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Is Inflation Always and Everywhere a Monetary Phenomenon? Evidence from Nigeria: 1980 - 2016

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Abstract

Money supply is thought as capable of increasing inflation and the output level in an economy. In Nigeria however, monetary growth is seen to have been accompanied with increases in the price level over the years. This study is aimed at evaluating the existing relationship between Money Supply and Inflation in Nigeria between 1980-2016. To achieve this, the study employed the use of the ARDL bound testing approach to co-integration on the annual series of broad Money supply, CPI and the exchange rate. After correcting for the apparent structural breaks in the series, the long run result established that both money supply and the exchange rate were found to have positive impact of 0.31% and 0.96% on the inflation rate. This finding lends empirical support to the monetarist view of inflation. The study therefore recommends as thus: the monetary authority should consider an alternative framework for monetary policy that will better anchor prices- say Nominal-GDP targeting as the current monetary targeting regime appears to be inefficient in anchoring price.

Keywords: Monetarist, Structural breaks, ARDL, exchange rate, inflation
JEL Codes: E31, E50

1. Introduction

One of the fundamental goals of a modern economic system is to keep prices of goods and services stable at rates that would not be detrimental to the economic system (Asekunowo,2016). Whereas 3% to 6% rate of inflation will spur economic activity through increased investment, production and wages, a high inflation rate in the range of double digit may produce a negative economic effect (Abraham, Helen & Gosele, 2015). Changes in the size of money supply have a number of implications on the macroeconomics variables especially inflation (Bakare, 2015). According to Nyong (2001), inflation varies ceteris paribus positively in relation to the growth in money supply. This is the contention of the monetarists as profess a one-to-one relationship between money supply and the general price level (MacCandless & Weber, 2005).

The two giant schools of taught in economics (Classicals and Keynesians) explained the role of money supply on the inflation rate of any economy through the Aggregate demand-Aggregate supply framework. While, the Classicals view the aggregate supply (AS) curve as vertical as any increase in money supply leads to increase in prices through increased demand. The Keynesians contend that it is an inverted L-shape. This is because, as long as there is idle resources in the economy an increase in the money supply leads to an increase in aggregate

demand, output and employment the short-run but translates into higher prices in the long run (Hussain, et.al. 2010).

Akinbobola (2012) offered three major explanations of inflation which include fiscal, monetary and balance of payments aspects. While in the monetary aspect, inflation is considered to be due to an increase in money supply, in the fiscal aspect, budget deficits are the fundamental cause of inflation in countries with prolonged high inflation. However, the fiscal aspect is closely linked to monetary explanations of inflation since government deficits are often financed by money creation in developing countries. In the balance of payments aspect, emphasis is placed on the exchange rate. Simply, the collapse of exchange rate brings about inflation either through higher import prices and increase in inflationary expectations, which are often accommodated, or through an accelerated wage indexation mechanism.

Many economists that favour traditional adjustment strategies contend that monetary growth, arising particularly from the domestic bank financing of large budget deficits, is the major source of inflationary pressures (UNECA, 1989 cited in Akinbobola, 2012). The negative consequences of inflation cannot be overemphasized. Inflation creates uncertainty which discourages savings and investment it erodes the gains from growth and leaves the poor worse off thereby increase the divide between the rich and poor in the society (Abraham, et. al. 2015).

A careful survey of the literature shows that myriads of empirical literature exist on the relationship between money supply and inflation in Nigeria and other countries alike (see: MacCandless & Weber 2005; Abraham et. al (2015); Akinbobola (2012); Asekunowo(2016) Bakare (2012); Chuba (2015); Ezekiel et. al (2014); Inam (2014); Mbutor 2014). However, it was noted from the literature that, previous studies so far reviewed ignored the structural breaks that are very apparent in the series. This portends great negative consequences on the results gotten. The breaks seen are sturdy enough to generate divergence and wrong inferences. This study aims at complementing these earlier efforts by taking care of the noticeable breaks in the series in its estimation.

