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Impact of Monetary Policy Instruments (Mpr, Ms2, Lr And Tbr) on Headline Inflation (Hi) in Nigeria: 2007-2019

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Abstract

The study employed ARDL-ECM model to investigate the dynamic effects of monetary policy (liquidity ratio, treasury bill rate, monetary policy rate, and broad money supply) on headline inflation, in Nigeria for the period of 156 months; from January 2007 to December 2019. The data were sourced from CBN statistical bulletins and stationarity of the variables were carried out with ADF (Augmented Dickey Fuller) and PP (Phillips Perron). The long-run relationship among the variables was determined with ARDL bound test. The error correction term (ECM) shows that the headline inflation rate responds to the deviation from its long-run (steady) state, and it significantly adjusts to it. The error correction term is correctly signed, and it shows that about 77.3% of disequilibrium in the headline inflation rate due to one-time temporary shock is corrected within a month; this is a fast rate of adjustment. The findings revealed that the liquidity ratio had negative and insignificant immediate and long-run effects on the headline inflation and money supply rate had positive and significant immediate and long-run effects on the headline inflation rate in Nigeria. Also, monetary policy rate was found to reduce the headline inflation rate in the short-run only and treasury bill rate had positive and significant immediate and long-run effects on the headline inflation rate in Nigeria. Finally, the result shows that the money supply rate had the highest effect on the headline inflation rate in Nigeria. Therefore, it is recommended that MPR (Monetary Policy Rate) should be increased whenever there is inflationary pressure to make sure that the economy does not get overheated and the Central Bank can equally increase M2 (Broad Money Supply) to spur the economy when it is experiencing deflationary pressures.

Keywords: Monetary Policy instruments, headline inflation, Nigeria

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1. Introduction

Money supply was not controlled before the establishment of Central Banks anywhere in the world. The reality is that it was procyclical; further exacerbating the situation on ground. Central Banks were set up so that they can counteract business cycles. For this reason, monetary policy strategies were put in place to achieve policy objectives such as price stability alongside maximum employment; furthermore, monetary policy operational framework deals with intermediate targets such as short-run interest rate (Coeure 2016 cited in Grossman-Wirth, 2019). The Central Bank of Nigeria (CBN) since its establishment in 1959 has been playing its traditional role, which is the regulation of money in the economy, the achievement of inter alia price stability which is anchored on the use of monetary policy. The major objectives which have dominated CBN's monetary policy are based on inflation targeting (Usman and Adejare, 2014). Then, monetary policy according to Folawewo and Osinubi (2006) is a combination of measures employed by monetary authority to control supply and cost of money in economy with the purpose of achieving desirable level of economic activity.

The official goals usually include relatively stable prices and low unemployment. In adherence, the monetary policy guides the Central Bank's supply of money in order to achieve the objectives of price stability (or low inflation rate), with full employment, and growth in aggregate income (Nyambok, 2010). This is necessary because money is a medium of exchange and changes in its demand relative to supply, necessitating spending adjustments. In the 2000s, the government took initiatives for reforming the financial sector in Nigeria by increasing bank capitalization and allowing the CBN a semblance of independence. As part of financial sector reforms, CBN has limited direct intervention in the market and adopted a market-based monetary and credit management systems.

In addition to the monetary policy rate (MPR), CBN had a variety of instruments such as open market operations (OMOs) with the use of Treasury Bills rate (TBRs), changes in cash reserve requirements (CRR), and liquidity requirements (LR) also called liquidity ratio (LR) in Nigeria, to implement the targeted monetary and credit expansion. Monetary policy studies have gained considered importance in recent years. However, empirical research in Nigeria has focused primarily on the link between the impacts of monetary policy on economic growth in Nigeria.

The impact of monetary policy instruments on headline inflation in Nigeria has rarely been considered. This therefore, underscores the importance of exploring the extent to which monetary policy instruments (MPR, MS2, LR and TBR) impact headline inflation in Nigeria. Following the introduction, the rest of the paper is structured as follows. Section two deals with the literature review. Methodology is covered in section three. The estimated results and discussion are dealt with in section four and the paper is concluded in section five.

2. Literature Review and Theoretical Framework

Conceptual Review

Monetary Policy

Monetary policy can be seen as instruments used by monetary authorities to regulate and influence cost and availability money in circulation in order to achieve price stability in the economy (CBN, 2007). Monetary policy is concerned with measures by a central bank to manage money supply to achieve stable prices as well as other objectives. Nwankwo (1991) defined monetary policy as one of the macroeconomic instruments with which the monetary authority of a country employs in the management of the economy to attain desired objectives. Also, Jhingan (2000) refers to monetary policy as the credit measures adopted by the central bank of a country.

According to Andrew (2018), MPR is the most powerful tool the CBN uses; a shift in this crucial interest rate has a drastic effect on borrowing and spending. The MPR serves as nominal anchor rate that gives direction to the money market, thus affecting the supply of money, price stability, monetary aggregates and full employment as well as the GDP. It is an indicator of the monetary policy stance; raising it indicates monetary tightening while lowering it indicates monetary easing. By Changing MPR, the CBN influences the demand for money and inflation expectation and outcome. Hence, economic activity either increases or decreases depending on the intended outcome of the change. When an economy is at trough, MPR is reduced in an effort to make borrowing more affordable. This creates an economic environment that encourages borrowing and ultimately leads to an increase in spending during the time. However, when the economy is at crest, that may lead to hyperinflation, hence, the CBN may increase MPR. An increase to

MPR has a direct impact on the interest rate charged to consumers for lending products, so spending shrinks. Although lending to banks or consumers is not as attractive when the MPR is increased, consumers are more likely to receive more attractive interest rates on low-risk savings vehicles.

Broad money supply (M2) includes currency in circulation with non-banking public, demand deposits (M1) in addition to savings deposit, time deposits and foreign currency denominated deposits. Money supply is the specific amount of money within circulation in the economy (Abdullahi, 2009). However, broad money (M2) is generally referred to as narrow money plus savings and time deposits, as well as foreign currency denominated deposits (CBN, 2006). The need to regulate money supply is based on the knowledge that there is a connection between the volume of money available in the economy and economic activities. If the volume of supply is not curtailed, it can result in inflation (CBN, 2006).

