Economy
Vol. 7, No. 1, 78-86, 2020
ISSN(E) 2313-8181/ ISSN(P) 2518-0118
DOI: 10.20448/journal.502.2020.71.78.86

Monetary Policy Changes and Inflationary Pressure in Nigeria

Isiwu George Duhu[1] ✉
Azike Lawrence Chike[2]
Ngwu Jerome Chukwuemeka[3]


(✉ Corresponding Author)

[1,2,3]*Department of Economics, Enugu State University of Science and Technology, Enugu, Nigeria.*
[1]*Email: george.isiwu@esut.edu.ng Tel: +2348037438796*
[2]*Email: lawazike55@gmail.com Tel: +2348033507658*
[3]*Email: ngwu2000@gmail.com Tel: +2348036669727*

Abstract

Achieving price stability has continued to be one of the major macroeconomic policy objectives of successive governments in Nigeria. This is because, inflation rate, as measured by changes in consumers price index (CPI), has continued to be on the increase despite the implementation of monetary policy measures to control it. Therefore, the main objective of this study is to analyze the impact of monetary policy changes on inflationary pressure in Nigeria. This is to identify whether inflationary pressure in Nigeria is a monetary phenomenon or not. Annual time series data on changes in inflation rate, broad money supply, net domestic credit, monetary policy rate, real GDP growth rate (real output) and exchange rate were collected from Central Bank of Nigeria (CBN) Statistical Bulletin, 2018 issue. To analyze the data, Autoregressive Distributed Lag (ARDL) model, applying bounds test, was adopted. The empirical results show that monetary variables (broad money supply, net domestic credit, monetary policy rate) have insignificant impact on inflation both in the short run and long run respectively. Real output has the expected negative sign and its impact on inflation is significant both in the short run and long run. This implies that inflation in Nigeria is more of output than monetary phenomenon. It is recommended that Nigeria should invest more in agricultural sector since more output is sourced from the sector. This will help to reduce food (price) inflation in the country.

Keywords: Inflation, Monetary policy, Real output, Price stability, Money supply, Quantity theory of money, ARDL.
JEL Classification: E59.

Citation | Isiwu George Duhu; Azike Lawrence Chike; Ngwu Jerome Chukwuemeka (2020). Monetary Policy Changes and Inflationary Pressure in Nigeria. Economy, 7(1): 78-86.
History:
Received: 9 April 2020
Revised: 18 May 2020
Accepted: 22 June 2020
Published: 13 July 2020

Publisher: Asian Online Journal Publishing Group

Acknowledgement: All authors contributed to the conception and design of the study.
Funding: This study received no specific financial support.
Competing Interests: The authors declare that they have no conflict of interests.
Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study was reported; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained.
Ethical: This study follows all ethical practices during writing.

Contents

1. Introduction 79
2. Literature Review 79
3. Methodology 81
4. Presentation and Discussion of Results 82
5. Summary, Conclusion and Recommendations 85
References 85

Contribution of this paper to the literature
The empirical works reviewed in Nigeria neither included real output nor conducted any test to identify whether inflation is a monetary phenomenon in the country or not. It is this limitation that motivated this study.

1. Introduction

1.1. Background of the Study

Inflation represents a persistent increase in the general price level in an economy. This tendency results to general loss of purchasing power of the currency which causes serious discomfort for the consumers, investors, producers and government. This results in corruption because individuals and groups resort to illegal methods to compensate for the loss in their purchasing power (Isiwu & Aminu, 2018). Hence, one of the policy objectives of monetary policy in Nigeria is to achieve price stability. Price stability does not imply that all prices are stable or fixed. The emphasis is on maintaining a relatively stable and not an absolute price level. Thus, price stability operationally represents an inflation rate between 0 and 3% (Fischer, 1993). This is because, according to Fischer (1993) macroeconomic stability, including inflation control, is a must for economic growth. Therefore, combining quantitative and qualitative aspects, Meltzer (1997) states that price stability implies an inflation rate so close to zero (0), which is an important factor in long term planning and notes that 3 percent inflation is too high for this objective.

In this regard, monetary authorities in Nigeria apply discretionary power to influence the money stock and interest rate to make money either more expensive or cheap, depending on the prevailing economic conditions in order to achieve price stability. Therefore, monetary policy in Nigeria involves the management of interest rate and exchange rate, money supply and the level of liquidity in the system in order to achieve the desired level of aggregate demand, the rate of inflation, output and employment (Ogwuma, 1997). The Central Bank of Nigeria (CBN) has been made to focus on the target growth rate of money supply, first through the credit guidelines before 1985. However, since the implementation of the Structural Adjustment Program (SAP) in 1986, the focus shifted to market- directed policy. The adoption of SAP changed the monetary policy implementation approach in Nigeria with more emphasis on the power of the market forces for policy effectiveness.

Thus, effective monetary policy must be built on consistent commitment to low inflation. It is against this background that the focus of this study is to empirically analyze the impact of monetary policy changes on inflationary pressure in Nigeria.

