

## IMPACT ANALYSIS OF CHANGES IN MONEY SUPPLY ON PRICE SHOCKS IN NIGERIA

BY

**Abubakar Bilkisu Aliyu**

Department of Statistics  
Central Bank of Nigeria

And

**Felix, Emmanuel Dodo**

Department of Economics & Developmental Studies  
Faculty of Social Sciences  
Federal University Dustsin-ma, Kastina State

### Abstracts

*One of the major important macroeconomic objectives is to ensure stable money supply. this is because increase in money supply may cause inflation. This paper analyses the impact of changes in money supply on price shocks in Nigeria. The study makes use of annual data from 1987 to 2018 to test the relationships between the variables. The short-run and long run relationships were analyzed using Autoregressive distributed lags (ARDL) framework. The study also revealed that there is co-integration and long-run relationship between the variables over the study period. The result of our analyses also shows that broad money supply has positive and significant impact on price shocks at 1% level of significance at both short run and long run level. This implies that increase in money supply causes inflation in Nigeria over the study period. Also, the result of the study coincides with the classical quantity theory of money that stated that doubling the money stock will lead to doubling of the price level since transaction (T) and money velocity (V) do not change. Based on the results, the study recommend that policy makers should take adequate policy measures that would moderate broad money supply and boost productivity in order to reduce inflation rate in Nigerian economy.*

**Keywords:** Broad money supply; Inflation rate; and Real GDP.

JEL classification: E52,G18

### Introduction

The global economies in general and Nigerian economy in particular have been experiencing a steady increase in the general price level due to increase in the volume of money

in circulation. One of the macroeconomic goals that the monetary authority strives to achieve is the maintenance of stable domestic price level. To achieve this objective, monetary policy is used to regulate the value, volume and cost of money in an economy, in consonance with the expected level of economic activity. The nexus between aggregate money supply, inflation and economic growth has raised a lot of scholarly debate in the field of economics and finance. Money supply is a very sensitive variable, the size and velocity of money supply determines the pace of any economic activity. Apart from being a powerful instrument of monetary policy, its expansion or contraction dictates the growth in investment and output of any economy. It is therefore the usual slogan of the Monetarist school of thought that money matters. They argued that changes in the size of money supply have a number of implications on the macroeconomics variables like inflation and economic growth (Charisma et al, 2018).

In Nigeria, the syndrome of inflation has been so alarming from the outset of the earlier and current administrations despite the various promises by politician both in the pre-democracy and democracy era to fight against it in Nigeria. Unfortunately, inflation rate has wide-ranged from 9.2% and 18.3% at the end of the first and fourth quarters of 2016 and decline to 16.1% at the end of the second quarter in 2017 which stands to represent instability of prices in the economy. Correspondingly, the rise in the inflation rate has accounted for about 100% rise in price levels of commodities and facilities. The school of thought that advocate for monetary policy measure believes that government should cut the money supply via credit refrain and stable budget deficit. As a matter of fact, the above suggestion is workable, however, with little defect, which is the tendency to truncate economic stability in the market mechanism as a result of the unprompted variation in inflation (Ditimi, Keji and Emma-Ebere, 2018).

Prior to the 2008-2010 global economic and financial crises and the 2015-2017 recession in Nigeria, the Nigerian economy consistently and progressively encountered severe decades of economic and financial shock arising from the macroeconomic instability of price, money supply, non-availability and accessibility of credit among others diminishing and distorting economic growth and development in Nigeria. In the bid to prevent price and money supply instability in Nigeria, the monetary and fiscal policy structures were implemented. The negative

impact of inflation in Nigeria triggered worry and inquiries that give birth to the question; Is money supply the cause of the high rate of inflation in Nigeria? (Udo et al, 2019).

