on economic growth becomes imperative. Also, the question as to how the different era of monetary policy management influences the various sectors' outputs of the Nigerian economy has not been given adequate attention. It therefore becomes pertinent to evaluate the impact of monetary policy management on the output growth of key sectors (like agriculture, manufacturing and service; and oil and non-oil industries) in Nigeria as robustness checks. Other parts of this study are divided into four parts. The literature review and methodology are discussed in the second and third parts respectively. Consequently, the fourth and last sect presents the analysis and discussion of results and the concluding part.

LITERATURE REVIEW

The monetarist theory of monetary policy formed the theoretical foundation of this study. The proponents of this theory were led by Milton Friedman (1963) of the Chicago school. The monetarist shares the view that only money matters. They laid emphasis on the role of money in explaining short-term changes in national income as against Keynesians who neglected the role of money. The monetarist adopted Irving Fisher's equation of exchange to explain their theory. Friedman (1963) laid emphasis on the supply of money as the key factor affecting the well-being of the economy and agreed with the need for an effective monetary policy to stabilize the economy. They further suggested that in order to promote steady growth rate, the money supply

should grow at a fixed rate rather than being regulated and controlled by the monetary authorities. The monetarists acknowledge the fact that the economy may not always be operating at full employment level of real GDP, that in the short run expansionary monetary policies may increase the level of real GDP by increasing aggregate demand but in the long run it does not affect the level of real GDP but leads to inflation. Monetarist also believe that recessions and depressions are the outcomes of intense contraction of money and credit and that booms and inflation are caused by increases in the supply of money. They further belief that changes in national income are caused entirely by changes in the supply of money.

The review of relevant studies on the links between monetary policy and economic growth is presented in this section. While examining monetary policy in Japan's economic growth between 1945 and 1959, Hugn (1959) found out that monetary restraints on capital formation improve the balance of payments in several ways. Soyoung (1999) carries out a research on the title, do monetary policy shocks matter in the G-7 countries, using common identifying assumptions about monetary policy across countries during the post-war period. Using VAR model, the effect of monetary policy shocks are examined, and the study found that monetary policy shocks have significant effects on output in the short run. However, the contributions of monetary policy shocks to output fluctuations is relatively small and monetary policy shocks are not the major sources of post-war G-7 output fluctuations.

Rafiq and Mallick (2008) examine the effects of monetary policy on output in Germany, France and Italy for the period 1981 – 2005. The study employs Vector Autoregressive technique and results show that monetary policy innovations are at their most potent only in Germany. It remains ambiguous as to whether a rise in interest rates collides with a fall in output. Starr (2005) considers Russia, Ukraine, Belarus and Kazakhstan when investigating the real effects of monetary policy for the period 1995 – 2003. Results show little evidence of real effects of monetary policy in the four core CIS countries with the notable exception that interest rates have a significant impact on output in Russia. In a broader scope, Dele (2007) examined the relationship between monetary policy and economic performance in Gambia, Ghana, Guinea, Nigeria and Sierra Leone for the period 1991 – 2004. The study employs the generalized least square method and their analysis reveal that monetary policy is a source of stagnation as it hurt real domestic output.

Using structural VAR technique, Bhuiyan (2008) investigate the effects of monetary policy shock in Canada for the period 1994 – 2007. Results show that transmission of the monetary policy shock to real output operates through both the interest rate and the exchange rate. Berumend and Dincer (2008) look at the effects of monetary policy on output in Turkey for the period 1986 – 2000. Using structural VAR, results show that a tight monetary policy has a

temporary effect on output. Amarasekera (2008) carried out a research on the impact of monetary policy on economic growth and inflation in Sri Lanka between 1978 and 2005. Using Vector Auto-regressive technique, the study analyze the effects of interest rate, money growth and the movement in nominal exchange rate on real GDP growth and inflation and the result show that none of the sub-samples since 1978 can be identified with a particular targeting regime.

Furthermore, Chuku (2009) investigates the effect of monetary policy innovations in Nigeria from 1986 – 2008. The study employs a structural VAR technique to estimate the effects of monetary policy shocks on output and prices. The study also conducts the analysis via three alternative policy instruments namely broad money (M_2), Minimum Rediscount Rate (MRR) and the Real Effective Exchange Rate (REER). Results emanating show that monetary policy innovations have both real and nominal effects on economic parameter depending on the policy used. Chimobi and Uche (2010) examine the relationship between money, inflation and output in Nigeria covering the period 1970 – 2005. Using Cointegration and Granger causality test analysis, results reveal that money supply Granger cause both output and inflation. M_2 have a strong causal effect on the real output as well as on prices. Akujuobi (2010) uses multiple regression technique on Nigerian data (986 – 2007) to study monetary policy and Nigeria's economic development. His study reveal that cash reserve ratio, treasury bill, minimum discount rate and liquidity rate have significant impact on the economic development of Nigeria while interest rate is not significant.

While investigating the impact of monetary policy on economy of the United Kingdom, Agbonahor (2015) applies the vector error correction model on data spanning from 1940 – 2012. The study reveals that a long run relationship exist among the monetary variables. Specifically, it finds that the inflationary rate and money supply are significant monetary policy instruments that drive growth in the United Kingdom. While investigating the connection between monetary policy presented by money supply, economic growth, balance of payment and inflation rate, Onyeiwu (2012) applies the ordinary least square (three multiple regression model) method. Using data covering the period 1981 – 2008, results show that money supply exerts a positive impact on economic growth and balance of payment but negative impact on inflation rate. Nwoko *et al.* (2016) examine how average price, labour force and money supply can influence economic growth in Nigeria for the period 1990 – 2011. Using multiple regression methodology, results reveal that average price and labour force have significant influence on economic growth while money supply is not significant.

Ageliki and Stephanos (2016) investigate the regional asymmetries in monetary policy transmission, the case of the Greek regions over the period 1980 to 2009. The study measures

the heterogeneous effects of monetary policy on regional and sectoral output of the 13 regions in Greece. By using an unrestricted vector autoregressive model and the impulse response analysis, the results show that an interest rate shock affects the economic activity across regions differently and that monetary policy is unlikely to have a uniform impact on the real economic activity across regions with different industrial structures. 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 realise the impact of monetary policy on economic growth in Nigeria, Anowor and Okorile (2016), used a 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.

Empirical literature on the impact of monetary policy management on economic growth is relatively few with most studies focusing on impact of monetary policy on economic growth all over the world, without actually focusing on the management of the instruments of monetary policy to achieve economic growth, which is one of the macroeconomic objectives. Researchers 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 deviates from the past studies by focusing on the impact of management of monetary policy instrument on economic growth during the eras of direct and indirect control. Thus, of all the study reviewed in this work, to the best of our knowledge, none of the studies considered the different policy regimes. This research study therefore carried out the study under direct and indirect policy regimes.