1.2. Statement of the Problem

High rate of inflation in Nigeria has continual to attract national discourse among scholars and policy makers for more than five decades since independence in 1960. Hence, achieving price stability has continued to be one of the major macroeconomic policy objectives of the successive governments in Nigeria over the years.

Following the introduction of SAP in Nigeria in 1986, price stability has been the major concern for the monetary authorities. This is because inflation rate, as measured by changes in Consumers Price Index (CPI), has continued to be on the increase. The Central Bank of Nigeria (CBN) Statistical Bulletin, 2018 shows that in 1980s (1985 – 1989), inflation rate averaged 26.06 per cent. Following this increase, an indirect monetary policy tool, the Open Market Operation (OMO), was introduced in 1993 as a control measure for achieving price stability. However, in 1990s (1990 – 1999), inflation rate averaged 30.17 per cent. It decreased to 13.27 per cent in 2000s (2000 – 2009) and then decreased further to 11.66 per cent for the period 2010 – 2018. This decrease, however, still maintains double digit as opposed to single-digit inflation rate, which the monetary authorities in the country have been targeting.

Similarity, net domestic credit to the economy has continued to be on the increase. It averaged 5.15 per cent for the period 1985-1989 and then increased to 37.58 per cent for the period 1990 – 1999, 52.77 per cent for the period 2000 – 2009 and then declined to 13.36 per cent for the period 2010 – 2018. In the same vein, changes in broad money supply (M_2) averaged 15.62 per cent for the period 1985 – 1989, 31.62 per cent for the period 1990 – 1999 and 32.18 per cent for the period 2000 – 2009. It declined to 8.40 per cent for the period 2010 – 2018.

These developments appeared to have lent credence to the monetary theory that inflation is a monetary phenomenon. Such conclusion assumes that other determinants of inflation are neither significant nor relevant. Hence, this study analyzes the impact of monetary policy changes [Broad Money Supply (M_2), monetary policy rate, net domestic credit to the economy, exchange rate and real GDP (real output)] on inflationary pressure in Nigeria for the period 1985 – 2018. This is to identify whether inflation is a monetary phenomenon in Nigeria.

This period (1985 – 2018) is chosen because CBN started publishing data on monetary policy changes in 1985. This is indicated in various issues of the CBN Statistical Bulletin.

1.3. Objectives of the Study

Specifically, this study intends to:

(i) Analyze the impact of monetary policy changes on inflationary pressure in Nigeria.
(ii) Identify whether inflation is a monetary phenomenon in Nigeria.

2. Literature Review

2.1. Theoretical Literature

2.1.1. Monetary Theory of Inflation

The monetarists hold the view that inflation is a monetary phenomenon. The earliest explanation of this approach is found in the Quantity Theory of Money. The transaction version of this theory is attributed to Fisher (1911). The Fisher's famous equation of exchanged is expressed as:

$$MV = PQ \quad (1)$$

Where, M is the quantity of money, V is the income velocity of money, P is the average price level and Q is the total output of goods and series. Specifically,

$$V = PQ/M \quad (2)$$

Thus, the Quantity Theory is based on the proposition that the velocity (V) is stable. Therefore, if money supply (M) increases, with the velocity remaining stable, the total spending (PQ) will rise. This implies that money is the key determinant of aggregate demand.

However, the modern Quantity Theorists led by Friedman (1956) hold the view that inflation is always and everywhere a monetary phenomenon, which arises from a more rapid expansion in the quantity of money than in real output. Their reason is that money is used to purchase not only the final output (Q) but also intermediate products. Their transaction version of the equation of exchange is expressed as:

$$MV_t = PT \quad (3)$$

Where, T represents total transactions and V_t is the transaction velocity, which is defined as being equal to PT/M.

The above equation is regarded as an identity which must always hold no matter the level of economic activity. Therefore, monetarists maintain that monetary policy is a more portent instrument than fiscal policy in economic stabilization.

2.1.2. Keynesian Theory of Inflation

The Keynesians hold the view that money does not matter and as such fiscal policy is a more powerful tool for economic stabilization. According to Keynes (1936) the increase in aggregate demand is the source of demand- pull inflation. When the aggregate demand exceeds the aggregate supply at full employment, inflationary gap sets in. Hence, the larger this gap, the more rapid the inflation; Keynes used the notion of inflationary gap to show price inflation.

The Keynesian chain of causation between changes in nominal income and prices is indirect one through the rate of interest. When the quantity of money increases, it first affects the interest rate, which tends to fall. A fall in interest rate will in turn increase investment, which will raise aggregate demand. A rise in aggregate demand will affect output first and not prices as long as there are unemployed resources.

The Keynesian theory holds the view that prices are determined by non monetary factors. However, at the beginning of the 1980s, this theory lose credibility and monetary theory held high by economists such as Milton Friedman, Karl Brunner and Alton Meltzer, who suggest that monetary regulation can stabilize the economy.