Generally, liquidity ratio is minimum percentage required by central bank of commercial banks to be kept to pay off its short-term debt obligations. This is calculated by number total liquid assets of a bank divided by total current liabilities. The higher the value of the ratio, the larger the margin of safety a bank possesses to cover short-term debts. The Central Bank of Nigeria (CBN) has said commercial banks will need to maintain minimum liquidity ratio of 30 per cent in line with regulatory requirement. The Monetary, Credit, Foreign Trade and Exchange Policy contains specific new guideline released by the apex bank for 2016/2017 fiscal years. The apex bank, however, said that the merchant and non-interest banks shall continue to maintain a minimum Liquidity Ratio (LR) of 20 and 10 per cent, respectively, subject to review from time to time (CBN, 2017).

In Nigeria, as well as the world over, the overarching objective of monetary policy is the attainment of price stability (CBN, 2007). Inflation today confronts policy makers throughout the world, has its origin in the earliest days of recorded history (Ojonye, 2015). Inflation remains a pervasive and persistent world problem because no economy in the world has been spared by this phenomenon while no fool-proof solution to the problem has yet been found. All countries of the world, irrespective of their social, political and economic systems have experienced one form of

inflation or the other at different stages of development, making the maintenance of price stability a fundamental objective of macroeconomic policy.

Inflation is defined as a continuous rise in price levels of goods and services leading to a fall in currency's purchasing power (Romer, 2012). Inflation occurs when the total demand for goods and services in an economy exceeds the supply of the same. When the supply is less, the prices of these goods and services would rise. Inflation is sustained increase in the general price level of goods and services in an economy over a period of time (Emerenini and Eke, 2014). Inflationary trend can be attributed to different causes: increase in demand in excess of supply, increase in cost of production, and some structural problems in the economy. Inflation can be measured using some indices which include: the consumer price index, producers' price index, wholesale price index and the Gross Domestic Product (GDP) deflator. The consumer price index (CPI) measures changes in the price level of market baskets of consumer goods and services purchased by households. This index is a potent tool for the formulation of policies which includes the income policy.

In the same vein, the producers' price index measures the average changes over time in the selling price received by the domestic producers for their output. Furthermore, the Wholesale price index (WPI) measures the price of a representative basket of wholesale goods. This is the main measure of inflation used in India, while the Gross Domestic Product deflator is also known as implicit price deflator which measures price changes in current year compared to the base year for all goods and services produced in the country. The CPI remains the best measure of inflation because it covers the widest range of goods consumed by the typical consumer, although it has some inherent weaknesses. The CPI may not completely cover goods and services produced. Also, the change in the quality of goods and services is not accounted for. In addition, Aminu and Anono (2012) affirmed that CPI does not affect capital goods purchased by the government.

Headline Inflation (HI): This is the measure of inflation that includes all the representative of consumer purchases. This is usually referred to as the overall measure of the consumer price index (CPI). It includes the prices of volatile goods such as energy and food thereby making it not to present an accurate inflation trend of the economy. According to Rich and Steindel (2005),

headline inflation is a broader measure of inflation and serves the ultimate goal of inflation targeting framework.

Theoretical Review

Classical (Quantity) Theory of Money

The classical economists' view of monetary policy is based on the quantity theory of money. The quantity theory of money is usually discussed in terms of Fisherian equation of exchange, which is given by the expression **MV = PY.** In the expression, M denotes the supply of money over which the monetary authority has some control; V denotes the velocity of money in circulation which is the average number of times a currency is spent on final goods and services over the course of a year; P denotes the price level. Hence, PY represents current nominal GDP. The equation of exchange is an identity which states that the current market value of all final goods and services (nominal GDP) must equal the supply of money multiplied by the average number of times a currency is used in transaction in a given year.

The classical economist believes that the economy is always at or near the natural level of real GDP. Thus, they assume that in the short-run, the Y in the equation of exchange is fixed. They further their argument and stressed velocity of circulation of money is constant and V is assumed to be fixed. Y and V are regarded to be fixed. For example if Central Bank of Nigeria (CBN) engaged either expansionary or contractionary monetary policy, this would rather result to either increase or decrease in money supply (M) and eventually lead to increase or decrease in the price level. By implication, P has direct relationship with change in money supply (M). In this case expansionary and contractionary of monetary policy would cause inflation or deflation respectively.

The classical school evolved through concerted efforts and contributions of economists like Jean Baptist Say, Adam Smith, David Ricardo, A.C. Pigou and others who shared the same beliefs. The classical model attempts to explain the determination, savings and investment with respect to money. According to the classicist, money is a veil and a neutral in its effect on the economy (Jhingan, 2010). In the classical system, the main function of money is to act as medium of exchange, it determined the general level of prices in which goods and services will be

exchanged (Jelilov, Waziri and Isik, 2016). This relationship between money and the price level is explained in terms of the quantity theory of money (Jelilov and Muhammad, 2015). The classical quantity theory of money states that the price level is a function of the supply of money, where:

$$MV=PT \quad \ldots\ldots\ldots 2.1$$

where M, V, P, and T are the supply of money, velocity of money, price level and the volume of transactions (Jhingan, 2000). The classical economists believe that the economy automatically tends towards full employment level by laying emphasis on price level and on how best to eliminate inflation (Amacher and Ulbrich, 1986).

Empirical Review

Tonprebofa (2019) examined the dynamics of monetary policy and inflation in Nigeria from 2009 to 2017 using Augmented Dickey Fully unit root test, Johansen Co-integration test and Error Correction model (ECM). The study discovered a significant relationship between inflation and monetary policy instruments including: money supply, exchange rate, monetary policy rate, treasury bills rate, reserve requirement and liquidity ratio. Akarara and Azebi (2018) investigated the effectiveness of several monetary policy instruments used to control of inflation in Nigeria with data covering 2009 December to 2016. The study adopted the co-integration and error correction model. The result of the study showed that treasury bill rate (TBR) has a significant influence on inflation in Short-run and long-run, while exchange rate and money supply are effective in the short-run. However, the Monetary Policy Rate is effective in the long-run.