RESEARCH METHODOLOGY

Based on the monetarist theory of monetary policy briefly explained in the previous section and the empirical modelling of previous studies like Bernanke and Mihov (1998), Bullard (1999), Nogueira (2009), Onyeiwu (2012), Twinoburyo and Odhiambo (2017), Gil and Iglesias (2019) among others, the modified model for examining the relationship between monetary policy management and economic growth under the direct policy regime is specified as:

$$gdp = \alpha_0 + \alpha_1 lqr + \alpha_2 M_2 + \alpha_3 crr + \alpha_4 redis + \alpha_5 depr + \alpha_6 trebr + \alpha_7 \text{int}rat + \mu \quad (1)$$

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; α_0, α_{1-7} are parameters; and μ 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.

Concerning the empirical model under the indirect monetary era, the study adapts the monetarist theory of monetary policy and also modifies other existing studies (such as Twinoburyo and Odhiambo, 2017; Gil and Iglesias, 2019) to assess the extent to which monetary policy management causes economic growth during the era of indirect control which is stated as:

$$gdp = \beta_0 + \beta_1 M_2 + \beta_2 mpr + \beta_3 depr + \beta_4 lqr + \beta_5 crr + \beta_6 \text{int}rat + \beta_7 trebr + \nu \quad (2)$$

Where: *gdp* represent gross domestic product, M_2 represent broad money supply, *mpr* represents monetary policy rate, *depr* is deposit rate, *lqr* is liquidity ratio, *crr* is cash reserve ratio, *intrat* represents lending rate; *trebr* is treasury bill rate; β_0, β_{1-7} are parameters; and ν is error term. In addition, 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 for robustness check.

In accordance with the theoretical expectation, (Keynes IS - LM theory), increased money supply is expected to have positive impact on economic growth. According to IS – LM model, interest rate goes down with increased money supply, this also foster economic growth. Similarly, the coefficients of minimum rediscount rates and monetary policy rate are expected to be negative, implying that a lower rate will enhance real output growth. However, the expected sign of the deposit rate parameter is positive indicating that high saving rate will encourage more savings which would further stimulate additional investment. This will invariably lead to an increase in the level of real output growth. In regard to the coefficient of liquidity ratio, the study

presumes a positive value indicating that a high ratio of liquid assets to current liabilities will improve a country's output level. As for cash reserve ratio, a positive relationship is also presumed with economic growth. The relationships between the variables are expressed algebraically in the table below.

Table 1: A'priori Expectations

Dependent Variable	Independent Variables	Expected Sign
Output growth (gdp)	Liquidity Ratio (lqr)	$\frac{\partial \text{gdp}}{\partial \text{lqr}} > 0$; Positive
Output growth (gdp)	Broad Money Supply (M_2)	$\frac{\partial \text{gdp}}{\partial M2} > 0$; Positive
Output growth (gdp)	Cash reserve ratio (crr)	$\frac{\partial \text{gdp}}{\partial \text{crr}} > 0$; Positive
Output growth (gdp)	Rediscount Rates (redis)	$\frac{\partial \text{gdp}}{\partial \text{redis}} < 0$; Negative
Output growth (gdp)	Monetary policy rate (mpr)	$\frac{\partial \text{gdp}}{\partial \text{mpr}} < 0$; Negative
Output growth (gdp)	Deposit rate (depr)	$\frac{\partial \text{gdp}}{\partial \text{depr}} > 0$; Positive
Output growth (gdp)	Treasury bill rate (trebr)	$\frac{\partial \text{gdp}}{\partial \text{trebr}} < 0$; Positive
Output growth (gdp)	Interest Rate (intrat)	$\frac{\partial \text{gdp}}{\partial \text{intrat}} < 0$; Negative

This research paper employed an annual time series data spanning between 1960 and 2018. They were obtained from Central Bank of Nigeria (CBN) Statistical Bulletin (2019). The data period chosen (1960 -2018) was as a result of availability of relevant data and because of the change of a major policy in 1986 which ushered in Structural Adjustment Programme (SAP). With the introduction of SAP, the apex bank changed from the direct control instruments of managing money supply to indirect controls (market based instruments). The data periods captures both the era of direct controls and indirect controls.

Furthermore, this study used both the Vector Error Correction Model (VECM) and Autoregressive Distributed Lag (ARDL) approaches to analyse the relationship between the variables in equations based on the result of the unit root tests. When the unit root results of our variables were found to be stationary at first differences and a long-run relationship exists among the variables using the Johansen cointegration test, the appropriate test used was the VECM approach. However, the autoregressive distributed lag (ARDL) model was found to be more appropriate when the stationarity level of our indicators reported mixed stationarity at levels and first difference. These methods help to provide both the short-run and long-run estimates and also determine the direction between our variables. According to Rahmaddi and

Ichihashi (2011), its cointegrating analysis which is a property of long-run equilibrium provides information about the long-run relationship among the variables.

RESULTS AND DISCUSSION

The findings of this study are presented in two sub-sections. The first sub-section was presented to investigate the nexus between monetary policy management and economic growth during the era of direct control and the second was to estimate their relationship under the indirect monetary policy rule. Prior to the presentation of our findings, pre-estimation tests in terms of stationarity and cointegration (long-run relationship) tests are presented first to select the appropriate estimation approach.

Monetary Policy Management and Economic Growth under Direct Control Regime

The pre-estimation approaches used to estimate the stationary level of the variables are Augmented Dickey Fuller (ADF) and Phillips Perron (PP). They are employed to test the stationary level of the monetary policy management indicators and output growth to suggest the appropriate technique to estimate the parameter coefficients. The results of the unit root for the indicators are presented in Table 2. The tau-statistic results for intercept and trend model were used to find the statistically significant of the variables at 1%, 5% and 10% critical point at levels and first difference. Meanwhile, it should be noted that the lag length for ascertaining this stationarity level of our variables as well as unit-root test is automatic and optimally chosen by the Schwarz-Bayesian Information Criterion (SIC) while few were fixed.

Table 2: Conventional Unit Root Tests during the Era of Direct Monetary Control

Variables	Level		First Difference		*I*(d)
	ADF	PP	ADF	PP	
rgdp	-1.7017(1)[-3.6032]	-1.7437(2)[-3.5950]	-4.1428(1)[-3.6122]**	-5.9568(5)[-3.6032]***	*I*(1)
agric	-1.2813(1)[-3.6032]	-1.2794(2)[-3.5951]	-4.0289(1)[-3.6122]**	-5.5926(4)[-3.6032]***	*I*(1)
ind	-1.7463(1)[-3.6032]	-1.8396(2)[-3.5950]	-4.4531(1)[-3.6122]***	-5.5974(2)[-3.6032]***	*I*(1)
ser	-2.0263(1)[-3.6032]	-2.0833(1)[-3.5950]	-3.8959(1)[-3.6122]**	-5.4143(4)[-3.6032]***	*I*(1)
oil	-1.5829(1)[-3.6032]	-1.7736(2)[-3.5950]	-4.4747(1)[-3.6122]***	-6.0197(2)[-3.6032]***	*I*(1)
noil	-1.7948(1)[-3.6032]	-1.7492(2)[-3.5950]	-4.0348(1)[-3.6122]**	-5.2582(4)[-3.6032]***	*I*(1)
m_2	-2.9579(4)[-3.6329]	0.5280(0)[-3.5950]	-3.8970(1)[-3.56122]**	-3.7990(1)[-3.6032]**	*I*(1)
lqr	-2.5657(1)[-3.6032]	-1.8840(1)[-3.5950]	-3.5529(0)[-3.6032]*	-3.6353(1)[-3.6032]**	*I*(1)
crr	-0.9662(1)[-3.6032]	-1.6802(1)[-3.5950]	-5.1841(0)[-3.6032]***	-3.9113(1)[-3.6032]***	*I*(1)