Inflation has been identified as one of the numerous problems facing developing countries Nigeria inclusive, price instability need to be curtailed for developing economies to attain sustainable growth. Over the years, rate of inflation has been on increasing side, causing damaging effects on the Nigerian economy through the movement of price of consumer's goods and services. Inflation is a household word in many market-oriented economies. The most complex and serious set of economic problem confronting national government and the international community since the end of World War II, consist of virulent and widespread inflation, a declaration of economic growth and massive disequilibrium of international payments. Monetary authority in Nigeria has put-in-place various monetary policy measures with the main objective of maintaining price stability. Despite this, inflation in Nigeria has continually been on increasing side over the years (Olalere, 2019).

Economists globally argue that, inflation is strictly a monetary phenomenon and that inflation may occurs if there is growth of the money supply in the economy. It is against this backdrop that this study sort to analyze the impact of changes in money supply on price shocks in Nigeria. Therefore, the null hypothesis ( $H_0$ ) states that there is no significant relationship between broad money supply and price shocks while the alternative hypothesis ( $H_1$ ) states that there is a significant relationship between broad money supply and price shocks in Nigeria during the study period. This research work is organised into five sections. Section one is the introduction; Section two presents conceptual literature, empirical literature and theoretical framework on the link between money supply and price shocks. Section three presents the methodology employed in the study. Section four analyze and discusses the empirical results obtained. Finally, section five draws conclusion and provides policy recommendations.

## **2.0. Review of Related Literature**

### **2.1 Conceptual Literature**

The money supply comprises of banknotes, and coins, outside the central bank circulating within a period of time.  $M_0$ ,  $M_1$ ,  $M_2$ , and  $M_3$  measures currency and liquid instrument held in different types and sizes of account in operation within Nigeria (Udoh, et al, 2019). Money

supply is the amount of money available in a country. Domestic credit is one of the factors, which leads to changes in amount of money. The measurement of money supply is done by looking at amount of domestic credit and net foreign assets in a country. Money supply is categorized as narrow money and quasi money. The definition of money supply differs from country to country. This is because it depends on what is added by country to ascertain total money in circulation (Satrugan, 2018). In its simplest form, money supply is the amount of money, which is in circulation over a certain period of time. Increases in this amount cause increases in the prices, in other words, the inflation, by increasing consumption expenditures and investment expenditures (Cuma, 2014).

Inflation occurs when there is a general and continuous rise in the prices of goods and services in the economy. A major cost is related to the inefficient utilization of resources because economic agents mistake changes in nominal variables for changes in real variables and act accordingly. During inflationary periods, opportunity cost of holding money is increased causing inefficient use of real resources in transactions. Therefore, inflation weakens the purchasing power of money and sinks the standard of living of the citizenry (Gbadebo and Mohammed, 2015). Inflation can be described as a rise in the general price level of goods and services in an economy over a period of time. When the general price level rises, each unit of currency buys fewer goods and services. Consequently, inflation reflects a reduction in the purchasing power per unit of money (Echekoba, Adigwe and Amakor, 2015).

Interest rate is the reward for not using all of ones money for present consumption. Interest is supposed to be a sort of cost of borrowing and it is unlikely that an individual will borrow money to finance any investment project if the internal rate of returns on that investment will be lower than the interest rate repayable on the money borrowed (Afolabi, 1991).

Economic growth is an increase in an economic variable, normally persisting over successive periods. The variable concerned may be real or nominal, and may be measured in absolute or per capita terms. Growth in real economic variables such as GDP for short periods or at low rates may occur by simply having similar activities conducted on a larger scale. Rapid or persistent growth is likely to involve changes in the nature of economic activity, with new products or processes, and new types of labour skills, capital goods and economic aggregates (Black, 2002).

## 2.2 Review of Empirical Literature

Olalere (2019) examined the impact of money supply on inflation in Nigeria between 1980 and 2009, using Vector Error Correction Mode (VECM). The data for the variables were sourced from CBN statistical Bulletin. The results of the test established a significant long run positive relationship between money supply and inflation in Nigeria.

Doan (2019) applied an econometric model to analyze the relationship between money supply and inflation. Besides, Vietnam's and China's research data are also collected in the period of 2012-2016. It is found out that the continuous increase in the money supply causes inflation in the long-term, but the continuous increase in the money supply growth does not cause inflation in a short time. Research results show that money supply has positive impact on inflation rate, and the money supply directly affects economic growth.