Lucky and Lyndon (2016) studied the impact of monetary policy instruments in controlling inflation in Nigeria using data from 1982 to 2011. The study adopted multiple regression analysis and the following monetary policy instruments such as: interest rate, minimum rediscount rate, liquidity ratio, and cash reserve ratio were used. The study found out that these instruments had no significant impact on inflation in Nigeria. Gbadebo and Mohammed (2015) investigated the impact of monetary policy on inflation in Nigeria. The study used co-integration and error correction approaches on data spanning from 1980Q1 to 2012Q4. The result revealed

that interest rate, exchange rate, money supply and oil-price are the major causes of inflation in Nigeria.

Onwachukwu (2014) focused on how the Central Bank of Nigeria (CBN) use of monetary policy to check inflation in Nigeria using time series data for the period 1970 to 2010. The study employed Ordinary Least Squares (OLS), the result revealed that bank rate, deposit with the central bank, liquidity ratio, and broad money supply have significant impact on inflation while variables like exchange rate has no significant impact on inflation in Nigeria. Akujobi (2012) investigated the impact of monetary policy instrument on economic development of Nigeria using multiple regression technique and found that Treasury bill, minimum rediscount rate and liquidity rate have significant impact on economic development of Nigeria.

Nenbe and Madume (2011) examined the impact of monetary policy tools on price stability in Nigeria between 1970 and 2009 using the co-integration and error correction model (ECM). Monetary policy tools such as money supply (MOS), minimum rediscount rate (MRR) and treasury bills (TRB) were tested. The tools showed mixed impact on inflation; treasury bills show significant impact on inflation in the long-run. Amassoma, *et al.* (2011) evaluated the effect of monetary policy on macroeconomic variables in Nigeria for the period 1986 to 2009. This study used co-integration technique. The result showed that monetary policy had a significant effect on exchange rate and money supply while monetary policy was observed to have an insignificant influence on price instability. The implication of this finding is that monetary policy had a significant influence in maintaining price stability within the Nigerian economy.

Adegbite and Alabi (2013) examined the impact of monetary policy on economic growth in Nigeria, using secondary data covering the period of 1970 to 2010. They concluded in their study that exchange rate stability played a key role in keeping inflation low for most of the transition period. Akosah (2015) examined the effectiveness of monetary policy instruments in Ghana for the period 2002 – 2014. The study discovered inflation is mostly driven by interest rate, which is mostly signaled by the monetary policy rate over the medium and long-term. However, in the short-term exchange rate shock has a larger influence on inflation.

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3. Methodology

Research Design

The study is ex-post-facto research and the data on the variables are from a secondary source that covers the period of 156 months; from January 2007 to December 2019. The study employed ARDL-ECM model is employed to investigate the dynamic effects of monetary policy (liquidity ratio, treasury bill rate, monetary policy rate, and broad money supply) on headline inflation, in Nigeria. This single equation type of model is employed due to its various advantages over other single equation models; it provides both the short-run and long-run impact simultaneously, and it is also applicable for time series with mixed order of integration. Hence, it suits the nature of this study as far as the stationarity of the variables is concerned. The long-run relationship among the variables was determined with ARDL bound test (Pesaran, Shin & Smith, 2001). The models after estimation are then appraised for robustness and reliability to ensure that correct policy inference is drawn from the empirical results. This post-estimation diagnostic analysis of the estimated models includes; test for autocorrelation using the Breusch-Godfrey serial LM Test for serial correlation between successive error terms, residual normality test using the Jarque-Bera (JB) test, residual heteroskedasticity test using the ARCH test.

Model Specification

The model for headline inflation rate was parameterised in an autoregressive distributed lag (ARDL) form so that the dynamic effects of the monetary policy tools (liquidity ratio, broad money supply, cash reserve ratio, and monetary policy rate) can be thoroughly investigated following the modified work of Onwachukwu (2014) who included bank rate, bank deposit, exchange rate, liquidity ratio, and broad money supply in his model as shown in equation 3.1;

$$\boldsymbol{inf_t = f(br_t, dcbn_t\, exch_t, lr_t, m2_t)} \qquad \boldsymbol{(3.1)}$$

In this study however, headline inflation is used instead of the aggregated inflation which combines headline, core and food inflation used in Onwachukwu (2014), while we retain liquidity ratio and broad money supply but added monetary policy rate and treasury bill rate in the models for this study. The model for this study is stated as;

$$\boldsymbol{hinf_t = f(lr_t, m2_t, mpr_t, tbr_t)} \ldots\ldots (3.2)$$

Where:

$hinf_t = Headline\ inflation\ rate$

$lr_t = Liquidity\ ratio$

$m2_t = Broad\ money\ supply$

$mpr_t = Monetary\ policy\ rate$

$tbr_t = Treasury\ bill\ rate$

The model in Equation (3.2) simply defines the headline inflation rate as a function of liquidity ratio, broad money supply, monetary policy rate, and treasury bills rate. This is a generic model, however; we specifically parameterised the model in an autoregressive distributed lag form so as to account for the underlying dynamism in the data and it is presented as equation 3.3.

$$\boldsymbol{hinf_t = c_1 + \sum_{i=1}^{l} \partial_{1i}\, hinf_{t-i} + \sum_{i=0}^{m} \partial_{2i}\, lr_{t-i} + \sum_{i=0}^{n} \partial_{3i}\, m2_{t-i} + \sum_{i=0}^{o} \partial_{4i}\, mpr_{t-i} + \sum_{i=0}^{p} \partial_{5i}\, tbr_{t-i} + u_t} \quad \ldots\ldots (3.3)$$

Where:

$\partial_i = Parameters \quad ; i = 1 \ldots 5$

$u_t = Shock/Stochatic\ error\ term$

Since the data to be supplied into the ARDL model are of mixed stationarity, there is a valid error correction form of the ARDL according to the granger representation theorem, and this enables both the short-run and long-run information to be attainable. Hence, the ECM form of equation 3.3 is presented in equation 3.4.

