

An Empirical Investigation of the Relationship between Money Supply and Inflation in Nigeria (1970-2011)

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Abstract: *This paper attempts to empirically investigate 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. The study recommends that s 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.*

Keywords: *Money supply, Inflation, Cointegration, Nigeria.*

1. INTRODUCTION

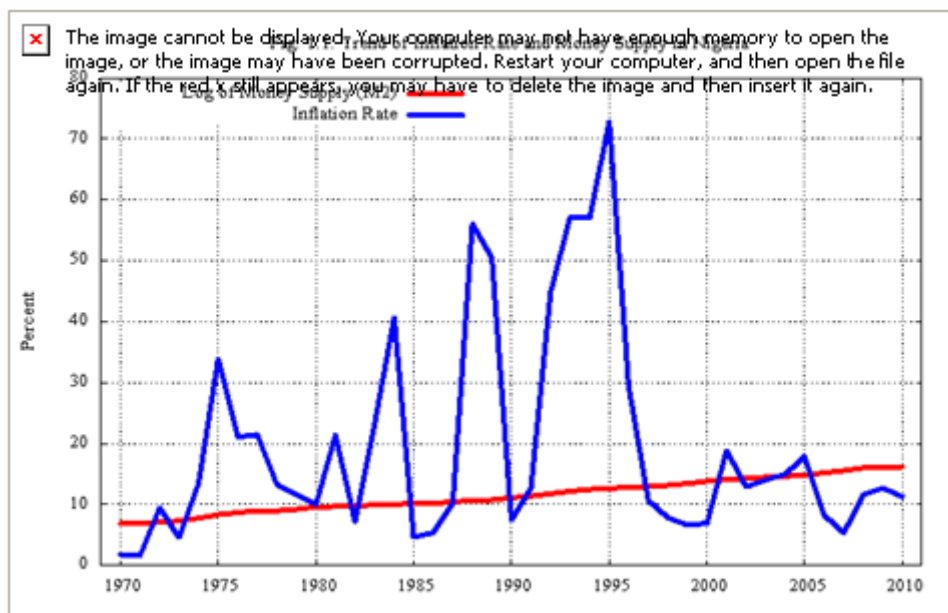
There is a general consensus that inflation is strictly a monetary phenomenon. Indeed, this general opinion is traceable to the famous proposition made by Milton Friedman, a foremost monetarist, that “inflation is always and everywhere a monetary phenomenon”. He postulated that the source of all inflation episodes is a high growth rate of the money supply: simply by reducing the growth rate of the money supply to low levels, inflation can be prevented (Mishkin, 2010). Friedman further argues that changes in the quantity of money will work through to cause changes in nominal income. Corroborating the views of Friedman, Jhinghan (2008) states that inflation everywhere is based on an increased demand for goods and services as people try to spend their cash balances. Since the demand for money is fairly stable, this excess spending is the outcome of a rise in the nominal quantity of money supplied to the economy. So inflation is always a monetary phenomenon.

To further buttress the validity of Friedman’s proposition, Mishkin (2010) illustrates to show that the countries with the highest inflation rates have also had the highest rates of money growth. Plotting the average inflation rate against the average money growth rate for a number of countries over a ten year period 1995-2007, Mishkin (2010) shows a positive association between inflation and the growth rate of money supply: the Countries with the highest inflation rates are also the ones with the highest money growth rate. By contrast, the Countries with low inflation rates are also the ones with low rates of money growth.

Available data on the Nigerian economy (CBN, 2010) reveals that inflation rate has been quite volatile and mostly double-digit for most of the years of this study (1970-2011). On the other hand, growth rate of money supply (specifically broad money supply-M2) has been on the increase throughout the period of this study. Figure 1.1.1 graphically presents the trend of inflation rate and money supply in Nigeria during the period 1970-2010. For ease of explanation, the periods are classified thus: 1970-1980; 1985-1995; and 1998-2010.