The paper follows the following sequence: section one gives the introduction and motivation for the work. Section two presents some stylized facts on money supply and inflation in Nigeria as well as highlights the findings of some important related literature. Section three contains the econometrics method as well as the data sets used while section four present and discusses the result. The study is concluded in section five.

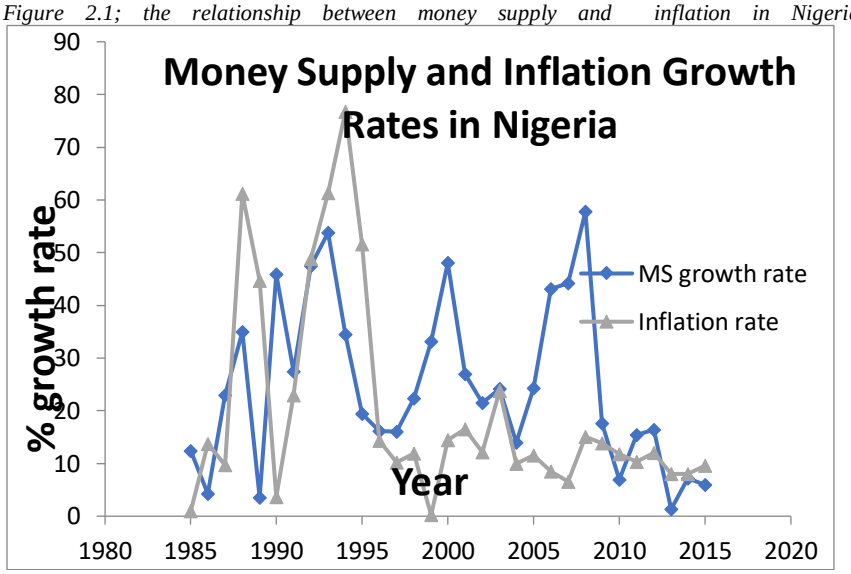
2. Literature Review and Thoretical Framework

Stylized Facts about Money Supply and Inflation in Nigeria

Nigeria had the economic impetus to reach its dream land in less than two decades from independence and still is; given its vast abundance of both human and natural resources, coupled with favorable climatic conditions that support all kinds of agricultural and manufacturing endeavors. This expectation was further strengthened by the oil boom in the 1970s. As a result massive oil money has being constantly injected into the economy with the view of expanding the productive base of the economy. However, the accompanying effect of this is the surging levels of prices overtime.

As a result of the over dependence on oil, the Nigerian mono economy is therefore exposed to the volatility of the world oil price. Consequently, the macroeconomic variables of money supply and the inflation rate among others have being characterized with several cyclical upswings and downswings. This can be seen in figure 2.1 below;

Figure 2.1; the relationship between money supply and inflation in Nigeria.



Data source: World Development Indicator, (2017)

Looking at figure 2.1, it could be seen vividly that there are four episodes of cyclical ups and downs in the behavior of the two macroeconomic variables of money and inflation in Nigeria. During the 1980s, the high rate of inflation of 61.2 per cent in 1986 was attributable to the increase in the level of money supply and the foreign exchange crises of the 1980s. The spillover effects of the windfall gains of the oil money flow of the 1970s further aggravated the situation. In the second period, money supply growth rate is seen to have increased to 53.76 per cent in 1991 and consequently inflation inched up to 76.8 per cent in 1993. Devaluation, Credit expansion, wage adjustments in addition to the increased liquidity may have influenced the rate of inflation. Consequent upon this, the indirect monetary control was adopted at the beginning of this period (1993-date) to control the growth of monetary aggregates in the belief that inflation is caused primarily by the persistent expansion in money supply (Ojo, 2013). As a reaction to the surging prices the average output level shrunk. This is not surprising as Babatunde & Shuaibu (2011) labeled inflation as a retardant to growth.