redis	-1.1693(1)[-3.6032]	-1.0696(1)[-3.5950]	-7.3483(0)[-3.6032]***	-7.2679(1)[-3.6032]***	*I*(1)
depr	-2.1854(1)[-3.6032]	-2.3900(1)[-3.5950]	-4.5055(0)[-3.6032]***	-10.978(1)[-3.6032]***	*I*(1)
trebr	-0.6013(1)[-3.6032]	-1.2180(1)[-3.5950]	-5.6772(0)[-3.6032]***	-5.6600(1)[-3.6032]***	*I*(1)
intrat	-1.5230(1)[-3.6032]	-2.176(1)[-3.5950]	-8.1512(0)[-3.6032]***	-8.1870(0)[-3.6032]	*I*(1)

Table 2…

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 (%); redis - Minimum rediscount rate (%); depr - Deposit rate (%); trebr - Treasury bill rate (%); and intrat - Interest rate (lending, %).

The two unit root tests under the conventional methods follow the same decision on stationary level of variables of interest at varying significant levels which were not stationary at levels at 5%. Thus, the unit root test results were found not to reject the null hypothesis “not stationary at level” at 5% McKinnon significance level. These variables that are not stationary at levels were further tested at first differences which were found significant 5% significance level. The results suggest that at first difference, the time series of the variables 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 3: Cointegration Test Results using Johansen Cointegration Test

Series	**Lags interval (in first differences):** 1 to 1					
	Trend assumption: *Linear deterministic trend*					
	Hypothesized No. of CE(s)	**Eigen value**	**Trace Statistic**	**0.05 Critical Value**	**Max-Eigen Statistic**	**0.05 Critical Value**
rgdp, M2, lqr, crr, redis, depr, trebr, intrat	r = 0	0.999	442.954***	159.530	219.637***	52.363
	r ≤ 1	0.968	223.318***	125.615	86.440***	46.231
	r ≤ 2	0.908	136.877***	95.754	59.519***	40.078
	r ≤ 3	0.792	77.358**	69.819	39.274**	33.877
	r ≤ 4	0.578	38.084	47.856	21.576	27.584
	r ≤ 5	0.333	16.509	29.797	10.122	21.132
agric, M2, lqr, crr, redis, depr, trebr, intrat	r = 0	0.999	549.140***	159.530	321.872***	52.363
	r ≤ 1	0.971	227.268***	125.615	88.636***	46.231
	r ≤ 2	0.915	138.633***	95.754	61.497***	40.078
	r ≤ 3	0.795	77.136**	69.819	39.649**	33.877
	r ≤ 4	0.576	37.486	47.856	21.468	27.584
	r ≤ 5	0.316	16.019	29.797	9.508	21.132

Table 3…

ind, M2, lqr, crr, redis, depr, trebr, intrat	r = 0	0.999	462.646***	159.530	247.126***	52.363
	r ≤ 1	0.958	215.520***	125.615	79.045***	46.231
	r ≤ 2	0.900	136.474***	95.754	57.532***	40.078
	r ≤ 3	0.792	78.943**	69.819	39.213**	33.877
	r ≤ 4	0.572	39.729	47.856	21.206	27.584
	r ≤ 5	0.360	18.523	29.797	11.140	21.132
ser, M2, lqr, crr, redis, depr, trebr, intrat	r = 0	0.999	438.264***	159.530	213.144***	52.363
	r ≤ 1	0.970	225.120***	125.615	87.594***	46.231
	r ≤ 2	0.912	137.526***	95.754	60.741***	40.078
	r ≤ 3	0.790	76.785**	69.819	38.962**	33.877
	r ≤ 4	0.587	37.823	47.856	22.125	27.584
	r ≤ 5	0.321	15.698	29.797	9.687	21.132
oil, M2, lqr, crr, redis, depr, trebr, intrat	r = 0	0.999	441.985***	159.530	238.140***	52.363
	r ≤ 1	0.940	203.845***	125.615	70.519***	46.231
	r ≤ 2	0.889	133.326***	95.754	54.999***	40.078
	r ≤ 3	0.789	78.327***	69.819	38.890**	33.877
	r ≤ 4	0.571	39.437	47.856	21.161	27.584
	r ≤ 5	0.341	18.277	29.797	10.413	21.132
noil, M2, lqr, crr, redis, depr, trebr, intrat	r = 0	0.999	418.941***	159.530	184.404***	52.363
	r ≤ 1	0.978	234.537***	125.615	95.542***	46.231
	r ≤ 2	0.914	138.995***	95.754	61.415***	40.078
	r ≤ 3	0.793	77.580**	69.819	39.426***	33.877
	r ≤ 4	0.581	38.154	47.856	21.734	27.584
	r ≤ 5	0.328	16.420	29.797	9.932	21.132

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

Afterward, the study conducted the cointegration test using the Johansen cointegration test. The optimal lag length employed in estimating the Johansen co-integration model was determined using the vector autoregressive (VAR) lag order selection criteria test and lag exclusion Wald tests, whose results were presented in the appendix. The result presented in the appendix revealed that lag length 1 is the most appropriate for the models using Schwarz Information Criterion (SIC), optimal and significant lag order to estimate the VAR model system to estimate the Johansen co-integration model. The cointegration results are presented in Table 3. The co-integrating equation reported for the models indicated that at McKinnon-Haug-Michelis 5%

significance level, the Trace and Max Eigenvalue tests suggest that the incorporated time series variables are co-integrated at the fourth hypothesized co-integration equations order i.e. r = 3 for linear deterministic trend model with intercept. These indicate that the alternative hypotheses "r=3" were not rejected for Trace statistics and Max-Eigen values. This suggests that there exist four cointegrating vector equations among the considered time series in their respective stated order. The economic implication is that there is long-run relationship between monetary policy management indices and real sectoral and overall output growth in Nigeria. More so, the result of both unit root test and Johansen cointegration test suggest that the vector error correction model is the most appropriate estimation technique to be used for the parameter estimates.

The vector error correction (VEC) model results of the parameter estimates both in short-run and long-run are presented in Tables 4 and 5 respectively. For robustness check of our results, the tables also report the parameter estimates of monetary policy management on the output growth of Nigerian industries like agriculture, manufacturing, service, oil and non-oil during the era of direct control.