Nwonodi (2018) examined the extent to which components of money supply affect Nigerian inflation rate in Nigeria. The ordinary least square (OLS) method of cointegration, augmented dickey fuller unit root, granger causality was used as data analysis techniques. Regression result in the study shows that Money Supply has positive and significant relationship with Nigerian Inflation Rate.

Mathias (2015) established a transmission mechanism from money supply to inflation in Nigeria in order to resolve the controversy of whether money supply or interest rate should be a target of monetary policy. In doing this, a recursive vector auto regression (VAR) model is employed using data from first quarter 2000 to fourth quarter 2013. The response of CPI to money supply ranges from zero to 0.014. The result shows that money supply has positive and significant responses to inflation rate. This indicates that the impact of the change in money supply is transmitted to inflation in Nigeria through the money-price link.

Raphael (2011) examined money supply, interest rate, exchange rate and oil price influence on inflation in South Africa. Monthly data are employed from January, 1999 through September, 2010. A multiple regression model was used. The findings from the study show that approximately 97% of the consumer price index movements are explained by the four

macroeconomic variables. The study confirms that money supply and exchange rates have a strong positive relationship with inflation and have to be managed.

Bakare (2011) examined the determinants of money supply growth and its implications on inflation in Nigeria. The study employed quasi-experimental research design approach for the data analysis. This design combined theoretical consideration (a priori criteria) with empirical observations and extracted maximum information from the available data. The results also showed a positive relationship between money supply growth and inflation in Nigeria

Abubakar and Felix (2019) examined the impact of monetary policy on economic growth in Nigeria, using annual time series data from 1960-2016. This study adapted Auto regressive distributive lag approach to test for co integration and error correction model. From the result generated shows that, monetary policy proxy by interest rate has a negative and insignificant impact on economic growth both in short and long run.

Charisma et al (2018) investigated the impact of money supply on macroeconomic variables in Nigeria for the period 1985 to 2016. The ordinary least square technique was employed to determine the magnitude and direction of the variables in the models. It emerged that narrow money supply has a positive and significant impact on inflation and real gross domestic product; conversely, broad money supply does not have any significant impact on inflation and real gross domestic product.

Amassoma, Sunday and Onyedikachi (2018) investigated the influence of money supply on inflation in Nigeria. The study employed co-integration test and error correction approach on annual time series data spanning from 1970 to 2016 to ascertain both the long run and short run dynamics relationship among the variables. The results showed that money supply does not substantially influence inflation both in the long and short run possibly because the country was in recession.

Abubakar and Felix (2018) examined the impact of inflation on economic growth in Nigeria, using annual time series data from 1981-2016. The Auto regressive distributive lag (ARDL) bound test is adapted to test for co integration and error correction model. From the results generated from ordinary least square (OLS) shows that, there is a negative and

insignificant relationship between inflation and economic growth, while Exchange rate and Interest rate have positive and significant effect on real GDP.

The result by Obi and Uzodigwe (2015) that assessed the dynamic linkage between money supply and inflation in ECOWAS member states for the period 1980-2012 show mixed results. The results show individual OLS estimates for each of the eight countries. In the current period, the coefficients of money supply (MS0) growth have positive impact on inflation rate for Cote D' Ivore, Senegal, Togo, Gambia and Ghana. However, no evidence of significant impact of money supply on inflation rate are seen in other countries (Burkina – Faso, Niger, and Nigeria).

Uduakobong (2014) empirically investigated the long-run causal relationship between money supply and inflation in Nigeria within the period 1970 to 2011. Employing a multivariate co-integration regression technique, the study reveals that: there exists a long run relationship between money supply and inflation in Nigeria; there is no causality between money supply and inflation in Nigeria; real broad money supply at lag 1 has a negative and significant influence on inflation rate in Nigeria.