$$\nabla hinf_t = \sum_{i=1}^{l} \breve{\partial}_{1i} \nabla hinf_{t-i} + \sum_{i=0}^{m} \breve{\partial}_{2i} \nabla lr_{t-i} + \sum_{i=0}^{n} \breve{\partial}_{3i} \nabla m2_{t-i} + \sum_{i=0}^{o} \breve{\partial}_{4i} \nabla mpr_{t-i} + \sum_{i=0}^{p} \breve{\partial}_{5i} \nabla tbr_{t-i} + \theta\left(hinf_{t-1} - \hat{\partial}_0 - \hat{\partial}_1 lr_{t-1} - \hat{\partial}_2 m2_{t-1} - \hat{\partial}_3 mpr_{t-1} - \hat{\partial}_4 tbr_{t-1}\right) + u_t \quad \ldots\ldots (3.4)$$

The stability of the model in equation 3.4 is ensured by the $\boldsymbol{\theta}$ parameter to be in the range of negative unity and zero, and the reliability of the model to be ensured by the shock parameter to be white noise. The immediate (impact or contemporaneous or short-run) effects of the monetary policy tools on inflation rate is captured by the $\breve{\partial}_i$, while the long-run effects of each policy tools on the headline inflation rate are captured by the $\hat{\partial}_i$ respectively.

Table 3.1: Definition of headline inflation rate, liquidity ratio, broad money supply, monetary policy rate, and treasury bill rate

Variables	Description
Headline Inflation rate	Headline inflation is the raw inflation figure reported through the Consumer Price Index (CPI). The CPI calculates the cost to purchase a fixed basket of goods, as a way of determining how much inflation is occurring in the broad economy. The CPI uses a base year and indexes the current year's prices according to the base year's values.
Monetary policy rate	The monetary policy rate is the interest rate at which banks can borrow from the central bank, and it is how the CBN influences the rate at which banks can lend to companies and customers. The higher the rate the less favourable terms you will get for loans from banks.
Liquidity ratio	This is a bank rate used by the monetary authority in regulating the commercial banks in setting the minimum reserve they should hold in their vaults. Generally, liquidity ratios are a class of financial metrics used to determine a bank's ability to pay off its short-term debts obligations. It is the total specified liquid assets of a bank divided by total current liabilities. The higher the value of the ratio, the larger the margin of safety a bank possesses to cover short-term debts.
Broad Money Supply	The money supply is the entire stock of currency and other liquid instruments circulating in a country's economy as of a particular time. The money supply can include cash, coins, and balances held in checking and savings accounts, and other near money substitutes.
Treasury Bill Rate	A Treasury Bill (T-Bill) is a short-term government debt obligation backed by the Treasury Department with a maturity of one year or less.

Source: Author's Computation, 2020

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The nature of this study suggests that time-series data is appropriate for the empirical analysis of the study, therefore monthly historical data on headline inflation rate, liquidity ratio, monetary policy rate, broad money supply, and treasury bill rate covering the period of 156 months; January 2007 to December 2019, are collated from the CBN statistical database 2020.

Data Presentation Analysis and Interpretation of Results

Data Presentation

This work entails the empirical investigation of the impact of monetary policy on inflation (headline,) in Nigeria using ARDL-ECM methodology to estimate and investigate this.

Descriptive Statistics of Data

Table 4.1 : Descriptive Statistics of variables

	$hinf_t$	lr_t	$m2_t$	mpr_t	tbr_t
Mean	**0.926859**	**44.23769**	**16011804**	**11.12660**	**9.299393**
Median	**0.800000**	**43.55000**	**15424114**	**12.00000**	**9.990000**
Maximum	**3.690000**	**104.2000**	**29137800**	**14.00000**	**15.00000**
Minimum	**-2.090000**	**17.87000**	**3900135.**	**6.000000**	**1.040000**
Std. Dev.	**0.684248**	**14.09902**	**6694464.**	**2.631156**	**3.438655**
Skewness	**0.518940**	**0.990651**	**0.143410**	**-0.717716**	**-0.447774**
Kurtosis	**7.411929**	**5.328125**	**1.966580**	**2.290792**	**2.464396**
Jarque-Bera	**133.5251**	**60.74722**	**7.476450**	**16.66236**	**7.077711**
Probability	**0.000000**	**0.000000**	**0.023796**	**0.000241**	**0.029047**
Observations	**156**	**156**	**156**	**156**	**156**

Source: Author's computation, 2020 Using E-views 11

Table 4.1 above shows the descriptive statistics for headline inflation rate, liquidity ratio, money supply rate, monetary policy rate, and Treasury bill rate. The unexpected means for all the variables are positive in sign, and they all have positive skewness except for MPR; and the implication of this is that, MPR have more rises than falls. It is obvious from the Table 4.1 that all the variables have kurtoses values that deviate far from 3 which is one of the properties of normally distributed variables. In fact, the probability value of the Jarque-Bera normality test is statistically significant for all the variables and this implies that they are not normally distributed;

however, this issue of non-normality may be taken with a grain of salt due to the asymptotic theory or the law of large number.

Unit Root Test

Table 4.2: ADF unit root test result

Variable	ADF Stat.	1% c.v	5% c.v	10% c.v	Remark
HI	-7.010664	-4.019151	-3.439461	-3.144113	I(0)
MPR	-11.82239	-4.018748	-3.439267	-3.143999	I(1)
LR	-8.789514	-4.019561	-3.439658	-3.144229	I(1)
TBR	--8.637596	-4.018748	-3.439267	-3.143999	I(1)
M2	-3.575550	-4.018349	-3.439075	-3.143887	I(0)

Source: Author's computation, 2020 Using E-views Version 11

Table 4.3: PP unit root test result

Variable	PP Stat.	1% c.v	5% c.v	10% c.v	Remark
HI	-9.476316	-4.018349	-3.439075	-3.143887	I(0)
MPR	-11.91004	-4.018748	-3.439267	-3.143999	I(1)
LR	-18.99027	-4.018748	--3.439267	-3.143999	I(1)
TBR	-8.645027	-4.018748	-3.439267	-3.143999	I(1)
M2	-3.499683	-4.018349	-3.439075	-3.143887	I(0)