The third split shows improvement as money supply remains at averagely 27 per cent. Here, the inflation rate dropped to 12.7%. Also in the last episode, both variables reduced moderately with decrease in money supply being the highest. This is not unconnected with the government's renewed efforts in strengthening its stabilization measures in the economy through several reforms policies, fiscal discipline and good monetary and exchange rate policy etc. the CBN independence granted in 2005 further strengthened it as well as its ability to control the level of prices.

Empirical Review

Several works have been conducted on the impact of money supply on the inflation rate both in Nigeria and other countries alike. For example, Akinbobola (2012) reports a negative relationship between money supply and exchange rate on the inflation rate of Nigeria. He opined that, the inverse effect of

money supply on price level is that inflation may not be due to aggregate demand pressure but rather due to hiccups in the supply chain of goods both from the domestic and foreign supply outlets. On the contrary, the usual argument of the Monetarist school of thought that says money matters was given credence in Bakare (2012) as the results of the Error Correction Mechanism employed reveals 1% to 5.6% positive relationship between money supply growth and inflation in Nigeria from 1981 to 2006. This positive relationship between money supply and inflation is not only reported in Nigeria rather in Romania, Păun & Topan (2013) established Inflation has a monetary cause, as the basic VAR model performed on endogenous variables shows a unidirectional causality between M2 dynamics and CPI dynamics. However, from the results obtained reveals no statistical relevance for M1 on the inflation rate of Romania.

Odiba, et al (2013) examined the effects of both money supply and aggregate demand on the price level between the years 1986-2009. Through the use of OLS technique, a multiple regression model was estimated and the result suggested that there exist a strong positive relationship between money growth rate and the level of prices. The work of Dayo and Kemi (2013) also supports the positive relationship as they found money supply exerts considerable influence on the rate of inflation. But Inam (2014) has a contrasting result. His study refutes the monetarist explication of inflation. Having employed a multivariate co-integration regression technique, the study reveals that: there exists a long run relationship between money supply and inflation in Nigeria; but no causality between money supply and inflation in Nigeria from 1970 to 2011. The study recommends that monetary policies instruments and institutions should be improved and strengthened to effectively manage the money stock and maintain it at acceptable and non-inflationary levels.

Mbutor (2014) employed the use of impulse response analysis in his study of money and inflation dynamics in Nigeria from 1970 to 2012. The results showed that money supply is the most crucial variable for determining inflation in Nigeria other than the contribution of inflation to variations of inflation. Money supply plays an important role in explaining inflation as it accounts for up to 34.5% of aggregate price changes until the tenth period. In similar vein, Chuba (2015) affirm the supposition of the monetarist as the results of the recursive (VAR) model established the transmission mechanism from money supply to inflation in Nigeria from 2000Q1-2013Q4.

Asekunowo (2016) identified exchange rate pass-through of import prices to domestic prices as well as persistence of inflation itself as the causal factors of inflationary pressure in Nigeria from 1974 to 2013. In Moses et. al. (2016) all the three variants of OLS - ordinary least square, fully modify OLS, and dynamic OLS – techniques in order to ascertain the relationship between money supply and inflation in Nigeria from the period 1982q1 to 1996q4. Results from these estimates showed that the overall sample coefficients of money supply of 0.31% was positive and significant at 1, 5, and 10 per cent in the inflation equation for the full sample period, suggesting that money supply bears a long run positive relationship with inflation. The CBN is advised to continue to factor growth in monetary aggregates in its monetary policy considerations aimed at achieving price stability while keeping a keen eye on financial innovations and their impact on money supply. Also, Priscilla (2016) investigated the effect of monetary policy on inflation in Ghana using a modeling technique of the Autoregressive Distributed Lagged Model (ARDL) over a period of 1980 to 2014. The study finds a stable long-run relationship amongst the variables as the results show a statistically significant positive short-run and long-run relationship between money supply and inflation. The study recommends that immediate measures need to be adopted by

the Central Bank to reduce money supply through the sell of government securities.