2.2. Empirical Literature

Several studies have been carried out at both international and national levels on the nexus between monetary policy and inflation dynamics. De Grauwe and Polan (2005) examined the link between money supply and inflation in 160 countries using 30 years of data range. The results show that inflation is a monetary phenomenon and that the link between inflation and money growth rate is positive and much stronger only in countries with high inflation rates. In a similar study, Bernanke (2006) tested the Quantity Theory (QT) of money using data from United States of America for the period 1961 – 1988. The result shows that there is a positive significant relationship between price changes and changes in the quantity of money.

Aikaeli (2007) examined the relationship between money supply and inflation in Tanzania for the period 1994 – 2006. Applying GARCH model in the analysis, the result shows that it takes a period of 7 months for fluctuations in money supply to have an impact on inflation rate in Tanzania.

Ndanshau (2010) also in Tanzania, adopted Autoregressive Distributed Lag (ARDL) model on quarterly data for the period 1967 – 2005 to analyze the role of money in explaining inflation dynamics in the country. Employing M_0, M_1 and M_2 as monetary aggregates, the result failed to identify any relationship between money and inflation. The conclusion drawn is that money is of less importance in determining inflation in Tanzania. In another study, Ndanshau (2012) included budget deficit to analyze the impact of changes in monetary policy on inflation rate in Tanzania. Applying Granger causality test and Vector Error Connection (VEC) model to estimate the data set, the result indicates that changes in monetary policy regime have an influence on inflation rate in Tanzania.

Contrary to the finding by Ndanshau (2012); Ayubu (2013) examined the degree to which inflation is as a result of monetary phenomenon in Tanzania. In the study, money supply was compared with other potential determinants, which includes output, exchange rate, and international oil price. Applying the Structural Vector Autoregressive (SVAR) and VEC models for the period 1993 Q4 – 2011 Q4, the empirical results show that inflation in Tanzania is more of an output factor than monetary phenomenon.

Alemu, Mulugeta, and Wassie (2016) examined the share of money supply in explaining the dynamics of inflation in Ethiopia for the period 1994/75 – 2014/15. Applying the Johansen method of cointegration and Granger causality test, the empirical results indicate that money supply, real GDP, trade openness, real exchange rate, budget deficit and nominal deposit rate variables are important in explaining the long run dynamics of inflation. Money supply was estimated to impose the dominant effect towards validating the classical Quantity Theory.

Dany-Knedlik and Gracia (2018) investigated the evolution of inflation dynamics in the five largest Association of South East Asian Nations (ASEAN) economies (Indonesia, Malaysia, the Philippines, Singapore and Thailand) for the period 1997 – 2017. Basing the analyses on country – specific Philips curves, the result indicates evidence of forward – looking, dynamic and a better anchoring of inflation expectations consistent with the improvements in monetary policy framework in the country.

At the national level, many empirical studies have equally been conducted. In a study on the relationship between money supply, inflation and output in Nigeria, Chimobi and Uche (2010) employed cointegration and Granger causality techniques. The results indicate that money supply has significant causal effect on output and inflation. It is also found that there is no cointegration relationship between money supply, output and inflation.

Nenbee and Madume (2011) investigated the impact of monetary policy on macroeconomic stability in Nigeria for the period 1970 – 2009. Using cointegration and Error correction (ECM) techniques, the results show that 47

per cent of total variations in the model are attributed to changes in money supply, minimum rediscount rate and treasury bills rate. The conclusion drawn is that inflation is not always a monetary phenomenon.

Onwuchukwu (2004) investigated the impact of monetary policy on inflation control in Nigeria, covering the period 1970 – 2010. Applying the method of Ordinary Least Squares (OLS) on inflation rate (department variable) and bank rate, liquidity ratio and broad money supply (M_2) as independent variables, the results show that all the variables, except exchange rate, are statistically significant in explaining changes in inflation in Nigeria.

Obi and Uzodigwe (2015) assessed the dynamic linkage between money supply and inflation in ECOWAS member states, West African Monetary Zone (WAMZ) and West African Economic Monetary Union (WAEMU) for the period 1980 – 2012. Applying panel regression, the random effect model for ECOWAS member states shows that the impact of money supply on inflation is effective in the current and first period. The impact is effective in the first period for WAMZ while WAEMU experiences that impact in the current period. The significant country – specific effects on the variables implies that the objective of macroeconomic convergence is yet to be achieved in the zone.

Tamunonimim (2016) empirically examined the effectiveness of monetary policy in controlling inflation in Nigeria for the period 1985 – 2012. The study modeled inflation rate as a function of monetary policy rate (MPR), treasury bills rate (TBR), savings rate (SR), prime lending rate (PLR), maximum lending rate (MLR), growth of narrow money (M_1), broad money (M_2), net domestic credit (NDC), net credit to government (NCG) and credit to private sector (CPS). Applying the OLS method, the results show that MPR, TBR, MLR and NDC are not significant in explaining changes in inflation rate while SR, M_1, M_2.MCG and CPS are statistically significant.