Source: Author's computation, 2020 Using E-views Version11

Tables 4.2 and 4.3 show the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) unit root tests results for headline inflation rate, liquidity ratio, money supply rate, monetary policy rate, and Treasury bill rate. It can be seen from the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) unit root tests results that headline inflation rate, and money supply are stationary variables i.e. they contain no unit root. However, the results of both the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) unit root tests show that liquidity ratio, monetary policy rate, and Treasury bill rate are first-order integrated variables i.e. they are not stationary but become stationary after first difference. Unfortunately, the statistical implication of this result is that co-integration has to be tested for in order for the result not to be spurious. For this reason, the adoption of an ARDL methodology is justified due to its flexible nature to dynamically accommodate the mixture of stationary and integrated regressors.

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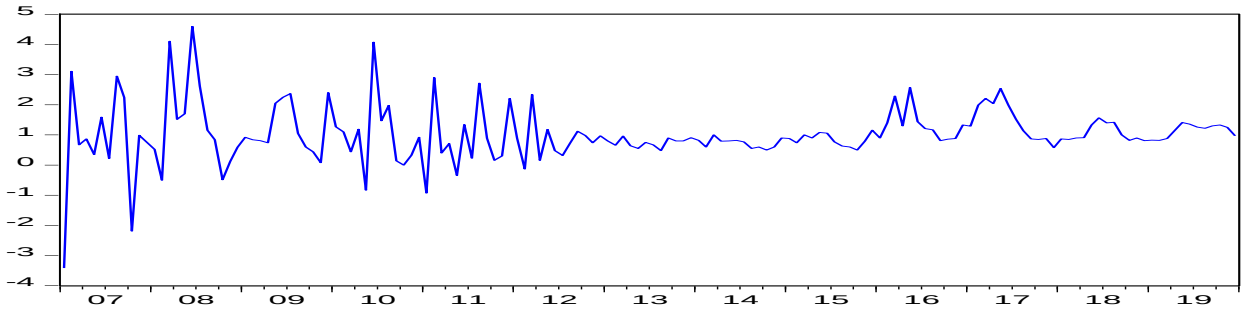
Trend Analysis

Figure 4.2 depicts the historical movement of headline inflation rate from 2007M1 to 2019M12. The lowest point of headline inflation is in October, 2007 at -2.09 per cent while the highest point is in June, 2008 at 3.69 percentage points. With the exceptions of a few spikes and declines, the data remains largely in the region of plus or minus 1 on an average.

Figure 4.2: Trend of Headline Inflation Rate from 2007M1 to 2019M12



Source: Researcher's computation, 2021

Data Analysis

This section presents the estimation of the headline inflation model. The lag specification of the model was first determined followed by the respective short-run and long-run impact of the monetary policy variables and tests were conducted to check for the reliability of the results.

The Headline Inflation Model

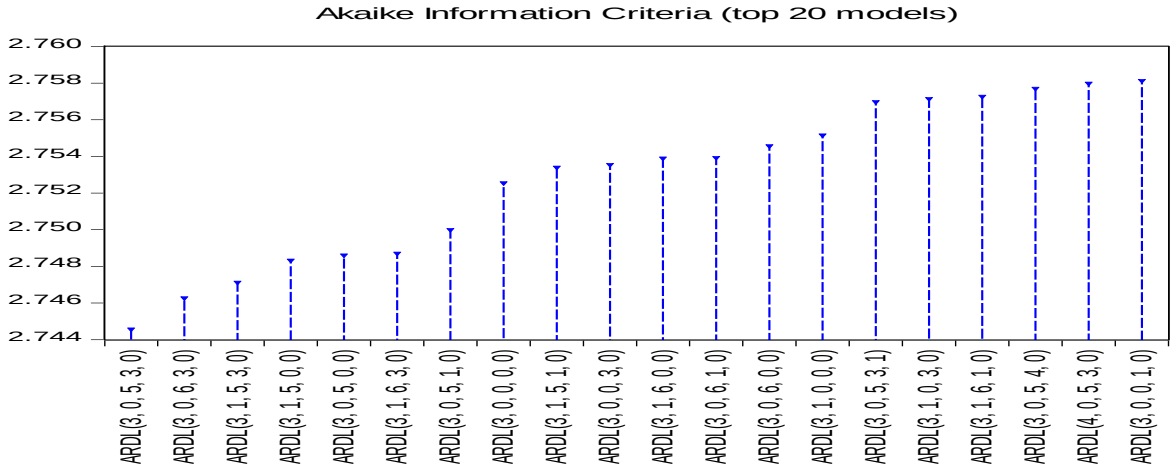


Figure 4.3 Lag selection, Source: Author's computation, 2021. Using E-views Version11

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Before the estimation of the inflation model, information criteria are used to select the optimal ARDL lag specification in order to minimize information losses and to retain useful information. The information criteria Figure 4.3 showed that ARDL (3, 0, 5, 3, 0) is appropriate to analyse the impact of the selected monetary policy instruments on the headline inflation rate. Also, this ARDL is estimated to circumvent the problems of model misspecification and residual autocorrelation.

Table 4.4 ARDL Bounds Test

Pesaran, Shin, and Smith (2001) Bounds test

Test	Statistics
F-stat	10.52
t-stat	-6.99
d.o.f.	4

Sample	150

Pesaran, Shin, & Smith (2001) critical values

	10%		5%		2.5%		1%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
F	1.90	3.01	2.26	3.48	2.62	3.90	3.07	4.44
T	-1.62	-3.26	-1.95	-3.6	-2.24	-3.89	-2.58	-4.23

Source: Authors' computation 2020 Using E-views Version11

Table 4.4 shows the ARDL bounds test result for testing for the level (long-run) relationship between the headline inflation, the liquidity ratio, money supply rate, monetary policy rate, and Treasury bill rate . The null hypothesis of the test is that there is no long-run relationship between the variables. The decision rule of the test is that, if the F and t statistics lie between the bounds I(0) and I(1), the test is inconclusive. If it is above the upper bound I(1), the null hypothesis of no level effect is rejected. If it is below the lower bound I(0), the null hypothesis of no level effect can't be rejected. The result shows that the calculated F-stat (10.52) and the t-stat (-6.99) are significant at 1% level of significance; hence, we conclude that there exists a valid long-run relationship between headline inflation, the liquidity ratio, money supply rate, monetary policy rate, and Treasury bill rate. The long-run and the short-run parameters are thus presented in Table 4.5.