Table 4: Short-run estimates of monetary policy and output growth under the direct rules

Variables	**Dependent Variable:** Overall and sectoral output growth					
	Real GDP	**Agriculture**	**Industry**	**Service**	**Oil**	**Non-oil**
Δ*(y(-1))*	0.6314**	0.8290**	0.2568***	-0.0137	0.1399	0.0238
	(0.2934)	(0.3436)	(0.0368)	(0.3155)	(0.3325)	(0.3214)
Δ*(M2(-1))*	-1.1851	-2.8731	-2.4574	-4.6265**	-3.8117*	-3.6614
	(1.4548)	(2.0970)	(1.6165)	(2.1201)	(2.0851)	(1.9522)
Δ*(**l**qr(-1))*	0.0233**	-0.0432***	-0.0462***	-0.0568***	-0.0656***	-0.0481***
	(0.0117)	(0.0167)	(0.0142)	(0.0187)	(0.0193)	(0.0169)
Δ*(crr(-1))*	0.0477	0.0753	0.0229	0.0772	0.0369	0.0742
	(0.0325)	(0.0476)	(0.0484)	(0.0612)	(0.0646)	(0.0512)
Δ*(**r**edis(-1))*	0.3811***	0.3644***	0.6478***	0.1922*	0.6257***	-0.0181
	(0.0571)	(0.0846)	(0.0675)	(0.1028)	(0.0796)	(0.9153)
Δ*(**d**epr(-1))*	0.3422	0.4749	0.1022	0.2711	0.0676	0.3323
	(0.2387)	(0.3711)	(0.3904)	(0.5204)	(0.4526)	(0.4387)
Δ*(**t**rebr(-1))*	0.3321***	0.3439***	0.4343***	0.3611**	-0.4359	0.2425***
	(0.0557)	(0.0826)	(0.0667)	(0.1485)	(0.8102)	(0.8814)
Δ*(**i**ntrat(-1))*	-0.2269*	-0.3332*	-0.1149*	-0.1658*	-0.2499	-0.2754
	(0.1245)	(0.1865)	(0.0603)	(0.0993)	(0.1965)	(0.2011)
ECT(-1)	-0.1642***	-0.1030***	-0.1591***	-0.2788***	-0.6711*	-0.2026*
	(0.0164)	(0.0167)	(0.0761)	(0.1378)	(0.3861)	(0.1204)

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

In Table 4, the lag length on all variables as the model was set at one because the number of observation is limited while putting the augmenting the variables into one model and this was found to be sufficient based on the results of the automatic selection of Schwarz Information Criterion. In the short-run, it shows that the lag one of real GDP have positive and significant relationship with real GDP. Thus, it follows the a'priori expectation. This means that the level of economic activities in the previous periods contribute to the overall output growth in the current short period. Among all the monetary policy variables, liquidity ratio, rediscount rate and Treasury bill rate positively and significantly influence economic growth in the short-run. Meanwhile, money supply, cash reserve ratio and deposit ratio also have positive coefficient but were not significant. More so, low lending interest rate drives growth but was found significant at 10% when all the variables were augmented into the same model. Specifically, money supply has a positive impact on the level of economic growth in the short-run. It thus aligns with the theoretical expectation but was not statistically significant at 5%. This shows that the supply of money into the Nigerian economy does not drive the economic activities in the short-run during the period of direct monetary rules. Similarly, cash reserve ratio and deposit ratio have positive coefficients but they do not drive the real output growth positively during these periods. However, in regards to liquidity ratio, rediscount rate and Treasury bill rate, they have direct relationship with the economic growth. Consequently, they conform with a'priori expectations and are statistically significant at the conventional level. Meanwhile, interest rate has an indirect effect on the overall economic growth of the Nigerian economy which confirms with theoretical expectation and also found statistically significant at 10% significance level. The error correction term (ECT) that measures the speed or degree of adjustment is reported in the short-run estimation results in Table 4. It is the rate of adjustment at which the dependent variable changes due to changes in the independent variables. The short run analysis shows the dynamic pattern in the model and to ensure that dynamics of the model have not been constrained by inappropriate lag length specification. The coefficient of the ECT is found to be negative and statistically significant at the conventional level for the models in columns. For the augmented model, the ECT value (-0.1642) implies that the model corrects its short-run disequilibrium by 16.42% speed of adjustment in order to return to the long run equilibrium.

For robustness purpose, the short-run estimates of the impact of monetary policy management on real GDP components like agriculture, industry, service, oil and non-oil sectors were also reported in Table 4. The short-run estimates show that only the lag one of agriculture and industry positively and significantly influenced their current level of activities. The coefficients of lag one of oil and non-oil were also positive but not significant, while the

parameter of lag one of service was negative and insignificant. The parameters of liquidity ratio were negative and significant, implying that they negatively and significantly influence agriculture, industrial, service, oil and non-oil sector growth. Similarly, the coefficients of money supply and lending rate were negative but only found significant for service and oil sectors and industry and service sectors respectively. Meanwhile, the parameters of rediscount rate and Treasury bill rate were positive for all the sectors considered.

Table 5: Long-run Estimates of Monetary Policy and Output Growth under the Direct Rules

Variables	**Dependent Variable:** Overall and Sectoral Output Growth					
	Rea GDP	**Agriculture**	**Industry**	**Service**	**Oil**	**Non-oil**
Money supply (M2)	-1.4684***	-1.7590***	-0.4573***	3.1776***	-0.4067***	1.8022***
	(0.0873)	(0.1381)	(0.0385)	(0.1152)	(0.0332)	(0.0776)
Liquidity ratio (lqr)	0.0060**	0.0093***	0.0069***	0.0269***	0.0033***	0.1843***
	(0.0026)	(0.0035)	(0.0011)	(0.0026)	(0.0009)	(0.0190)
Cash reserve ratio (crr)	0.1426***	0.2469***	0.1171***	0.5274***	0.1551***	-2.8706***
	(0.0112)	(0.0161)	(0.0047)	(0.0124)	(0.0039)	(0.0871)
Rediscount rate (redis)	-4.4960***	-6.8394***	1.2390***	10.467***	1.5751***	6.1985***
	(0.3084)	(0.4551)	(0.1253)	(0.3268)	(0.1022)	(0.2388)
Deposit rate (depr)	1.7580***	3.2547***	-0.7177***	-6.9255***	-0.8706***	-3.5655***
	(0.1901)	(0.3025)	(0.0800)	(0.2219)	(0.0658)	(0.1575)
Treasury bill (trebr)	3.4896***	4.9241***	-1.4561***	-7.4847***	-1.7310***	-4.7192***
	(0.2731)	(0.3845)	(0.1115)	(0.2814)	(0.0930)	(0.2047)
Interest rate(intrat)	-0.8293***	-1.3597***	0.2623***	1.9917***	0.1075***	1.2704***
	(0.0734)	(0.1066)	(0.0300)	(0.0755)	(0.0252)	(0.0546)
Constant	8.4010***	14.594***	2.9815***	-3.5847***	1.2706***	1.0252**
	(0.3112)	(0.4643)	(0.3252)	(0.4731)	(0.4111)	(0.4380)
Adjusted R^2	0.5351	0.4201	0.4099	0.4543	0.5379	0.5251
F-Stat	10.902***	9.0593***	9.3567***	9.1660***	10.462***	11.074***
Serial Correlation	(0.7429)	(0.5525)	(0.3489)	(0.2680)	(0.2700)	(0.6368)
Normality Test	(0.3659)	(0.3059)	(0.2696)	(0.1607)	(0.1949)	(0.1961)
Heteroskedasticity test	(0.2569)	(0.2930)	(0.2562)	(0.2813)	(0.2689)	(0.2475)