It is evident that the empirical studies reviewed above on the link between monetary policy and inflation dynamics have produced mixed results. Some studies have found that inflation is a monetary phenomenon (Alemu et al., 2016; Bernanke, 2006; Chimobi & Uche, 2010; De Grauwe & Polan, 2005). Conversely, some studies have found that inflation is not a monetary phenomenon (Aikaeli, 2007; Ayubu, 2013; Ndanshau, 2010; Nenbee & Madume, 2011). Moreover, most of the studies in Nigeria failed to include real output proxied by real GDP (Onwuchukwu, 2004; Tamunonimim, 2016).

It is the above discrepancies that motivated and provoked this study.

3. Methodology

This study adopted Autoregressive Distributed Lag (ARDL) model, applying bounds test, in estimating the data set. The choice of this model is guided by the fact that it is applied irrespective of the order of integration of the variables; whether they are I(0) or I(1) (Pesaran, Shin, & Smith, 2001). Moreover, the model is suitable for small sample size and most importantly, it has the advantage of generating long run and short run results simultaneously.

3.1. Data and Definition of Variables

This study used annual time series data covering the period 1985-2018 on the following variables.

Inflation Rate (INFr). This is proxied by percentage change in consumers' price index (CPI). CPI best represents inflation of the country due to the less developed nature of the economy, where the largest share of spending goes to consumption of final goods and services.

Broad money supply (M_2). This is the principal independent variable and the most preferred monetary aggregate; M_2 is estimated to have the highest correlation with inflation compared to other monetary aggregates (Aikaeli, 2007).

Net Domestic Credit (NDC). This is one of the monetary policy variables that affect inflation. Monetary Policy Rate (MPR). This is the CBN's official interest rate policy. When this rate changes, all other interest rates change in the same direction.

Real GDP Growth Rate (RGDPr). This is used as a measure of changes in real income or real output.

Exchange Rate (EXR). This is the national currency (Naira) per us dollar, that is, ₦/$. This represents the foreign sector and captures international transmission of inflation.

3.2. Model Specification

This study adopted the model used by Ayubu (2013) with some modifications; net domestic credit to the economy and monetary policy rate are included in the current study. The long run relationship between changes in inflation rate and independent variables (M_2, NDC, MPR, RGDPr, and EXR) is specified below:

$$INFr_t = \beta_0 + \beta_1 M_{2t} + \beta_2 NDC_t + \beta_3 MPR_t + \beta_4 RGDP_{rt} + \beta_5 EXP_t + \mu_t \quad (4)$$

Where, INFr, M_2, NDC, MPR, RGDPr, and EXP are as defined in 3.1 above. B_0 is the constant intercept while β_1-β_5 are the coefficients of the variables respectively.

μ is the error term and t is the time period.

3.3. Economic a Priori of the Variables

The coefficient of M_2 (β_1) is expected to be positive; an increase in money supply will increase inflation and vice versa. The coefficient of NDC (β_2) is expected to be positive; an increase in net domestic credit will increase inflation and versa. The coefficient of MPR (β_3) can be negative or positive. The coefficient of real output, RGDPr (β_4) is expected to be negative; an increase in real output will reduce inflation and vice versa. The coefficient of EXR (β_5) can be positive (showing currency depreciation) or negative (showing currency appreciation).

3.4. Estimation Techniques

To estimate and analyze the data, Augmented Dickey and Fuller (1979) and Phillips and Perron (1988) unit root tests were conducted before the application of ARDL approach to cointegration. This is to ensure that none of the variables is integrated into order two [I,(2)], which is the condition for the application of ARDL model.

After the unit root tests, ARDL bounds test procedure was conducted to determine the long run relationship between changes in inflation rate and independent variables. Following (Pesaran et al., 2001) the ARDL format of Equation 4 above becomes:

$$\Delta INF_{rt} = \beta o + \sum_{i=1}^{p} \beta_1 \Delta INF_{rt-i} + \sum_{i=1}^{p} \beta_2 \Delta M_{2t-i} + \sum_{i=1}^{p} \beta_3 \Delta NDC_{t-i} + \sum_{i=1}^{p} \beta_4 \Delta MPR_{t-i} + \sum_{i=1}^{p} \beta_5 \Delta RGDP_{rt-i} + \sum_{i=1}^{p} \beta_6 \Delta EXR_{t-i} + \lambda_1 INFrt + \lambda_2 M_{2t} + \lambda_3 NDC_t + \lambda_4 MPR_t + \lambda_5 RGDPrt + \lambda_6 EXRt + \varepsilon_t \quad (5)$$

Where, t is the time period, Δ is first difference operator, β_0 is the constant, β_1 - β_6, with summation signs, represent the short run dynamics, while λ_1 - λ_6 represent the long run coefficients, respectively. P_S are the optimum lags order selected by Akaike information criteria and ε is the error term.

When cointegration between inflation rate (dependant variable) and independent variables exists, the Error connection Model (ECM), which measures the short run dynamics or adjustment of the cointegrated variables towards their equilibrium values, has to be estimated.