In conclusion, all works aforementioned, with the exception of Akinbobola (2012) and Inam (2014) provide empirical support to the monetarist explanation of the money supply inflation relations. This is plausible and understandable as the historical series show that over the years the oil money inflows have translated into higher prices. The growth in monetary aggregates was due to factors such as: rapid monetization of oil inflows, minimum wage adjustments, and the financing of government's fiscal deficits through the banking system (Babatunde and Shuaibu, 2012).

Theoretical Framework

This study is hinged to the Fisher's equation of exchange for its theoretical backing. According to the monetary economists, money supply has an equi-proportional relationship with the price level in every economy, they therefore view inflation as nothing more than a monetary phenomenon. Totonchi (2011) posits that, they make use of the quantity theory of money represented by equation of exchange formulated by Irving Fisher (1876-1947) as thus;

$$MV = PT \qquad 2.1$$

Where, M= Money supply; V= the speed with which money changes hands; P = the price level and T= the total transaction during a period of time. MV is therefore, how much money is used to make transactions while PT is the number of money exchanged in a year (Howden, 2013). It is widely agreed to use the GDP (Y) as a proxy for (T) because it is practically impossible to know for certain the number of transactions that take place in a year. This makes the equation to become;

$$MV=PY \qquad 2.2$$

Where **PY** is the nominal GDP. Keeping the velocity constant, makes the equation to become a theory of the effects of money called the Quantity Theory of Money (QTM). Since the velocity is fixed, any change in money supply will eventually lead to changes in the nominal GDP. This means **(M)** determines the value of the economy's output. Inferentially, whenever **(M)** increases, the prices will rise which will eventually leads to a rise in nominal GDP **(PY).** The above rise in price will be termed as inflation; which is calculated as a percentage change in the general price level.

Summarily, when **(V)** and **(Y)** are held constant, due to their exogeneity, any increase in money supply will inevitably increase prices proportionately. A central implication of the QTM is that a given change in the rate of money growth induces an equal change in the inflation rate. Walsh (2003) argued that, any theoretical model not consistent with a roughly one-to-one long run relationship between money growth and inflation is questionable. The QTM is therefore a viable theory in explaining the economic relationship between Money, Inflation in any economy

3. Methodology

Data Source and Variables Description.

The data used in this study is gotten from the World Development Indicators courtesy of the World Bank. The data range from 1980-2016. The Consumer price index CPI is used as proxy for measuring inflation while broad money is used as the measure for the money supply. Also the exchange rate is equally used as an independent variable.

Estimation Techniques

Most time series data analyzed in applied econometrics are found to be non-stationary. Co-integration is a technique used in estimating relationship between non-stationary variables and reconciling the short run dynamics with long run equilibrium (Nkoro & Kelvin, 2016).Commenting further, Nkoro & Kelvin, (2016) assert that, Granger (1981), Engle and Granger (1987), Autoregressive Distributed Lag (ARDL) co-integration technique or bound test of co-integration (Pesaran and Shin 1999 and Pesaran et al. 2001) and, Johansen and Juselius (1990) are all co-integration techniques that have become the solution to determining the long run relationship

between series. The deviation of a variable from its long run equilibrium does affect its short run behavior; the Error Correction Mechanism (ECM) is employed to revert co-integrated variables or to re-parameterize the short-run dynamics and long run relationship of the underlying variables (Nkoro & Kelvin, 2016). Although there are a number of co-integration estimation techniques in the analysis of relationships in economics. This study employed the bound testing approach to co-integration that was developed by (Pesaran and Shin 1999 and Pesaran et al. 2001). This is because it is not only superior to the rest of the aforementioned, the unit root test conducted showed that the variables were not of the same order rather of orders *I*(0) and *I*(1).