Onyeiwu (2012) examines the impact of monetary policy on the Nigerian economy using the Ordinary Least Squares Method (OLS) to analyses data between 1981 and 2008. The result of the analysis shows that monetary policy presented by money supply exerts a negative impact on rate of inflation.

Amassoma (2011) examined the effect of money supply on macroeconomic variables in Nigeria for the period 1986 to 2009 by adopting a simplified Ordinary Least Squared technique found that monetary policy had a significant effect on exchange rate and money supply does not have an influence on price stability.

Many empirical studies have examined the links between money supply and inflation rate in Nigeria. However, some researchers such as Olalere (2019), Doan (2019), Nwonodi (2018), Mathias (2015), Raphael (2011) and Bakare (2011) found positive relationships between money supply and inflation rate and some such as Uduakobong (2014) and Onyeiwu (2012) found negative relationships between money supply and inflation rate while other results such as Charisma et al (2018) and Amassoma, et al (2018) showed that money supply does not

considerably influence inflation. In fact, there is no conclusive result on the relationship between the two variables. In view of the above, this study attempts to add new literature to the existing literature specifically using data that covers the period when the economy enters into recession.

## **2.3 Theoretical Framework**

### **The Classical Quantity Theory of Money**

Classical economist have notice the relationship between money supply and prices of commodities in the market especially with the evolution of silver and metal money which made prices to rise disproportionately. A French economist, Jean Bodin (1576), linked sudden increase in prices in France with discovery of gold in the United States on the presumption that the importation of such gold to France to boost money supply actually forced prices up. In the modern sense, the works of Sir Irving Fisher popularized the quantity equation approach to the theory of money with his popular Fisher equation:  $MV=PT$ . In the equation T is used to represent the real volume of all market transactions during a period of time but it is better replaced with Q i.e. quantity of goods involved making the equation read  $MV=PQ$ . The V is the velocity of money in circulation. M stands for the money stock-coins, bank notes and banks deposit. P is the average price. Fisher then states that the average price in the economy (P) multiplied by the amount of transaction (T) when divided by the money stock (M) gives us a volitional element, which he called the money velocity (V). The equation mathematically gives us Fisher equation  $MV=PT$ . Fisher concluded by stating that doubling the money stock will lead to a doubling of price level. Since transaction (T) and money velocity (V) does not change. He established that there is a direct and one-to-one relationship between money stock and the price level (Afolabi, 1991).

## **3.0 Methodology**

### **3.1 Sources of Data**

The paper uses annual time series data from secondary sources spanning the period 1987 to 2018. The data were drawn from the Central Bank of Nigeria and the World Bank reports on money supply, price shock, interest rate and Real GDP in Nigeria covering the study period.

### **3.2 Model Specification**



The econometric model is specified as follows:

$$MS_t = \beta_0 + \beta_1 PS_t + \beta_2 INTR_t + \beta_3 RGDP + \mu_t \dots\dots(1)$$

MS= Money supply

PS= Price shock is proxy for inflation rate

INTR= Interest rate

RGDP= Real Gross Domestic Product proxy for economic growth

e =Error term, t = Time-series,  $\beta_0$  = Constant

$\beta_1, \beta_2, \beta_3$  are parameters of the variables expected to be estimated.

## 4.0 Results and discussion

### 4.1 Tests for Stationarity

At this pre-estimation stage, there are several tests of stationarity but this study used the Augmented Dickey Fuller (ADF) and Phillips Perron (PP) to test for unit root of the variables. The study used the two tests to be able to compare the results for consistency.

**Table 1: Results of unit root tests**

ADF and PP Unit root tests results							
Augmented Dickey Fuller (ADF)					Phillips Perron (PP)		
	Level						
Variables	Constant Trend	Without	Constant Trend	With	Constant Without Trend	Constant Trend	With
LPS	-2.8518**		-3.5426		-3.002**		-3.4968
LBMS	-3.0104***		-2.9577		-2.4387***		-2.1656
LINTR	- 3.3279**		-4.2918		-3.3032**		-4.2672
LRGDP	-0.4576		-2.0366		-0.3062		-1.5444
First Difference							
LPS	-5.8106		-7.4234		-7.4339		-7.4511
LBMS	-4.5935		-4.4275		-4.2957		4.2305
LINTR	-7.4099		-9.4582		-9.5705		-9.7216
LRGDP	-2.7053**		-2.6483		-2.7053**		-2.6483
Note: ***, ** and * denotes significant at 1%, 5% and 10% significance level, respectively.							