The general error correction representation of Equation 5 becomes:

$$\Delta INF_{rt} = \beta o + \sum_{i=1}^{p} \beta_1 \Delta INF_{rt-i} + \sum_{i=1}^{p} \beta_2 \Delta M_{2t-i} + \sum_{i=i}^{p} \beta_3 \Delta NDC_{t-i} + \sum_{l=1}^{p} \beta_4 \Delta MPR_{t-i} + \sum_{i=1}^{p} \beta_5 \Delta RGDP_{rt-i} + \sum_{i=1}^{p} \beta_6 \Delta EXR_{t-i} + \theta ECM_t + \varepsilon_t \quad (6)$$

For a stable system, the coefficient of ECM (Θ), which measures the speed of adjustment of the dependent variable to the value implied by the long run equilibrium relationship, is expected to be fractional negative and significant.

To test for the existence of cointegration, the null hypothesis of no cointegration among the variables, defined by:

Ho: $\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = 0$ is tested against the alternative:

H_1: $\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 \neq 0$

F test was conducted for the bounds test. This test has two sets of critical values; one set assumes that all variables are of order I (0) and the other assumes that they are I(1). If the computed F statistic falls above the upper bound critical value, which corresponds to I (1), the null hypothesis of no cointegration is rejected. If it falls below the lower bound, which conesponds to I(0), the null hypothesis is not rejected. If it falls between the two bounds, the result is inconclusive. The order of lag was selected by the Akaike information. Criteria.

3.5. Post Estimation Tests

The robustness residual tests conducted include, Jarque-Bera (for normality test), Lagrange Multiplier (LM) test for serial correlation, Breusch-Pagan-Godfrey test for heteroscedasticity and Ramsey Reset test for model specification.

4. Presentation and Discussion of Results

4.1. Descriptive Statistics

Table-1. Result of descriptive statistics.

Variable	Mean	Median	Standard Deviation	Skewness	Kurtosis	Observations
INFr	19.694	12.100	18.924	1.675	4.685	34
M2	23.589	20.480	15.739	0.557	2.318	34
NDC	30.869	15.565	56.688	2.440	12.132	34
MPR	13.662	13.500	3.890	0.745	4.734	34
RGDPr	4.955	5.400	3.812	0.383	2.628	34
EXR	99.012	115.255	86.462	0.684	2.893	34

The result of the descriptive statistics presented in Table 1 above shows that exchange rate has the highest mean of 99.012, followed by net domestic credit (30.869), broad money supply (23.589) and inflation (19.694). Real output has the least mean of 4.955. Exchange rate has the highest standard deviation of 86.462 and hence, more variable. Real output has the least standard deviation of 3.812 and hence, it is less variable. The values of the skewness for all the variables are different from zero (0) and the values of their respective kurtosis are different from 3. These indicate a non-normal distribution for the series.

4.2. Unit Root Tests

To avoid the problem of spurious regression, which is associated with time series data, unit root tests were conducted. Augmented Dickey – Fuller (ADF) and Philips-Perron (PP) Statistics were adopted to determine the stationary status of the variables. The results of ADF and PP unit root tests are presented in Table 2 below.

Table-2. Results of ADF and PP unit root tests.

ADF Unit Root Test Result			PP Unit Root Test Result		
Variables	**Constant**	**Constant & Trend**	**Constant**	**Constant & Trend**	**Inference**
INFr	-5.230659(0.0002)*	-5.331126 (0.0012*)	-7.518778 (0.0000)*	-7.186417 (0.000)*	I (1)
M2	-3.438498(0.0166)**	-3.756007 (0.0322)**	-3.398155 (0.0183)**	-3.704699 (0.0361)**	I (0)
NDC	-5.70273 (0.0000)*	-5.605770 (0.0003)*	-5.750796 (0.0000)*	-5.639814 (0.0003)*	I (0)
MPR	-7.939559 (0.0000)*	-7.83861(0.0000)*	-8.052707(0.0000)*	-7.948975(0.0000)*	I(1)
RGDPr	-7.605874(0.0000)*	-4.603335(0.0000)*	-13.79743 (0.0000)*	-17.42948 (0.0000)*	I(1)
EXR	-4.039880 (0.0038)*	-4.264177 (0.0102)*	-3.99351 (0.0043)*	-4.100729 (0.0150)*	I (1)

Note: * and ** implies rejection of the null hypothesis @ 1% and 5% critical values respectively; I(1) and I(0) show order of integration; [ ] are the p – values and the variables are as defined earlier.

The results of both ADF and PP unit root tests show that broad money supply (M_2) and net domestic credit (NDC) are stationary at levels, that is, they I (0) process. This implies that they do not contain unit root. On the other hand, changes in inflation rate (INFr), monetary policy rate (MPR), real output (RGDPr) and exchange rate (EXR) are stationary at first difference, that is they are I(1) process. Therefore, they contain unit root. The existence of unit root in most variables paves way for further investigation on the nature of the long run relationship among the variables.

4.3. Cointegration

The results of the unit root tests from Augmented Dickey-Fuller and Philips-Perron statistics show that the series contain a mixture of I (0) and I(1) variables. Therefore, ARDL approach becomes the most appropriate procedure for testing for cointegration between the dependent variable (inflation rate) and independent variables (money supply, net domestic credit, monetary policy rate, real output and exchange rate). The result of ARDL, applying bounds testing procedure, is presented in Table 3 below.