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

Likewise, the coefficients of cash reserve ratio and deposit rate were positive but insignificant at 5%. The coefficients of the ECT were found to be negative and statistically significant at the conventional level for all the sectoral models. The ECT values implied that the

model corrects its short-run disequilibrium by 10.3%, 15.91%, 27.88%, 67.11% and 20.26% speed of adjustment in order to return to the long-run equilibrium of agricultural, industrial, service, oil and non-oil sector output respectively.

As for the long-run estimates, the results are presented in Table 5. The parameter of money supply has a negative coefficient and also statistically significant at 5% level. It thus means that money supply had an inverse influence on the real GDP in the long-run during the direct rule system. Similarly, the coefficients of rediscount rate and lending interest rate are negative and significant at the conventional level. It however means that low rediscount rate and lending rate are responsible for increasing real income in Nigeria during the regime. In magnitude terms, a 10% increase in broad money supply, rediscount rate and lending rate reduce real GDP by 14.7%, 44.96% and 8.29% correspondingly. However, the coefficient of liquidity ratio was reportedly positive and only significant at 5% when augmented with other monetary policy variables. Likewise, the long-run coefficient of cash reserve ratio was positively signed and statistically significant at 5% before and after being augmented with other monetary policy indices. Equally, the parameter estimate of deposit rate reported that it has a direct impact on real income growth during the direct policy rules. Meanwhile, the positive coefficients of Treasury bill rate were found significant at 10% and 5% before and after its augmentation with other monetary variables respectively. In regards to their coefficient values, it was reported that a 10% changes in liquidity ratio, cash reserve ratio, deposit rate and Treasury bill rate will cause an increase in real GDP growth by 0.06%, 1.43%, 17.6% and 34.9% respectively. For robustness checks, the long-run estimates in Table 5 revealed that liquidity ratio have positive and significant impact on the output of all sectors. For cash reserve ratio, it has direct effect on the sectors except for non-oil sector. The sectoral output of agriculture was negatively influenced by rediscount and lending rate whereas the outputs of industrial, service, oil and non-oil sectors were influenced positively by rediscount and lending rate. More so, deposit rate and Treasury bill rate have direct effects on agriculture output while their effects on other sectors were indirect. All the parameters were found to have significant impact on the sectors' output at 5%. In summary, the monetary policy variables under the era of direct control significantly influence the sectors' and overall output growth in the long-run compared to the short-run.

Furthermore, the coefficient of determination (measured by the Adjusted-R^2) is high for the models. As for real GDP growth model, the adjusted R^2 is 53.51% indicating that about 53.51% of the total variations in real output growth was explained by the monetary variables in the model. Concerning the sectoral growth, about 42.01%, 40.99%, 45.43%, 53.79% and 52.51% of the total variations in the real output 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 are statistically significant at 5% level of significance showing that models are well specified and statistically significant. As for the diagnostic tests, the estimated VECM models are tested for serial correlation, normality and heteroskedasticity. The results from these tests are also shown in Table 5. The results revealed that the models passed the serial correlation test indicating that the error terms are not correlated up to order 3. 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.

Monetary Policy Management and Economic Growth under Indirect Control Regime

Prior to the estimation of parameters of monetary policy variables under the indirect 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 toot test, Augmented Dickey Fuller (ADF) and Phillips Perron (PP) were employed to establish the stationary level of the economic variables. Table 6 shows the results of the unit root for the economic indicators. The tau-statistic results for intercept and trend model were used to find the statistically significant of the variables at 1%, 5% and 10% critical point at levels and first difference. More so, the lag length for ascertaining the stationarity level of our variables is automatically and optimally was chosen by the Schwarz-Bayesian Information Criterion (SIC) whereas few were fixed. The results of the two unit root tests under the conventional methods follow approximately the same decision on stationary level of variables of interest at varying significant levels which were stationary at levels for monetary policy rate, deposit rate and lending rate at 5%. The unit root test results were found to reject the null hypothesis “not stationary at level” at 5% McKinnon significance level. However, the unit root test of other variables were found not to reject the null hypothesis “not stationary at level” at 5% McKinnon significance level. These variables were further tested at first differences which were found significant at 5% level.

The results suggest that at first difference, the time series of the variables (real GDP, agriculture, industry, service, oil, non-oil, money supply, liquidity rate, cash reserve ratio, 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 6: Conventional unit root tests during the era of indirect monetary control

Variables	Level		First Difference		
	ADF	PP	ADF	PP	*I*(d)
rgdp	-1.8217(1)[-3.5639]	-1.7030(3)[-3.5578]	-4.3580(0)[-3.5629]***	-4.3344(3)[-3.5629]***	*I*(1)
agric	-2.0183(0)[-3. 5578]	-2.0183(0)[-3.5578]	-5.2172(0)[-3.5629]***	-5.2181(1)[-3.5629]***	*I*(1)
ind	-2.1560(0)[-3.5578]	-2.1560(0)[-3.5578]	-5.1897(0)[-3.5629]***	-5.1904(1)[-3.5629]***	*I*(1)
ser	-1.8169(1)[-3.5629]	-1.6060(3)[-3.5578]	-4.2948(6)[-3.5950]**	-3.7513(0)[-3.5629]**	*I*(1)
oil	-0.8915(0)[-3.5578]	-0.8827(1)[-3.5578]	-5.6917(0)[-3.5629]***	-5.7186(2)[-3.5629]***	*I*(1)
noil	-1.8046(1)[-3.5629]	-1.5967(3)[-3.5578]	-4.4914(0)[-3.5629]***	-4.4914(0)[-3.5629]***	*I*(1)
m_2	-1.1682(0)[-3.5578]	-1.1822(1)[-3.5578]	-4.9838(0)[-3.5629]***	-4.9941(2)[-3.5629]***	*I*(1)
lqr	-3.2411(0)[-3.5578]*	-3.2448(3)[-3.5578]*	-6.0685(0)[-3.5629]***	-6.0787(1)[-3.5629]***	*I*(1)
crr	-5.1317(4)[-3.5806]**	-1.1777(1)[-3.5578]	-	-5.5609(4)[-3.5629]***	*I*(1)
mpr	-3.7470(0)[-3.5639]**	-3.6807(2)[-3.5578]**	-	-	*I*(0)
depr	-4.1303(0)[-3.5478]**	-4.1308(3)[-3.5578]**	-	-	*I*(0)
trebr	-3.5222(0)[-3.5578]*	-3.5222(0)[-3.5578]*	-6.5580(0)[-3.5629]***	-6.5936(1)[-3.5629]***	*I*(1)
intrat	-4.5123(0)[-3.5578]***	-4.5172(1)[-3.5578]***	-	-	*I*(0)

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, %).