The period 1970-1980 represents the oil boom era (a period that witnessed a massive inflow of oil revenue into the country as a result of an astronomical increase in the price of crude oil by OPEC). During this period, the inflation rate rose from 1.75 percent in 1970 to 33.93 percent in 1975 and declined to 10 percent in 1980 when crude oil prices began to slump. The disruption of productive activities as a result of the civil war and the unrealistic wage increases awarded by

Adebo and Udoji Commissions of 1971 and 1974 respectively contributed to the inflationary pressures observed in this era (CBN,1993;Udah,2009). Conversely, money supply (M2) was steadily increasing throughout this decade. It rose from ₦978.2 million in 1970 to ₦4,241.2 million in 1975 and further increased to ₦15,100 million in 1980. In this era, monetary management depended mainly on direct instruments such as credit ceilings, selective credit, exchange rate, interest rate,cash reserve requirements and special deposits. Market-based instruments were not widely used. Thus to address the inflationary pressures at the time, the monetary authorities encouraged commercial banks to direct a greater percentage of their credit to the productive sectors(CBN,1993; Udah,2009).



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The period 1985-1995 represents the Structural Adjustment Programme (SAP) era. Onwioduokit (1996) identifies other common features of this era to include declining oil revenue (as a result of crude oil price slump), disequilibrium in the balance of payment, growing unemployment, etc. Thus, the monetary policy objectives of this era included the stimulation of output and employment as well as the promotion of both domestic and external viability (CBN,1993; Udah,2009). During this period, the inflation rate increased from 4.67 percent in 1985 to 56.04 percent in 1988. However, it declined to 7.50 percent in 1990 and thereafter increased to peak at 72.81 percent in 1995. These price fluctuations were partly due to: the spill-over effects of the erst-while regime of direct control and economic regulation; and the immediate impact of the host of policy and institutional reforms that accompanied SAP. On the other hand, money supply (M2) was steadily increasing throughout this period. It rose from ₦26, 277.6 million in 1985 to ₦45, 446.9 million in 1988. It further increased to ₦68, 662.5 million in 1990 and thereafter to ₦318, 763.5 million in 1995.

Monetary management during this period was to re-align prices through policy and institutional reforms after many years of distortion introduced by control regimes. The main cornerstone of the new policy thrust was exchange rate policy reform aimed at finding the appropriate external value of the domestic currency. Foreign exchange controls and allocations were abolished and moves were made towards the implementation of Dutch auction market-based exchange rate mechanism. This was accompanied by de-regulation of interest rates and de-emphasizing of the use of credit allocation and control policies followed by the introduction of indirect tools of monetary management, anchored on Open Market Operations (OMO), (Inam, 2005).

Other major monetary highlights of this era as cited in Amassoma, et al (2011), include: establishment of two foreign exchange markets (1986); liberalization of bank licensing(1987); Bank Portfolio restriction relaxed in 1988; ban on credit extensions based on foreign exchange deposits(1989); introduction of a stabilization security to mop up excess liquidity (1990); increase in banks required paid-up capital (1990); embargo on bank licensing (1991); privatization of government-owned banks (1992); introduction of indirect monetary instruments(1993); and re-imposition of interest rate and exchange rate controls in 1994 to stem the rising tide of high lending rates. Thus the maximum lending rates was pegged at 21 percent.

The years 1998-2011 represent the period of democratic rule in Nigeria. The main feature of the period was: increased privatization and commercialization of government concerns. During this period, inflation rate fell from 7.86 percent in 1998 to 6.94 percent in 2000. It peaked at 18.87 percent in 2001 and 17.85 percent in 2005, declined to 5.38 percent in 2007 and rose to 12.7 percent in 2009. It however, declined again to 10.8 percent in 2011. On the other hand Money Supply (M2) was steadily increasing throughout the period. It rose from ₦525, 637.8 million in 1998 to ₦11,154, 782.8 in 2010. The Post-SAP Monetary Policy as explained by Udah (2009), was aimed at drastic reduction in the rate of inflation; stabilization of the naira rate; and addressing adverse changes in BOP. To realize this, Post-SAP Monetary Policies since 1994 centred on High growth rate of GDP, single digit inflation and accumulation of external reserves, (CBN, 1993; Udah, 2009).