Table-3. Result of ARDL bounds test.

ARDL Bounds Test		
Date: 05/27/20 Time: 11:39		
Sample: 1987 2018		
Included observations: 32		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	3.939702	5
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

The result of the bounds test presented above shows that the value of F statistic is 3.939702. Since this value is greater than the upper bound, I(1), critical value of 3.79 at 5 per cent level of significance, the null hypothesis of no cointegration is rejected. This implies that there is long run relationship between inflationary pressure and monetary policy changes.

The existence of cointegration among the variables necessitates testing for the short run and long run impact of monetary policy changes (money supply, net domestic credit, monetary policy rate, real output and exchange rate) on inflationary pressure in Nigeria.

4.4. Presentation and Discussion of ARDL Short Run and Long Run Results

Table-4. ARDL short run and long run results.

ARDL Cointegrating And Long Run Form				
Dependent Variable: INFR				
Selected Model: ARDL(2, 0, 0, 1, 0, 0)				
Date: 05/27/20 Time: 11:46				
Sample: 1985 2018				
Included observations: 32				
Cointegrating Form				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(INFR(-1))	0.465302	0.174586	2.665176	0.0138
D(M2)	0.137106	0.200482	0.683881	0.5009
D(NDC)	0.015412	0.046754	0.329638	0.7447
D(MPR)	-1.032745	0.809355	-1.276010	0.2147
D(RGDPR)	-1.420887	0.640996	-2.216686	0.0368
D(EXR)	-0.056380	0.036986	-1.524359	0.1411
CointEq(-1)	-0.757393	0.178052	-4.253775	0.0003
Cointeq = INFR - (0.1810*M2 + 0.0203*NDC + 0.9705*MPR -1.8760				
*RGDPR -0.0744*EXR + 18.9716)				
Long Run Coefficients				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
M2	0.181023	0.278854	0.649168	0.5227
NDC	0.020349	0.062104	0.327656	0.7461
MPR	0.970465	1.053042	0.921582	0.3663
RGDPR	-1.876024	0.921553	-2.035721	0.0535
EXR	-0.074439	0.042950	-1.733172	0.0965
C	18.971627	17.622865	1.076535	0.2929

The above results show that changes in broad money supply (M_2) have positive impact on changes in inflation rate both in the short run and long run. This conforms to a priori expectation. In the short run, an increase in money supply by 1 per cent increases inflation by 13.71 per cent while in the long run, an increase in money supply by 1 per cent increases inflation by 18.10 per cent. However, the impact of changes in money supply on inflation is insignificant both in the short run and long run as indicated by the probability values of 0.5009 and 0.5227

respectively. This finding agrees with the findings of Aikaeli (2007) and Ndanshau (2010) in the empirical literature.

The results also show that net domestic credit has positive impact on inflation both in the short run and long run. This conforms to a priori expectation. However, the impact is insignificant as indicated by the probability values (0.7447 and 0.7461) respectively. This finding agrees with the finding of Tamunonimim (2016) who finds that net domestic credit is not significant in explaining inflationary changes in Nigeria.

Monetary policy rate has negative impact on inflation in the short run and positive impact in the long run. However, its impact in both short run and long run is insignificant. This finding agrees with the finding of Tamunonimim (2016) who finds that monetary policy rate is not significant in explaining inflationary changes in Nigeria. The change in signs from negative in the short run to positive in the long run indicate policy shift. Its insignificance implies that interest rate channel of monetary policy is less effective in dealing with the long run process of inflation in Nigeria.

The real output has negative and significant impact on changes in inflation rate both in the short run and long run. The negative sign is in line with the a priori expectation. This implies that real output is more important in explaining the long run dynamism of inflation than monetary variables. This finding agrees with the finding of Ayubu (2013) in Tanzania.

Exchange rate has negative and insignificant impact on inflation both in the short run and in the long run. The negative impact shows appreciation of naira. However, the appreciation is not significant to boost economic activity because of the import-dependent nature of the Nigerian economy. This finding agrees with Onwuchukwu (2004).

The error correction term, which measures the speed by which short term deviations in inflation model can converge back to, or diverse from its long run equilibrium, is -0.757391. It is correctly signed, fractional and significant. The negative and significant impact imply that any short term distortions in the inflation model could be corrected; the short term deviations could converge to long run equilibrium at the annual speed rate of 75.7 per cent. This shows a high speed of adjustment to equilibrium after a shock.

4.5. Robustness Tests

The diagnostic tests carried out for the robustness of the model include, Breusch-Godfrey LM test for serial correlation, Breush-Pagan-Godfrey test for heteroscedasticity, Ramsey Reset test for model specification and Jarque-Bera test for normality.

Table-5. Results of the robustness tests.