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Table 4.5 ARDL-ECM Result: The Effects of Monetary Policy on Headline Inflation Rate

Estimated ARDL Parameters

Variable	Coefficient	Std. Error	t-Statistic	Prob.
lr_{t-1}	-0.010139	0.097764	-0.103714	0.9176
$m2_{t-1}$	0.500735	0.270317	1.852398	0.0662*
mpr_{t-1}	-0.131281	0.177967	-0.737667	0.4620
tbr_{t-1}	0.207208	0.101312	2.045254	0.0428**
$\Delta hinf_{t-1}$	0.043698	0.096024	0.455079	0.6498
$\Delta hinf_{t-2}$	0.193342	0.080732	2.394866	0.0180**
Δlr_t	-0.007838	0.075533	-0.103765	0.9175
$\Delta m2_t$	0.185311	0.074654	2.482256	0.0143**
$\Delta m2_{t-1}$	-0.280238	0.103263	-2.713820	0.0075***
$\Delta m2_{t-2}$	-0.317887	0.105263	-3.019946	0.0030***
$\Delta m2_{t-3}$	-0.198637	0.092612	-2.144823	0.0338**
$\Delta m2_{t-4}$	-0.183753	0.070597	-2.602861	0.0103**
Δmpr_t	-0.195966	0.073784	-2.655933	0.0089***
Δmpr_{t-1}	-0.172417	0.086380	-1.996024	0.0479**
Δmpr_{t-2}	-0.162452	0.071671	-2.266634	0.0250**
Δtbr_t	0.160169	0.080004	2.002018	0.0473**
ecm_{t-1}	-0.772987	0.105030	-7.359645	0.0000***
R^2	= 0.49			
S.E	= 0.9			
Regression diagnostic test result				
LM-test	= 0.44[0.5052]			
ARCH	= 0.78[0.3779]			
RESET	= 0.39[0.5314]			

Source: Authors' computation. 2020 Using E-views 11

(*), (**) & (***) denotes significance at 10%, 5% and 1%

Table 4.5 shows both the estimated long-run/cumulative effect (at the first segment of the table) and the short-run effect (at the middle segment of the table) of liquidity ratio, money supply rate, monetary policy rate, and Treasury bill rate on headline inflation rate in Nigeria. Looking at the long-run result, it can be seen that money supply and the Treasury bill rate have significant long-run impact on the headline inflation rate in Nigeria. The result shows that if the money supply rate rises by one standard deviation units in the long-run, the average value of the headline inflation rate goes up by 0.5 standard deviation units in the long-run. Also, if the Treasury bill rate rises by one standard deviation in the long-run, the average value of the headline inflation rate goes up by 0.21 standard deviation units in the long-run. On the short-run side, it can be seen from Table 4.5 that all the variables except the one-period lag of headline inflation rate and the liquidity ratio impacted significantly on the headline inflation rate at the conventional levels. The error correction term (ECM) shows that the headline inflation rate responds to the deviation from its long-run (steady) state, and it significantly adjusts to it. The value of the error correction term

must be negative and strictly lies between -1≤ ECM ≤ 0 for a valid statistical and economic meaning. Table 4.5 depicts that the error correction term is correctly signed, and it shows that about 77.3% of disequilibrium in the headline inflation rate due to one-time temporary shock is corrected within twelve months; this is a fast rate of adjustment.

In addition to this, the correctness and significance of the error correction term prove the estimated long-run result presented to be valid and further prove the convergence of the estimated ARDL model. The short-run result is further discussed below. The result shows that the second-period lag effects play significant roles in determining the headline inflation rate in Nigeria by increasing it by almost 0.2 standard deviation units in the short-run. It can be seen that a rise in broad money supply rate has a significant positive immediate short-run effect on the headline inflation rate in Nigeria. If the money supply rate raises by one standard deviation, the average value of the headline inflation rate goes up by 0.19 standard deviation units in the short-run; however, the significant of the money supply rate lags imply that delay in expansionary monetary policy implementation may bring about decline the headline inflation rate. Also, the result shows that the monetary policy rate has negative and distributive effects on headline inflation rate in Nigeria. It can be deduced from the result that rise in the monetary policy rate leads to immediate significant falls of about 0.20 standard deviation unit in the headline inflation rate, and consecutive significant falls of about 0.17 and 0.16 standard deviation units decline in the headline inflation rate in the second and third periods respectively. The immediate/short-run effect of Treasury bill rate on the headline inflation rate is found to be significant. One standard deviation rise in Treasury bill rate leads to immediate significant rises of about 0.16 standard deviation units in headline inflation rate in the short-run.

The coefficient of determination shows that about 49% of the variation in headline inflation rate is explained by the regressors, and the standard error of the regression is small which shows that the estimated regression line slightly deviates from the true regression line; this implies that the model can be used for policy analysis and dynamic forecasting. The LM and ARCH tests are carried out to test for the presence of autocorrelation and heteroscedasticity in the estimated model residuals. The regression specification test (RESET) is used to test the possibility of non-linearity of the estimated model. Consequently, based on the insignificant computed diagnostics

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statistics probabilities (in the square brackets); we may accept that the model is free from autocorrelation and heteroscedasticity of residuals, and the model is well-specified.

Table 4.6: Summary of Findings I

	Headline Inflation Rate	
Policy	**Short-run**	**Long-run**
$lr_t\uparrow$	$\downarrow$	$\downarrow$
$m2_t\uparrow$	$\uparrow$*	$\uparrow$*
$mpr_t\uparrow$	$\downarrow$*	$\downarrow$
$tbr_t\uparrow$	$\uparrow$*	$\uparrow$*

Source: Authors' computation.