Subsequently, the study conducted the cointegration test using the autoregressive distributed lag (ARDL) approach which is found appropriate for this section. The estimation approach is employed because it is suitable for variables at different order of integration. The F-statistics estimates for testing the existence of long-run relationship between the monetary policy and sectors' and overall outputs are presented in Table 7.

The estimated F-statistics of the normalized equations were found greater than the lower and upper critical bound at 1% significance level. It 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 sectors' and overall GDP growth in Nigeria. The models have equilibrium condition that keeps the variables together in the long-run.

Table 7: Cointegration test results using ARDL bound test

Dependent variable: *y*	Functions	F-statistics
Model I ARDL (2, 2, 2, 0, 1, 2, 2, 2)	$F_{rgdp}(rgdp \mid m2, lqr, crr, redis, depr, trebr, \text{int}\, rat)$	15.561***
Model II ARDL (2, 1, 2, 0, 0, 2, 0, 0)	$F_{agric}(agric \mid m2, lqr, crr, redis, depr, trebr, \text{int}\, rat)$	3.9472***
Model III ARDL (2, 2, 2, 1, 1, 2, 2, 1)	$F_{ind}(ind \mid m2, lqr, crr, redis, depr, trebr, \text{int}\, rat)$	4.2219***
Model IV ARDL (2, 2, 2, 1, 1, 0, 0, 0)	$F_{ser}(ser \mid m2, lqr, crr, redis, depr, trebr, \text{int}\, rat)$	8.1776***
Model V ARDL (2, 2, 2, 0, 0, 2, 2, 2)	$F_{oil}(oil \mid m2, lqr, crr, redis, depr, trebr, \text{int}\, rat)$	3.4131**
Model VI ARDL (2, 1, 2, 1, 0, 2, 0, 0)	$F_{noil}(noil \mid m2, lqr, crr, redis, depr, trebr, \text{int}\, rat)$	4.2177***

	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

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, %).

As the above submission indicated that there exists a long relationship among the variables, the short-run and long-run estimates using the ARDL method are presented in Tables 8 and 9 respectively. It thus answers the null hypothesis that monetary policy management does not have significant impact on the economic growth during the era of indirect control. The error correction mechanism that measure the speed or degree of adjustment are reported in the short-run estimation results in Table 8. It is 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 two to ensure sufficient degree of the freedom based on automatic selection of Akaike Information Criterion (AIC). The coefficient of the error correction term (ECT) were 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 4.23%, 22.77%, 61.45%, 5.43%, 53.46%, and 8.48% speed of adjustment in order to return to the long run equilibrium.

Table 8: Short-run estimates of monetary policy and output growth under indirect rules

Variables	**Dependent Variable:** Real GDP & Sectors' Output (*y*)					
	Real GDP	**Agriculture**	**Industry**	**Service**	**Oil**	**Non-oil**
Δ***(y(-1))***	-0.4703***	-0.2814*	-0.2096**	-0.6528***	-0.3004**	-0.4011**
	(0.0832)	(0.1585)	(0.1063)	(0.1416)	(0.1268)	(0.1626)
Δ***(M_2(-1))***	-0.0881***	-0.1205	-0.4209***	-0.0964***	-0.5452***	-0.0894**
	(0.0217)	(0.0769)	(0.0947)	(0.0312)	(0.1337)	(0.0347)
Δ***(lqr(-1))***	-0.0038***	-0.0047***	-0.0050***	-0.0032***	-0.0055***	-0.0037***
	(0.0003)	(0.0014)	(0.0010)	(0.0005)	(0.0013)	(0.0007)
Δ***(crr(-1))***			-0.0091***	-0.0045***		-0.0080***
			(0.0030)	(0.0012)		(0.0020)
Δ***(mpr(-1))***	0.0165***		0.0190***	0.0078***		
	(0.0017)		(0.0057)	(0.0010)		
Δ***(depr(-1))***	0.0017**	0.0090***	-0.0144***		-0.0117**	0.0040***
	(0.0008)	(0.0032)	(0.0037)		(0.0051)	(0.0013)
Δ***(trebr(-1))***	0.0067***		0.0131***		0.0274***	
	(0.0010		(0.0033)		(0.0056)	
Δ***(intrat(-1))***	-0.0041***		-0.0057**		-0.0176***	
	(0.0007)		(0.0029)		(0.0048)	
ECT(-1)	-0.0423***	-0.2277***	-0.6145***	-0.0543***	-0.5346***	-0.0848***
	(0.0026)	(0.0444)	(0.0743)	(0.0051)	(0.0734)	(0.0111)

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

Results of the parameter estimates in the short-run revealed that the lag one of real GDP and outputs of the sectors negatively influence their current level of activities. The coefficients of money supply were negative for all the models of real GDP and sectors' output except for agriculture which was not significant. Likewise, the parameters of liquidity ratio were negative, implying they indirectly and significantly influence real GDP and sectors' output. Similarly, cash reserve ratio has adverse and significant impact on the output of manufacturing, service and non-oil sectors. Equally, low lending rate enhances real GDP growth as well as for growth in the manufacturing and oil sectors. On the contrary, high Treasury bill rate influenced the real GDP growth and the outputs of manufacturing and oil industries. More so, monetary policy rate influenced real GDP, manufacturing and service outputs positively. For deposit rate, it has positive impact on real GDP, agriculture and non-oil output whereas negative effect on manufacturing and oil sector.

As for the long-run estimates presented in Table 9, the coefficients of money supply were positive for the models but only influenced the output of agriculture, manufacturing, and oil sectors significantly. Similarly, liquidity ratio positively and significantly influenced real GDP growth and

the outputs of the considered sectors except for the agricultural industry. Also, the parameters of monetary policy rate were positive all through but only influenced significantly the real GDP and the outputs of agriculture and service sectors. In contrast, cash reserve ratio adversely and significantly influenced real GDP and the sectors' outputs. The table further shows that deposit rate has indirect and significant impact on non-oil output whereas the service sector's output was negatively influenced by Treasury bill rate. Lending rate was found to have positive impact on the outputs of service and oil sectors while negative for manufacturing sector. In magnitude, 100% changes in money supply, liquidity ratio, cash reserve ratio, monetary policy rate, deposit rate, Treasury bill rate and lending rate cause changes in real GDP by 0.29%, 0.57%, -0.94%, 0.78%, 0.02%, -0.55% and 0.39% respectively. Summarily, the findings revealed that monetary policy management influences the Nigerian economic growth in the short-run than in the long-run.