**Source: Authors' computation from E-views 9 software**

Table 1 shows the result of the ADF and PP unit root test. However, the results indicated that price shocks, money supply and interest rate are integrated at level 1(0) while real GDP is

integrated at first difference 1(1). The \*\* and \*\*\* indicates significance at the 5% and 10% level. Given the results in table 1, the ARDL would be the appropriate technique to be applied in order to check the co-integration between the variables.

#### 4.2 ARDL Cointegration Bounds Test.

At this estimation stage, the test for cointegration come immediately after the unit root test results which shows a mixture of 1(0) and 1(1). The paper proceed to conduct the ARDL Cointegration Bounds test to see whether there is long-run relationship among the variables in the model as shown below:

**Table 2: ARDL Bounds Test results**

Test Statistic	Value	k
F-statistic	7.328849	3
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.72	3.77
5%	3.23	4.35
1%	4.29	5.61

**Source: Authors' computation from E-views 9 software**

In table 2 the F- Statistics value of 7.328849 is greater than both the lower and upper bound as compare with critical value provided by Pesaran et al. (2001). This implies that cointegration existed within the variables. The major advantages of this test is that, it determines the existence of long run relationship among the variables and it helps the researchers to avoid the spurious regression problem among the variables under investigation.

**Table 3 : ARDL Cointegrating and short run Form**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LBMS)	0.508014	0.180781	2.810105	0.0093
D(LINTR)	-0.141693	0.329767	-0.429677	0.6710
D(LRGDP)	-0.840849	2.216836	-0.379302	0.7075

C	13.865409	2.603579	5.325519	0.0000
CointEq(-1)	-0.723480	0.137242	-5.271568	0.0000

$$\text{Cointeq} = \text{LINFR} - (0.9503 \cdot \text{LBMS} - 0.3644 \cdot \text{LINTR} - 0.9223 \cdot \text{LRGDP})$$

**Source: Authors' computation from E-views 9 software**

Table 3 shows that in the short-run broad money supply have positive and significant impact on price shocks at 1% significances level. This means that an increase in broad money supply by 1% would increase price shocks by 51%. The error correction coefficient results indicates that the error correction term CointEq(-1) is negative and less than one, it is also significance at 1% level as require. However, the short run dynamic adjustment has a speed of about 72%. That is about 72% of the errors are corrected yearly.

**Table 4 : ARDL Cointegrating and Long Run Coefficients**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LBMS	0.950301	0.293382	3.239127	0.0033
LINTR	-0.364405	0.672583	-0.541800	0.5926
LRGDP	-0.922251	0.306423	-3.009731	0.0057

**Source: Authors' computation from E-views 9 software**

In a similarly way, the long run coefficient as contain in table 4 further show broad money supply has positive and significant impact on inflation rate at 1% significances level. Therefore, this further means that an increase in broad money supply by 1% would increase price shocks by 95%. Real GDP has negative and significant effect on inflation rate at 1% significances level. Also, an increase in real GDP by 1% would lead to decrease in price shocks by 92% respectively.

To make a precise decision on the result obtained, as the null hypothesis states that there is no significant relationship between money supply and price shocks in Nigeria while the alternative hypothesis says there is a significant relationship between money supply and price shocks in Nigeria during the study period. Therefore, we accept the alternative hypothesis ( $H_1$ ) that states there is a significant relationship between broad money supply and price shocks in Nigeria during the study period.