*** Denote significance reaction**

Table 4.7 : Summary of Findings II

Dependent variable	Independent Variables	Short-run	Long-run
Headline inflation	Liquidity ratio	Negative-Insignificant	Negative-Insignificant
	Money supply	Positive-Significant	Positive-Significant
	Monetary policy rate	Negative-Significant	Negative-Insignificant
	Treasury bill rate	Positive-Significant	Positive-Significant

Source: Authors' computation.

Table 4.7 above depicts the findings of the study at a glance and it is presented for relative and comparison motive to see how the headline, react to monetary policy. The policy column shows the stimulation direction of the policy. On a comparative basis, it is clear that the rise in money supply rate brings about headline in Nigeria both in the short-run and long-run, whereas the Treasury bill rate brings about headline in Nigeria both in the short-run and long-run respectively.

Discussion

Empirically, the result from the estimated headline inflation rate model revealed that the liquidity ratio had negative and insignificant immediate and long-run effects on the headline inflation rate in Nigeria. This result corroborates the findings of Ujuju & Etale (2016) and Sulaiman (2015). It was also found that the money supply rate had positive and significant immediate and long-run effects on the headline inflation rate in Nigeria. This agrees with the results in the studies of Gbadebo & Mohammed (2015), Onwachukwu (2014) and Chaudhry *et al.*, (2012); however, the results in the studies of Adigwe *et al.*, (2015), Matthew (2015), Tamunonimim (2016) and

Akarara & Azebi (2018) were contrary to the result of this study. The monetary policy rate was found to reduce the headline inflation rate in the short-run only. This is in line with the studies of Okonkwo *et al.*, (2018), Darma & Abdusalami (2020), and Akarara & Azebi (2018); it is however contrary with the studies of Sulaiman (2015) and Matthew (2015). It was also found that the Treasury bill rate had positive and significant immediate and long-run effects on the headline inflation rate in Nigeria. This is in support of the finding in the study of Tamunonimim (2016) but in contrary with the studies of Sulaiman (2015) and Akarara & Azebi (2018). Relatively, the result shows that the money supply rate had the highest effect on the headline inflation rate in Nigeria. Therefore expansionary policy towards money supply had the

Conclusion and Recommendations

Attaining price stability seems to have eluded Nigeria. Efforts of the monetary authority alongside the fiscal policy authority have yielded nothing much. Even with the overarching reason for the existence of the Central Banks to be stable prices. This is not easily attained in this part of the world. If inflation is not controlled then there will be consequences in the entire economy. The implicit tax levied because the value of savings crashes as a result of inflation cannot be over-emphasised. Inflation reduces purchasing power and hence impoverishes individuals even more. The findings of this study suggest that the problem of inflation can be tamed by increasing MPR, LR and decreasing M2 and TBR. This means that the monetary authority has within its power to tame inflation. Considering the findings of the study, the following recommendations to address the problem of inflation in Nigeria are made: Since there is an inverse relationship between MPR and inflation, this means an increase in MPR reduces inflation. Then MPR should be increased whenever there is inflationary pressure to make sure that the economy does not get overheated. The direct relationship between M2 and inflation can be used to manage inflation. It means that the monetary authority can reduce M2 to reduce inflation. The Central Bank can equally increase M2 to spur the economy when it is experiencing deflationary pressures. The direct relationship between TBR and inflation can be deployed when the need arises. The government will be made to pay a higher yield on treasury bills (T-bills) and other debt instruments to head off reduction in value due to inflation.

References

Abdullahi, H. (2009). *Monetary Economics: Theory, policy and the millennium global financial crisis: A Guide to Tertiary Institutions in Nigeria* (1st ed.). Halygraph Nigeria Ltd.

Adegbite, T. A. and Alabi, W. O. (2013). Monetary policy and economic growth: The Nigerian experience (1970-2010). *Prime J. of Business Administration & Management*, 3(1), 822-833.

Adigwe, P. K., Echekoba, F. N. and Onyeagba, B. C. J. (2015). Monetary policy and economic growth in Nigeria: A critical evaluation. *IOSR J. Business & Management*. 17(2), 110-119.

Akarara, E. A. and Azebi, O. I. (2018) The Effectiveness of Monetary Policy in the Control of Inflation in Nigeria: An ECM Approach. *J. Economics & Finance (IOSR-JEF)*. 9(1), 86-94.

Akosah, N.K. (2015). *Is the monetary policy rate effective? Recent evidence from Ghana*. Graduate Institute of International and Development Studies Working Paper, No. 14/2015.

Akujobi, L. E. (2012). Monetary Policy and Nigeria's Economic Development. *African Res. Review*, 4(4). 153-161.

Amacher, R.C. and Ulbrich, H.H. (1986). *Principles of Macroeconomic*. South Western: Publishing Co. Cincinnati

Amassoma, D., Nwosa, P.I. and Olaiya, S.A. (2011). An Appraisal of Monetary Policy and Its Effect on Macroeconomic Stabilization in Nigeria. *Journal of Emerging Trends in Economics & Management Sciences* (JETEMS). 2(3): 232-237.

Aminu, U. and Anono, A.Z. (2012). Effect of Inflation on the Growth and Development of the Nigerian Economy (An Empirical Analysis). *Int. J. of Business & Social Science*. 3(10).

Andrew, A.A. (2018). The Effects of Monetary Policy Intruments on Macroeconomic Policy Targets in Nigeria: 1981-2016. Unpublished Ph.D Thesis, University of Abuja, Nigeria.

CBN (Central Bank of Nigeria) (2017). *Monetary Policy At A Glance*. Monetary Policy Departmen retrieved 2nd June, 2019 from thttps://www.cbn.gov.ng/CBN (2014). Understanding Mnetary Policy series No.3 central Bank of Nigeria Policy Framework.

CBN (Central Bank of Nigeria) (2007). Monetary Policy in a Changing Environment. *Economic & Financial Review.* 45(4), 15-30.