Table 9: Long-run estimates of monetary policy and output growth under indirect rules

	Dependent Variable: Real GDP & Sectors' Output (*y*)					
	Real GDP	**Agriculture**	**Industry**	**Service**	**Oil**	**Non-oil**
Money supply (M2)	0.0029	0.0799*	0.0961**	0.0130	0.0471*	0.0213
	(0.0154)	(0.0478)	(0.0394)	(0.0127)	(0.0259)	(0.0194)
Liquidity ratio (lqr)	0.0057***	0.0025	0.0074**	0.0043***	0.0085*	0.0041**
	(0.0009)	(0.0031)	(0.0036)	(0.0010)	(0.0045)	(0.0018)
Cash reserve ratio (crr)	-0.0094***	-0.0125**	-0.0174***	-0.0134***	-0.0205**	-0.0127***
	(0.0015)	(0.0059)	(0.0062)	(0.0026)	(0.0079)	(0.0034)
Monetary policy rate (mpr)	0.0078*	0.0212*	0.0330	0.0116**	0.0285	0.0133
	(0.0045)	(0.0121)	(0.0236)	(0.0058)	(0.0177)	(0.0083)
Deposit rate (depr)	0.0002	-0.0131	0.0117	-0.0036	0.0036	-0.0078*
	(0.0029)	(0.0091)	(0.0099)	(0.0028)	(0.0156)	(0.0042)
Treasury bill (trebr)	-0.0055	0.0137	0.0012	-0.0065**	-0.0273	-0.0044
	(0.0042)	(0.0101)	(0.0117)	(0.0028)	(0.0193)	(0.0045)
Interest rate(intrat)	0.0039	-0.0110	-0.0183*	0.0059**	0.0222**	-0.0039
	(0.0044)	(0.0103)	(0.0103)	(0.0024)	(0.0113)	(0.0043)
Constant	-0.9250	2.4944	8.2793**	-1.1611	7.2090**	-0.3224
	(0.8648)	(1.8187)	(3.4911)	(0.6138)	(2.8626)	(0.9682)
Adjusted R^2	0.7554	0.4737	0.7245	0.8692	0.6793	0.6743
F-Stat	374.25***	158.43***	36.321***	91.565***	58.231***	75.024***
Serial Correlation	(0.1709)	(0.1584)	(0.0637)	(0.0823)	(0.1254)	(0.1831)
Normality Test	(0.3163)	(0.0000)	(0.0010)	(0.0191)	(0.1566)	(0.0000)
Heteroskedasticity test	(0.9635)	(0.0840)	(0.7539)	(0.1106)	(0.5100)	(0.7262)

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

In addition, the coefficient of determination (measured by the Adjusted-R^2) is high for the models. The coefficients imply that about 75.54%, 47.37%, 72.45%, 86.92%, 67.93% and 67.43% 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 9. The results revealed that the models passed the serial correlation test indicating that the error terms are not correlated up to order 3. As well, 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

This study provides answers to the effect of monetary policy management on economic growth during the eras of direct and indirect control. For the direct regime, the result shows that money supply statistically influences economic growth in the long-run rather than in the short-run. It implies that the supply of money into the economy does not necessarily improve the level of economic activities in Nigeria in the short-run. Likewise, cash reserve ratio has direct and significant impact on output growth in long-run and not in the short-run. This means that the higher the amount of reserve in cash/deposits required by the central bank, the better the level of economic activities of the Nigerian in the long-run. Similarly, high deposit rate influences economic growth in the long-run and not in the short-run. However, liquidity ratio positively influenced output growth in both short- and long- run. Another monetary variable found driving the Nigerian economic growth both in short- and long-run is the Treasury bill rate. It was also found that low rediscount rate and lending rate enhance the Nigerian output growth for both periods. The summary of findings in regards to the ranking of how monetary policy variables influenced economic growth during the era of direct control in terms of significance, magnitude and a'priori expectation is presented in Table 10.

Table 10: Ranking of monetary policy variables during the era of direct control

	1st	2nd	3rd	4th	5th	6th	7th
				Short-run			
Real GDP	ϕRediscount rate	Treasury bill rate	Interest rate	Liquidity ratio	Money supply†	Deposit rate†	Cash reserve ratio†
Agriculture	ϕRediscount rate	Treasury bill rate	Interest rate	ϕLiquidity ratio	Money supply†	Deposit rate†	Cash reserve ratio†
Manufacturing	ϕRediscount rate	Treasury bill rate	Interest rate	ϕLiquidity ratio	Money supply†	Deposit rate†	Cash reserve ratio†
Service	ϕMoney supply	Treasury bill rate	ϕRediscount rate	Interest rate	ϕLiquidity ratio	Deposit rate†	Cash reserve ratio†
Oil	ϕMoney supply	ϕRediscount rate	ϕLiquidity ratio	ϕTreasury bill rate†	Interest rate†	Deposit rate†	Cash reserve ratio†
Non-oil	Treasury bill rate	ϕLiquidity ratio	Money supply†	Deposit rate†	Interest rate†	Cash reserve ratio†	Rediscount rate†
				Long-run			
Real GDP	Rediscount rate	Treasury bill rate	Deposit rate	ϕMoney supply	Interest rate	Cash reserve ratio	Liquidity ratio
Agriculture	Rediscount rate	Treasury bill rate	Deposit rate	ϕMoney supply	Interest rate	Cash reserve ratio	Liquidity ratio
Manufacturing	ϕTreasury bill rate	ϕRediscount rate	ϕDeposit rate	ϕInterest rate	ϕMoney supply	Cash reserve ratio	Liquidity ratio
Service	ϕRediscount rate	ϕTreasury bill rate	ϕDeposit rate	Money supply	ϕInterest rate	Cash reserve ratio	Liquidity ratio
Oil	ϕTreasury bill rate	ϕRediscount rate	ϕDeposit rate	ϕMoney supply	Cash reserve ratio	ϕInterest rate	Liquidity ratio
Non-oil	ϕRediscount rate	ϕTreasury bill rate	ϕDeposit rate	ϕCash reserve ratio	Money supply	ϕInterest rate	Liquidity ratio

Note: ϕ implies that the variable did not conform with a'priori expectation; †denotes that the variable is not found significant at 1%, 5% and 10%.

The table confirms that the monetary policy management during the era of direct control geared towards the long-run growth of the Nigerian economy. From Table 10, one can observe that rediscount rate, Treasury bill rate and interest rate were the most prominent monetary policy variables determining the real level of economic activities in Nigeria in both periods. It should also be noted that their impact on the real GDP exhibit similar influence on the agriculture and manufacturing sectors. This conforms with the findings of Nwosa and Saibu (2012) which were conducted for the Nigerian economy within the period 1986:Q1:2009:Q4. Also, the oil sector is adversely influenced by the monetary policy management during the era of direct control as most of the variables were found with wrong a'priori expectation and significance level. The least monetary variables influencing output growth in short-run are deposit rate and cash reserve ratio whereas in the long-run are cash reserve ratio and liquidity ratio.