### 4.3 Post –Estimation Stage

At this stage various diagnostic tests are applied to validate the adequacy of the estimates such as the adjusted coefficient of determination of  $R^2$ , Breusch-Godfrey Serial Correlation LM test, Heteroskedasticity test: Breusch-Pagan-Godfrey, Ramsey RESET test and the CUSUM (cumulative sum of residual) and CUSUMSQ (cumulative sum of square) test of stability of coefficients. The results are shown as follows:

**Table 5: Ordinary least square results**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LBMS	0.571485	0.188810	3.026781	0.0053
LINTR	-0.083623	0.529325	-0.157980	0.8756
LRGDP	-0.649499	0.229799	-2.826380	0.0086
C	13.84492	4.912288	2.818425	0.0088
R-squared	0.435487	Mean dependent var	2.722767	
Adjusted R-squared	0.375003	S.D. dependent var	0.719242	
S.E. of regression	0.568610	Akaike info criterion	1.825223	
Sum squared resid	9.052873	Schwarz criterion	2.008440	
Log likelihood	-25.20357	Hannan-Quinn criter.	1.885955	
F-statistic	7.200087	Durbin-Watson stat	1.549107	
Prob(F-statistic)	0.000994			

**Source: Authors' computation from E-views 9 software**

The results generated from the ordinary least square in table 5 shows that there exists positive and significant impact of broad money supply on price shocks at 1% level of significant. Real GDP also has negative but significant impact on price shocks at 1% level of significant. The R squared value is highest at 0.435 with adjusted R square the model accounts for 0.375 of the variation in the dependent variable. The R square value 0.44. That is, 44% of variation in price shocks can be explained by broad money supply, interest rate and real GDP. Thus, 56% is due for other factors. The Durbin Watson (DW) statistics is close to the conventional point 2, indicating the absence of autocorrelation problem. Again, the F-Statistic is significant at 1%, which buttress that the model is fit.

**Table 6: Stability diagnostic tests results**

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	0.311255	Prob. F(2,24)	0.7354

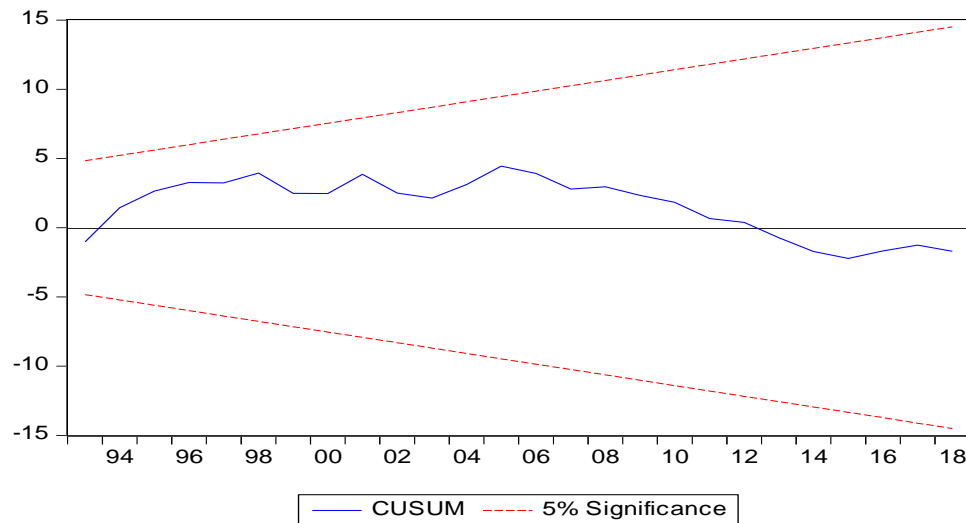
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.972822	Prob. F(4,26)	0.4392
Ramsey RESET Test			
	Value	Df	Probability
F-statistic	0.676044	(1, 25)	0.1060

**Source: Authors' computation from E-views 9 software**

In table 6, the Breusch-Godfrey test for autocorrelation LM test result indicates the p-value 0.7354 is not significant at any level. This implies there is no serial correlation problem. The Breusch-Pagan-Godfrey test result generated reveals that since the p-value 0.4392 is not statistically significant. This further means that the variables are free from the problem of Heteroskedasticity. The Ramsey Reset test that is applied shows there is no misspecification of model because the probability value 0.8454 is not statistically significant at any levels.