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.070199	Prob. F(2,21)	0.3609
Obs*R-squared	2.959876	Prob. Chi-Square(2)	0.2277

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.791576	Prob. F(8,23)	0.6153
Obs*R-squared	6.908472	Prob. Chi-Square(8)	0.5465
Scaled explained SS	9.997517	Prob. Chi-Square(8)	0.2652

Ramsey RESET Test			
Equation: UNTITLED			
Specification: INFR INFR(-1) INFR(-2) M2 NDC MPR MPR(-1) RGDPR EXR C			
Omitted Variables: Squares of fitted values			
	Value	df	Probability
t-statistic	1.925938	22	0.0671
F-statistic	3.709238	(1, 22)	0.0671

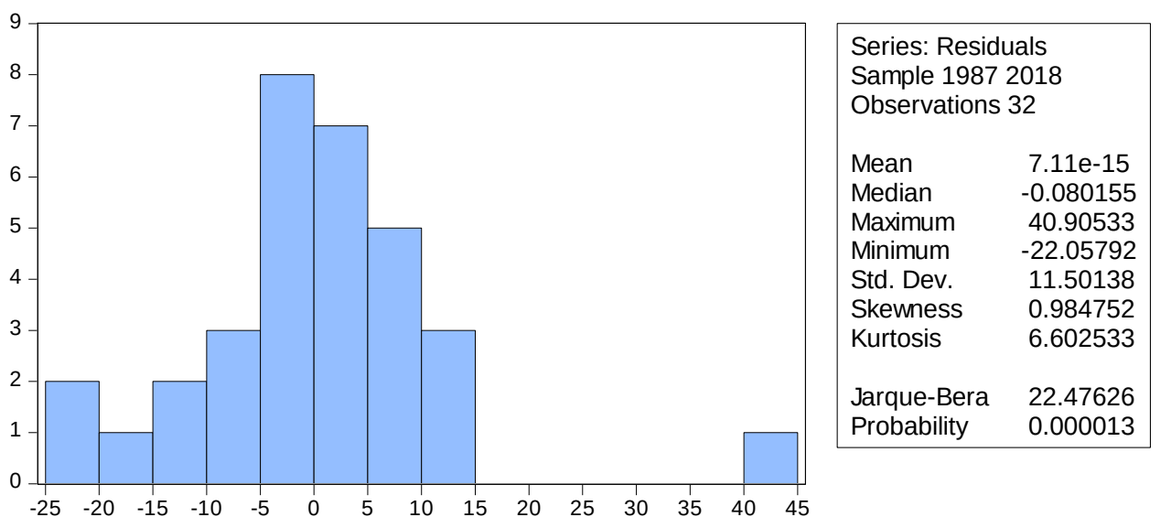

Figure-1. Jarque-Bera normality test histogram.

From the results of the above tests, the probability values for Lm test, heteroscedasticity and Ramsey Reset tests are greater than 0.05 respectively. This implies that there is no serial correlation problem; the residuals are

homoscedastic; and that the functional form of the model is well specified. However, the probability value of Jarque-Bera is lower than 0.05, which indicates that the residuals are not normally distributed. Be that as it may, the normality assumption may not be very crucial in large data sets (Gujarati & Porter, 2009).

5. Summary, Conclusion and Recommendations

5.1. Summary and Conclusion

This study examines monetary policy changes and inflationary pressure in Nigeria. The objective is to analyse the impact of monetary policy changes on inflationary pressure in Nigeria so as to identify whether inflation is a monetary phenomenon in the country. Annual time series data on changes on inflation rate, broad money supply, net domestic credit, monetary policy rate, real GDP growth rate and exchange rate were collected for the period 1985-2018 from CBN Statistical Bulletin, 2018 issue. To analyse the data, Autoregressive Distributed Lag (ARDL) model was adopted.

The empirical results show that changes in broad money supply (M_2) have positive but insignificant impact on inflationary pressure in Nigeria both in the short and long run.

It is also found that net domestic credit has positive impact on inflation in Nigeria. However, its impact is not significant, implying that it is not significant in explaining inflationary pressure in Nigeria.

Monetary policy rate (the CBN interest rate) has negative impact on inflation in the short run and positive impact in the long run. However, its impact in both the short run and long run is insignificant and the change of sign indicates policy shifts.

The real output has negative and significant impact on inflation both in the short run and long run. This implies that real output is more important in explaining the long run dynamism of inflation in Nigeria than monetary variables.

The results also show that exchange rate has negative and insignificant impact on inflation both in the short and long run.

The error correction term, which measures the speed of adjustment to equilibrium after a shock, is correctly signed (negative) and significant. This implies that short term deviations in inflation model will converge to long run equilibrium at the annual speed rate of 75.7 percent.

The conclusion drawn is that since real output is more important in explaining the long run dynamism of inflation than the monetary variables, inflation in Nigeria is more of output than monetary phenomenon.

5.2. Recommendations

Based on the findings emanating from this research, the following recommendations are made. Real output is found to be significant both in the short run and long run in explaining inflationary pressure in Nigeria. There should be massive investment in agricultural sector since more output is sourced from this sector. Improvement in agricultural productivity and hence, output will help to reduce food prices inflation. This will, in turn, explain more than half of consumer price index (CPI), which will support the process of price stabilization and growth in general.