CBN. (2006). *Monetary Policy Series*, CBN/MPD/Series/01/2006.

Chaudhry, I. S., Qamber, Y., and Farooq, F. (2012). Monetary policy, inflation and economic growth in Pakistan: Exploring the cointegration and causality relationships. Pakistan *J. of Commerce & Social Sciences, 6*, 332-347.

Clarida, R., Gali, J., & Gertler, M. (2017). Monetary Policy Rules and Macroeconomic Stability: Evidence and some theories. *Quarterly J. of Economics*, 1(1), 147-180.

Darma, N. A., and Abdulsalami, O. (2020). An Empirical Analysis of The Effect of Monetary Policy on Inflation In Nigeria; 1970 – 2018. *Advances in Social Sciences Res. J.* 7(6) 841-859.

Emerenini, F. M. and Eke, C. N. (2014). The impact of monetary policy rate on inflation in Nigeria. *J. of Economics & Sustainable Development*, 5(28), 146-153.

Folawewo, A.O. and Osinubi, T.S. (2006) Monetary Policy and Macroeconomic Instability in Nigeria: A Rational Expectation Approach. *J. of Social Sciences*, 12, 93-100.

Gbadebo, A.D., Mohammed, N. (2015). Monetary policy and inflation control in Nigeria. *J. of Economics & Sustainable Development* 6(8): 108-116.

Jelilov, G.; Muhammad, Y. M. (2015). Economic Growth and Energy Consumption in Nigeria. The Empirical Economics Letters, 1187-1196.

Jelilov, G.; Waziri, F.; Isik, A. (2016). Interest Rate Behaviour and its Relationship with Economic Growth in Nigeria: An Error Correction Model Approach. *The Empirical Economics Letters*, 245-255.

Jhingan M.L, (2010); *Macroeconomics Theory*, 12th edition, Vrinda. Publications (P) Ltd. Delhi, India.

Jhingan, M. L. (2000). *Monetary and Banking International Trade*. New Delhi: Hamsphire. Vrinda Publications (P) Ltd.

Lucky, E.U., and Lyndon, M.E. (2016). Macroeconomic Analysis of the Relationship Between Monetary Policy Instruments and Inflation in Nigeria. *European Centre for Research Training & Development*, 4(6), 31-39

Matthew, K. (2015). Monetary Policy and Inflation in Developing Economies: Evidence from Nigeria's Data, Proceedings of 4th European Business Research Conference, Imperial College, London, UK.

Nenbe, S. G., and Madume, J. V. (2011). The Impact of Monetary Policy on Nigeria's Macroeconomic Stability (1970 - 2009). *Int. J. Economic Development Res. & Investment*, 2(2), 174-183.

Nwankwo, G. O. (1991). *The money and capital market in Nigeria*. Macmillan.

Nyambok, C.A. (2010). The relationship between Inflation Rates and Liquidity of Companies Quoted at the NSE. *Unpublished MBA Thesis*, University of Nairobi. Pp. 10-28.

Okonkwo, Jisike, Onyebuchi, Onyinyechukwu, Azolibe, Chukwuebuka, Victoria, Obi-Nwosu. (2020). Monetary Policy and Selected Macroeconomic Variables in Nigerian Economy (1990-2018).

Okoro, A. S. (2013). Impact of monetary policy on Nigeria Economic Growth. *Prime J. of Social Sciences*. 2 (2), 195-199.

Olweny, T., and M. Chiluwe (2012). The effect of Monetary Policy on Private Sector Investment in Kenya. *J. of Applied Finance & Banking* 2(1), 23-52.

Onwachukwu, P. O., Dibie, A. C. and Ogudo, A. P. (2014) Effectiveness of Monetary Policy in Reducing Inflation in Nigeria (1970-2013). *J. of Economics & Sustainable Development*. 5(13).

Onwachukwu,C.I. (2014). Impact of Monetary Policy on Inflation Control in Nigeria. *Munich Personal RePEC Archive (MPRA Paper 67087).* University Library of Munich, Germany.

Onyeiwu, C., (2012). Monetary policy and economic growth of Nigeria. *J. of Economics & Sustainable Development, 3*(7): 62-70.

Pesaran, M. H., Shin, Y., and Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *J. of Applied Econometrics, 16(3*), 289-326.

Pham, A. D. (2020). *Application of Inflation Forecasting Models to Central Bank's Monetary Policy Implementation:* The Case of Vietnam. Ph.D. thesis, Vietnam Banking Academy, Hanoi, Vietnam.

Rich, R., and Steindel, C. (2005). *A Review of Core Inflation and an Evaluation of its Measures*. Federal Reserve Bank of New York. Paper no 236.

Romer, D. (2012) *Advanced Macroeconomics*. 4th Edition, McGraw-Hill Irwin, New York.

Sulaiman, L. A. (2015). An empirical analysis of price stability effect of Nigerian monetary policy (1981-2012), *Public & Municipal Finance*, 4(1).

Tamunonimim, A. N. (2016). Monetary Policy and Inflation in Nigeria. *Int. J. of Finance & Accounting*. 5(2): 67-76

Tonprebofa, W.O. (2019). The Dynamics of Monetary Policy and Inflation in Nigeria. *IOSR J. of Economics & Finance (IOSR-JEF)*, 10(2), 37-49.

Uchendu, O. A., (2010). Monetary Policy Review. *CBN* Monetary Policy Review. *1*(1)

Ufoeze , L. O., Odimgbe , S. O., Ezeabalisi, V. N., Alajekwu, U. B. (2018) Effect of Monetary Policy on Economic Growth in Nigeria: An Empirical Investigation. *Annals of Spiru Haret University Economic Series*. 1.

Ujuju, L. E. and Etale, L. M. (2016). Macroeconomic analysis of the relationship between monetary policy instruments and inflation in Nigeria. *Int. J. of Business & Management Review*. 4(6), 31-39.

Usman, O.A. and Adejare, T.A. (2014). Impact of Monetary Policy on Industrial Growth in Nigeria. *Int. J. of Academic Research in Business & Social Sciences* January 2014, 4(1).