According to Peasaran and Shin (1995) the ARDL has numerous advantages over all other methods of testing for co-integration including the two most notable other methods of Johansen's (1991) maximum likelihood approach and Phillips-Hansen's (1990) fully modified OLS procedure. The advantages of the ARDL approach to co-integration developed by Peasaran and Shin (1999) and Peasaran *et al*. (2001) over the other traditional co-integration methods include; flexible to analyze data of variables with different order of integration that is to say it can be applied when the underlying variables are *I*(0), *I*(1) or mutually co-integrated and also has the additional advantage of yielding consistent estimates of the long-run coefficients that are asymptotically normal irrespective of the order of the regressors (Peasaran and Shin, 1995). Theoretically, Peasaran et.al (2001) give the general model as thus;

$\Delta z_t = \boldsymbol{\alpha}_0 + \boldsymbol{\alpha}_1 t + \Pi z_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta z_{t-i} + \varepsilon_t$ ... 3.1

Where Δ is first difference operator, z_t is a vector of both x_t and y_t, y_t is k x1 vector of dependent variables, X_t is k x k matrix which represents a set of explanatory variables, is an intercept, $\boldsymbol{\alpha}_1$ is trend coefficient, t is time trend, Π is long run multiplier matrix, Γ is short-run coefficients matrix, and $\varepsilon_t$is k x 1 vector of error terms. However, before estimating the models, it is pertinent to start by testing the stationarity of the variables of the study because bound-testing approach cannot be applied to *I*(2) variables. More so, stationarity test is carried out to avoid the problem of spurious result since not all time series data are stationary at level (Granger & Newbold, 1974).

Model Specification

To achieve the objective of this study which is to analyze the impact of money supply on the inflationrate of Nigeria, the empirical model is adapted from the work of Ifeakachukwu & Olasunkanmi (2012) conducted in Nigeria with a minor modification on the right-hand side.

$LogCPI_t = \theta + \theta_1 LogMS_t + \theta_2 LogEXR_t + \varepsilon_t$ 3.2

Hence, the ARDL model is specified as thus;

$\Delta\ LogCPI_t = \alpha_{01} + \alpha_{11}t + \sum_{i=1}^{p} \alpha_{2i} \Delta\ LogCPI_{t-i} + \sum_{i=0}^{q} \alpha_{3i}\ \Delta\ LogMS_{t-1} + \sum_{i=1}^{p} \alpha_{4i} \Delta\ LogEXR_{t-i} + \lambda_{11} CPI_{t-1} + \lambda_{21} MS_{t-1} + \lambda_{31} EXR + \varepsilon t2$ ---------- 3.3

Where MS, CPI and EXR are proxies for money supply growth rate, inflation and exchange rate respectively. α_{01} is the intercept ,α_{11}, α_{2i}, α_{3i} and α_{4i} are the coefficients. The first part of equation 3.3 with the coefficients mentioned above represents the short run dynamics of the model whereas the second part with parameters λ_{11}, λ_{21} and λ_{31} represent the long run relationship.

4. Result Presentation and Discussion

Descriptive Statistics

Table 4.1 presents a clear description and a good summary of the data sets used in this study at a glance. Looking at the maximum and the minimum values of each of the variables, as well as their large standard deviations from the mean, one will expect nothing other than a large number of JB statistic which shows that the data sets are not normally distributed. However, this is

largely attributable to the large outliers seen in the data sets. For example, while the devaluation of the domestic currency as a result of SAP increased the inflation rate to a record high of 76.8% the oil inflow and fiscal deficit expanded the money supply to a tremendous level of 45.92% in 1990. As a result, the data sets could be non-stationary; parameters such as mean and variance being time-variant. Hence, a unit root test is conducted to ascertain the stationarity of the variables prior to estimation.

Table 4.1. Descriptive statistics of money supply, inflation and exchange rate in Nigeria.