Exchange rate is found to have negative impact on inflation (showing appreciation of the domestic currency), but the impact is insignificant. The insignificance impact of exchange rate arises from the fact that Nigeria exports mainly primary products which have elastic demand in international market. As a result, reducing the exchange rate will only lead to more inflation. Therefore, there is the need to diversify the export base of the economy.

Monetary policy rate is among the monetary policy instruments of CBN. Its insignificance implies that interest rate channel of monetary policy is less effective in dealing with the long run process of inflation in Nigeria. Therefore, exchange rate, interest rate and prices should be programmed jointly because they are closely linked with money supply in an open economy like Nigeria.

There is the need, for further research, to incorporate the government fiscal discipline, especially with respect to deficit expenditure into the entire policy package. This is because monetary policy alone may not really be very effective means of achieving price stability in Nigeria. This will help to reduce inflationary pressure in Nigeria.

References

Aikaeli, J. (2007). Money and inflation dynamics: A lag between change in money supply and the corresponding inflation response in Tanzania. Working Papers Series.Available at: http://dx.doi.org/10.2139/ssrn.1021227.

Alemu, M., Mulugeta, W., & Wassie, Y. (2016). Monetary policy and inflation dynamics in ethiopia: An empirical analysis. *Global Journal of Human-Social Science: (E) Economics, 16*(4), 45-60.

Ayubu, V. S. (2013). *Monetary policy and inflation dynamics: An empirical case study of Tanzanian Economy.* M.Sc Thesi,s Department of Economics, University of Dares Salaam, Tanzania.

Bernanke, B. S. (2006). *Monetary aggregates and monetary policy at the Federal Reserve: A historical perspective.* Paper presented at the The Fourth EBS Central Banking Conference, Germany.

Chimobi, O. P., & Uche, U. C. (2010). Money, price and output: A causality test for Nigeria. *American Journal of Scientific Research, 8*(5), 78-87.

Dany-Knedlik, G., & Gracia, J. A. (2018). Monetary policy and inflation dynamics in ASEAN economies. *IMF Working Papers, No. WP /18/147,1-37.*

De Grauwe, P., & Polan, M. (2005). Is inflation always and everywhere a monetary phenomenon? *Scandinavian Journal of Economics, 107*(2), 239-259.Available at: https://doi.org/10.1111/j.1467-9442.2005.00406.x.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American statistical association, 74*(366a), 427-431.Available at: https://doi.org/10.1080/01621459.1979.10482531.

Fischer, S. (1993). The role of macroeconomic factors in growth. *Journal of Monetary Economics, 32*(3), 485-512.Available at: https://doi.org/10.1016/0304-3932(93)90027-d.

Fisher, I. (1911). *The purchasing power of money.* New York: MacMillan Press.

Friedman, M. (1956). *A restatement of the quantity theory of money. In M. Friedman (Ed.), Studies in the quantity theory of money.* Chicago: University of Chicago Press.

Gujarati, D. N., & Porter, D. C. (2009). *Basic econometrics* (5th ed.). New York: McGraw-Hill companies Inc.

Isiwu, G. D., & Aminu, U. H. (2018). Relationship between corruption and inflation in Nigeria. . *International Journal of Science and Research (IJSR), 7*(12), 39-46.

Keynes, J. M. (1936). *The general theory of employment, interest and money.* New York: Harcourt Brace.

Meltzer, T. C. (1997). To conclude: Keep inflation low and, in principle, eliminate it. *Federal Reserve Bank of St Louis Quarterly Review, 79*(6), 3-8.

Ndanshau, M. A. (2010). Money and other determinants of inflation: The case of Tanzania. *Indian Journal of Economics and Business, 9*(3), 1-37.

Ndanshau, M. A. (2012). Budget deficits, money supply and inflation in Nigeria: A multivariate Granger causality test (1967-2010). *University of Dares Salaam Working Paper, No. 04/12.*

Nenbee, S., & Madume, J. (2011). The impact of monetary policy on Nigeria's macroeconomic stability (1970–2009). *International Journal of Economic Development Research and Investment, 2*(2), 174-183.

Obi, K. O., & Uzodigwe, A. A. (2015). Dynamic impact of money supply on inflation: Evidence from ECOWAS member states. *10SR Journal of Economics and Finance, 6*(3), 10-17.

Ogwuma, P. A. (1997). An effective monetary policy for nation building. *CBN Bullion, 21*(3), 3-10.

Onwuchukwu, C. I. (2004). Impact of monetary policy on inflation control in Nigeria. *Munich Personal RePEC Archive (MPRA), Paper No: 67087, 1-14.*

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16*(3), 289-326.Available at: https://doi.org/10.1002/jae.616.

Phillips, P. C., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika, 75*(2), 335-346.Available at: https://doi.org/10.1093/biomet/75.2.335.

Tamunonimim, A. N. (2016). Monetary policy and inflation in Nigeria. *International Journal of Finance and Accounting, 5*(2), 67-76.Available at: 10.5923/j. jjfa. 20160502.01.