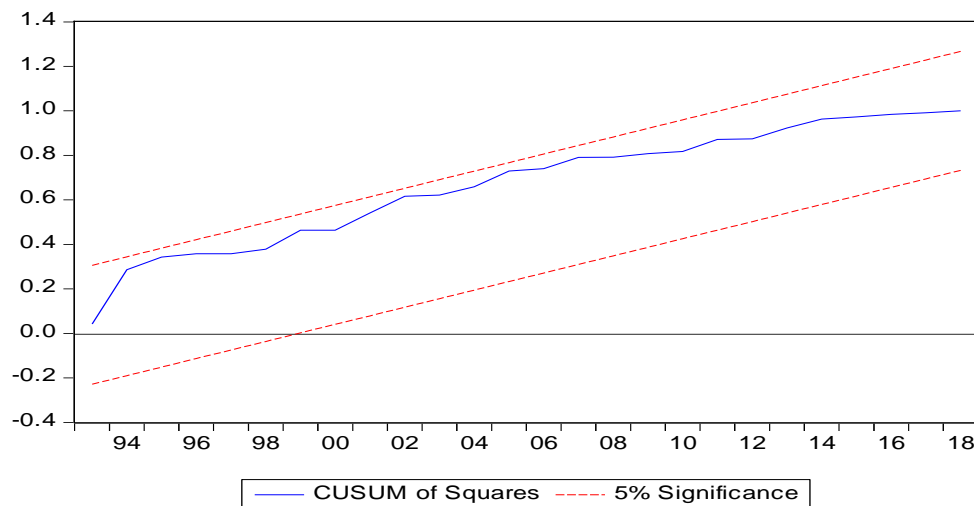
### **Fig. 1 and 2: Recursive Estimates: CUSSUM test and CUSSUM of square test**

**Fig. 1**



**Source: Authors' computation from E-views 9 software**

**Fig.2:**



**Source: Authors' computation from E-views 9 software**

It is observed from the figures 1 and 2 that both the CUSUM and CUSUMSQ plots cross the 5% critical boundaries and the blue line is in-between the two red lines. Therefore, the estimated parameters are stable and there is a significant relationship among the variables during the entire sample period of the study. This further reveals that there are no chances of having spurious regression.

## 5. Conclusion and policy recommendation

This paper investigates the impact analysis of changes in money supply on price shocks in Nigeria. The study makes use of annual data from 1987 to 2018. From the results of findings, the unit root test results shows a mixture of  $I(0)$  and  $I(1)$ , the paper proceed to conduct the ARDL Cointegration Bounds. The F- Statistics value of 7.328849 is greater than both the lower and upper bound which implies that cointegration existed within the variables. The short-run and long run results show that broad money supply has positive and significant impacts on inflation rate. There is a general consensus in literature that money supply affects price shocks either positively or negatively. The positive impact of money supply on price shocks found by this study corroborate and validates the findings of Olalere (2019), Doan (2019), Nwonodi (2018), Mathias (2015) and Raphael (2011), Bakare (2011). However, the findings did not conform to the research of Onyeiwu (2012), Uduakobong (2014) whose result of their analysis shows that money supply exerts a negative impact on rate of price shocks. The results further differ from the work of Charisma et al (2018), Amassoma, Sunday and Onyedikachi (2018) among others, who

found out that money supply, does not considerably influence price shocks in Nigeria. Subsequently, the paper also find evidence supporting the theoretical prediction that doubling the money stock will lead to a proportional increase in price level since transaction (T) and money velocity (V) do not change. The results may help reconcile the seemingly contradictory findings in the literature. The alternative hypothesis ( $H_1$ ) that states that there is a significant relationship between broad money supply and price shocks in Nigeria during the study period has been accepted.

The study therefore recommends that the government and monetary authorities should strengthen its regulation on money supply and provides the necessary inputs that would boost supply and reduce the growth of inflation.

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