	CPI	**MS**	**EXR**
Median	12.21701	18.82110	100.0000
Maximum	72.83550	64.92465	546.4059
Minimum	5.382224	1.953095	49.77731
Std. Dev.	17.51471	17.17742	125.5099
Skewness	1.707371	0.944975	1.636078
Kurtosis	4.680742	2.962539	4.816130
Jarque-Bera	22.33160	5.508860	21.59156
Probability	0.000014	0.063645	0.000020
Sum	715.6820	889.4041	5813.402
Sum Sq. Dev.	11043.54	10622.29	567098.1
Observations	37	37	37

Unit Root Test Result

Before estimating the model, it is pertinent to start by testing the stationarity of the variables of the study because. To this end, the study employed ADF test for stationarity in the presence of breaks under the null hypothesis that the variables are not stationary at 5% level of significance. All the variables have significant breaks points but at different times as seen in the table 4.2 below. The result also shows that CPI and EXR are stationary at level while MS is only stationary at first difference all at 5% level of significance. In other words, the variables of interest to this study are found to be integrated of orders I(0) and I(1). Hence, the adoption of the ARDL model.

Table 4.2. Unit root test results (with intercept and linear trend)

Variables	ADF Statistic	Significance level	Break dates
MS	-6.565000* *	At first difference	2009
CPI	-4.977391**	At level	1995
EXR	-9.538232**	At level	1998

Source: Authors computation from E-Views9
Note (**) denotes 5% level of significance.

The Impact of Money Supply on the Inflation Rate of Nigeria

According to Tobin (1965) the exogenous increase in money supply by the monetary authority is thought to be a source of inflation. The preoccupation of this study is to exqmine this relationship with the view of providing empirical support or otherwise to the above assertion. The first step is examining the long run relationship between the two variables. This is shown in the table 4.3. As seen from table 4.3, the F– statistic value of 10.06770 is above the lower and upper bounds of 4.87 and 5.85 respectively at 5% level of significance. This is an evidence of the existence of long run relationship between the variables under study.

Table 4.3: ARDL Bound Test for Co-integration

Test Statistic	Value	K
F-statistic	10.06770	2
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	4.19	5.06
5%	4.87	5.85
2.5%	5.79	6.59
1%	6.34	7.52

Source: Author's Computation from E-Views9

Having established co-integration between the variables, the next stage is to determine the co-integrating and long-run model. Table 4.5 shows the estimated result of equation 3.3. The result shows that in the short-run, there is a positive and significant relationship between (CPI) and its lag values (CPI_{-1}) A percentage increase in the first and second lags of (CPI) will cause an increase in the current level of inflation by 0.71. This is a reflection of the adaptive expectations or backward-looking nature of the average Nigerian business and other economic actors about future path of inflation. When expectations are adaptive, current inflation will be the rate it was last year (Sloman, Garratt and Wride, 2015). Hence, could cause future inflation. Also, in the short run, it is found that a percentage increase in MS and EXR will increase inflation by 0.32% and 0.71% at 10% level of significance. In the long run, money supply has positive and significant impact on the level of prices in Nigeria with an impact of 0.31% at 10% level of significance. The above result is the same with the monetary-inflation narrative in Nigeria. However, EXR has almost one-to-one relationship with inflation in Nigeria as it is reported to have a 0.96% impact. This reveals the exchange rate pass-through to the CPI as reported in Sanusi (2011). This is not surprising as Nigeria is an import dependent country, therefore, the exchange rate is expected to have a positive significant influence on the Nigeria's inflation rate.

Increase in monetary growth rate, arising due to oil revenue monetization, expansion of government deficit, currency and devaluation the implementation of the Udoji committee's recommendation have been identified among other things are identified as the key and principal orchestrators of surging level of prices. The historic time series of the two variables of monetary growth and inflation shown in figure 2.1 have clearly reflected that. The result is in line with the findings of McCandless & Weber (2005); Bakare (2012); Paun and Topan (2013); Asekonuwo (2016) and that of Moses *et. al.*(2015) as they both lend support to the theoretical proposition of the QTM and that of the Tobin (1965). This was expected a priori. Notwithstanding. The result is in contrast with that of Akinbobola (2012) and Inam (2014) all conducted in Nigeria.