Table 11: Ranking of monetary policy variables during the era of indirect control

	1st	2nd	3rd	4th	5th	6th	7th
				Short-run			
Real GDP	ϕMoney supply	ϕMonetary policy rate	Treasury bill rate	Interest rate	ϕLiquidity ratio	Deposit rate	-
Agriculture	Deposit rate	ϕLiquidity ratio	ϕMoney supply†	-	-	-	-
Manufacturing	ϕMoney supply	ϕMonetary policy rate	ϕDeposit rate	Treasury bill rate	ϕCash reserve ratio	Interest rate	ϕLiquidity ratio
Service	ϕMoney supply	ϕMonetary policy rate	ϕCash reserve ratio	ϕLiquidity ratio	-	-	-
Oil	ϕMoney supply	Treasury bill rate	Interest rate	ϕDeposit rate	ϕLiquidity ratio	-	-
Non-oil	ϕMoney supply	ϕCash reserve ratio	Deposit rate	ϕLiquidity ratio	-	-	-
				Long-run			
Real GDP	ϕCash reserve ratio	ϕMonetary policy rate	Liquidity ratio	Treasury bill rate†	Interest rate†	Money supply	Deposit rate
Agriculture	Money supply	ϕMonetary policy rate	ϕCash reserve ratio	Treasury bill rate†	ϕDeposit rate†	Interest rate†	Liquidity ratio†
Manufacturing	Money supply	Interest rate	ϕCash	Liquidity	ϕMonetary	Deposit	Treasury

Table 11…

			reserve ratio	ratio	policy rate†	rate†	bill rate†
Service	ϕCash reserve ratio	ϕMonetary policy rate	ϕTreasury bill rate	ϕInterest rate	Liquidity ratio	Money supply†	ϕDeposit rate†
Oil	Money supply	ϕInterest rate	ϕCash reserve ratio	Liquidity ratio	ϕMonetary policy rate†	ϕTreasury bill rate†	Deposit rate†
Non-oil	ϕCash reserve ratio	ϕDeposit rate	Liquidity ratio	Money supply†	ϕMonetary policy rate†	ϕTreasury bill rate†	Deposit rate†

Note: ϕ implies that the variable did not conform with a'priori expectation; †denotes that the variable is not found significant at 1%, 5% and 10%.

Concerning the indirect regime, a glance at the results clearly shows changes in policy direction from the era of direct control. This reflected in the choice of variables automatically selected in the empirical analysis using the ARDL being the most appropriate estimation approach. The outcome of the result revealed that monetary policy management during the era of indirect control favours short-run output growth which is not sustainable in the long-run. Specifically, Treasury bill rate positively drive real GDP, manufacturing and oil sector in the short-run but fails to drive them in the long-run. Likewise, deposit rate also drive real output, manufacturing and non-oil sector growth in the short-run but do not enhance them in the long-run. Also, monetary policy rate influences real output growth positively in the short-run and long-run. However, liquidity ratio was found to influence real GDP and the outputs of considered sectors negatively whereas positive in the long-run. A similar result is obtained for money supply. More so, the outcome is similar to the findings of cash reserve ratio but its long-run coefficients were negative and significant. Table 11 presents the summary of findings in regards to the ranking of how monetary policy variables influenced economic growth during the era of indirect control in terms of significance, magnitude and a'priori expectation accordingly.

The table shows that money supply was the most important determinant of real output growth in the short-run as well as for manufacturing, service, oil and non-oil sector but third for agriculture sector. However, in the long-run, money supply played important role in development of agriculture, manufacturing and oil sectors, it occupies the fourth position for non-oil sector, and sixth for real GDP and service sector. More so, monetary policy rate was the second most important determinant of real GDP for both periods. Deposit rate played the third most important determinant in the short-run whereas cash reserve ratio was the third most important monetary variable in the long-run. However, deposit rate is least most important variable in the long-run. The study therefore concludes 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.

CONCLUDING REMARKS

This research paper provides an empirical insight on how monetary policy management influence the Nigerian economic growth during the era of direct and indirect control within the period of 1960 and 2018. The results were evaluated using appropriate statistical methods i.e. vector error correction model and autoregressive distributed lag tests. The study concludes that monetary policy management during the era of direct control significantly influenced the Nigerian economic growth in the long-run than in the short-run. This invariably led to a change in the policy direction favouring the market-based mechanisms. During the period of the market-based policy direction, the findings show that monetary policy management favours short-run real output growth which does not sustain the Nigerian economic growth in the long-run. Specifically, the findings confirmed that rediscount rate, Treasury bill rate and interest rate were the most prominent monetary policy variables determining the real level of economic activities in Nigeria during the era of direct control. Also, the impact of these monetary variables on the real GDP exhibits similar influence on the agriculture and manufacturing sectors. In addition, the oil sector was adversely influenced by the monetary policy management during the era of direct control because most of the monetary variables were found with wrong a'priori signs which were found to be significant. The least monetary variables influencing output growth in short-run are deposit rate and cash reserve ratio whereas in the long-run are cash reserve ratio and liquidity ratio during the direct control era. In the era of indirect monetary policy control, money supply was the most important determinant of real output growth in the short-run as well as for manufacturing, service, oil and non-oil sector but third for agriculture sector. In the long-run, money supply played important role in the development of agriculture, manufacturing and oil sectors which was fourth for non-oil sector, and sixth for real GDP and service sector. Meanwhile, monetary policy rate was the second most important determinant of real GDP for both periods. Deposit rate played the third most important determinant of output growth in the

short-run whereas cash reserve ratio was the third most important monetary variable in the long-run. Nonetheless, deposit rate is least most important variable in the long-run.

On the policy front, the findings showed that the role of money cannot be overemphasized in the Nigerian economic growth process. It shows that money smoothen the rate at which economic activities in Nigeria grew over the years. It therefore means that there is need for the apex bank to control money supply in a way that it would not cause disequilibrium between the aggregate demand and supply or excess liquidity/shortage. Furthermore, monetary policy rate is also found to be among the second monetary policy variables determining the growth pattern of the Nigerian economy. Thus, the Monetary Policy Committee (MPC) should take caution and also coordinate its activities when setting the monetary policy rate so that the desired behavioural changes in the real sector will be achieved. In addition, cautious action is also needed by the monetary authority for other monetary policy parameters such as cash reserve ratio, treasury bill rate lending rate, liquidity ratio and deposit rate in order to achieved the desired level of output growth. The action should be limited to the absorptive capacity of the economy as it tends to promote overall output growth and revive industries that are currently far below installed capacity.

SCOPE FOR FUTURE STUDY

The study expects future studies to conduct a structural break analysis that would provide the opportunity of comparing the various strategies of monetary policy (like monetary targeting, price level targeting, inflation targeting and exchange rate targeting) before and after the policy changes in the economy. Adopting estimation techniques such as the non-linear autoregressive distributed lag model to examine the asymmetric effect of monetary policy management on economic growth would expand frontiers of knowledge. Other macroeconomic policy and its variables such as fiscal policy (tax and expenditure), trade policy (trade volume and terms of trade), wage policy, price policy can be included in the output growth model for future knowledge expansion.

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