The coefficient of error correction term (ECT) is negative and statistically significant at 5% level of significance. This implies that short-run dis-equilibrium disturbances will converge back to equilibrium in the long-run at a speed of 126 % each year.

Table 4.5: ARDL Short-Run and Long Run Result

LONG-RUN MODEL	Coefficient	Std. error	t-Statistic	Prob.
LOGMS	0.318095	0.161811	1.965843	0.0641
LOGEXR	0.962189	0.222431	4.325779	0.0004
DUM02	0.517023	0.244047	2.118539	0.0475
C	9.122017	1.566003	5.825030	0.0000
SHORT –RUN MODEL				

LONG-RUN MODEL	Coefficient	Std. error	t-Statistic	Prob.
D(LOGCPI(-1))	0.715581	0.171276	4.177943	0.0005
D(LOGMS)	-0.173078	0.129758	-1.333850	0.1980
D(LOGMS(-1))	0.326685	0.159935	2.042611	0.0552
D(LOGMS(-2))	-0.168494	0.145316	-1.159502	0.2606
D(LOGEXR)	0.409463	0.269031	1.521995	0.1445
D(LOGEXR(-1))	0.716695	0.354946	2.019166	0.0578
D(LOGEXR(-2))	-0.349006	0.430829	-0.810081	0.4279
D(LOGEXR(-3))	0.582637	0.267775	2.175842	0.0424
DUM02	-0.656076	0.355518	-1.845407	0.0806
ECT (-1)	-1.268950	0.244302	-5.194187	0.0001
DIAGNOSTICS				
R^2				83
F-Stat.				7.23
D.W. Stat.				2.00
Serial Correlation (LM test)				0.76
Heteroskedasticity test				0.64
Ramsey RESET test				0.36

Source: Author's Computation from E-Views9

Other diagnostic test shows that: The probability value of the observed R-squared (LM statistic) of 0.76 from the Breusch-Godfrey Serial Correlation (LM Test) affirms the absence of serial correlation (H_0) at 5% level of significance. Similarly, the result of specification error test (Ramsey RESET Test) and the Heteroskedasticity test show that we could not reject H_0 at 5% level of significance, meaning that the model is correctly specified and residuals of the model have constant variance. Lastly, the CUSUM of squares test reveals the parameters are stable as they all fall within the 5 % critical bounds.

5. Conclusion and Recommendation

Having established a positive and significant impact between money supply and the exchange rate on the inflation rate rate in Nigeria from 1980-2016, it is therefore concluded that inflation may not be entirely a monetary phenomenon. The paper studies the relationship that exists between monetary growth and the level of prices in Nigeria by examining the existence of a significant long run relationship between money supply, inflation as well as the exchange rate between 1980 and 2016. The study makes use of the bounds testing approach to co-integration within an autoregressive distributed lag framework. The empirical result gotten reveals that there is a positive relationship between money supply and the exchange rate on the price level.

This implies that if effort is not intensified towards effective inflation and exchange rate management, the Nigerian macroeconomic space will be negatively affected. This is because of the negative effects they portend on the output level, employment and the general standard of living of the people. Another implication of the quantitative result

is that, as a monetary policy instrument, money supply is used to boost output, however, raising the money supply as a way of boosting output portends the danger of increasing the level of prices in the long run. Whereas, decreasing the supply of money as a way of controlling inflation will consequently decrease the output level. Based on the above stated findings, the following recommendation is proposed: The monetary authority should consider an alternative framework for monetary policy that will better anchor prices- say Nominal-GDP targeting as the current monetary targeting regime appears to be inefficient in anchoring the price level.

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