Specifically, according to Amassoma, et al (2011), all mandatory credit allocations on banks by the CBN guidelines were abolished, while in 1997 the minimum paid up capital of Merchant and Commercial Banks was further raised to a uniform level of ₦500 Million. Inam (2005) further explains that in 1999 and 2000, the Minimum Rediscount Rate (MRR) was lowered and this was aimed at inducing a downward movement of bank lending rates to stimulate private sector investment. Other major highlights of this era as cited in Amassoma, et al (2011) include: the introduction of universal banking system in 2001; increase in commercial bank's minimum paid capital to ₦25 billion in 2005; and introduction of a new monetary policy implementation framework (Monetary Policy Rate (MPR)) by the CBN in 2006 to replace the Minimum Rediscounted Rate (MRR). This was done to dampen the volatility of interest rate in money market and stimulate a transaction rate that would improve the transmission of monetary policy actions and ultimately to achieve stable value of domestic currency.

A close scrutiny of the graphical presentation of the trend of Inflation rate and money supply reveals that, whereas, inflation rates actively fluctuated, money supply (M2) rose steadily throughout the period 1970-2011. Using data for Nigeria, for the period under review, the relationship between increase in money supply and inflation rate thus remains unclear as indicated in the uncorrelated nature of the trends. The trends of inflation rate and money supply in Nigeria do not seem to move in the same direction. This may imply that, inspite of Friedman's proposition, there may not be any significant relationship between inflation rate and growth rate of money supply in Nigeria.

Furthermore, Whereas, several empirical studies both in the foreign scene and in Nigeria, have revealed and emphasized the influence of money supply in explaining fluctuations in the general price level, and have even gone further to establish long run relationship between both variables, the evidence of the direction and nature of causality between money supply and inflation is still very unclear or lacking in most of these studies, for example, Cheng and Tan (2002), Jones and Uri (1987), to mention but a few. Also, while empirical studies such as Chimobi and Igwe (2010) have established the evidence of unidirectional causality running from money supply to inflation,

Narayan, et al (2006) holds that the unidirectional causality running from money supply to inflation exists only in the short run. Thus, the nature and direction of causality between money supply and inflation is not very clear especially in Nigeria. What if it is bi-directional or still unidirectional?

Thus the major objective of this paper is to investigate the relationship between money supply and inflation in Nigeria using data for the period of 1970 to 2011. Specifically, the paper seeks to determine the nature and direction of causality between money supply and inflation in Nigeria.

This study is significant and relevant in that it will bring to the fore the history of Inflation and Monetary management in Nigeria while zeroing in on the impact of money supply on the general price level in Nigeria. It will reawaken the need for efficient monetary management to forestall future occurrence of hyper-inflation episodes in Nigeria. It will also serve as a clarion call on monetary authorities specifically the Central Bank of Nigeria (CBN) to enact good policies that will ensure macroeconomic stability thus resulting in economic growth and development of Nigeria.

This paper is organized into five chapters beginning with the introduction in chapter one and followed by Literature Review in chapter two. Chapter three explains, in detail, the methodology of research while chapter four presents the Empirical results and the interpretations. Finally, the summary of findings, recommendations and conclusion of the study are contained in chapter five.

2. LITERATURE REVIEW

2.1. Theoretical Literature Review

Akpakpan (1999) defines Money Supply as the sum total of currency in circulation and the demand deposits in banks; i.e., Coins and bank notes outside the banks and demand deposits (or current account balances). This concept, usually abbreviated as M1, leaves out savings deposits because they cannot immediately be used as a medium of exchange, i.e, they are not as liquid as currency and demand deposits. M1 is regarded as the narrowest concept of money supply. A broader concept, usually abbreviated as M2, is preferred when the time period being considered is long enough for holders of savings deposits to transfer funds to demand deposits for the purpose of effecting payments. Thus, using M2, money supply is the sum total of coins and bank notes outside the banks, demand deposits, and savings account deposits at the commercial banks (Akpakpan, 1999).

There is still a much broader definition of money supply than M2, which is usually abbreviated as M3. Thus, using M3, money supply is the sum total of: coins and bank notes outside the banks; demand deposits and savings account deposits at the commercial banks; plus savings deposits at other financial institutions, e.g, mortgage banks and savings and loan associations. M3 is useful only when one is concerned with a period long enough for holders of all forms of deposits in all the financial institutions in the banking system to be able to convert them into current account (demand deposits) balances for the purpose of making payments. The appropriate concept of money supply therefore depends on the context (Akpakpan, 1999).

By definition, inflation is a sustained rise in the general level of prices-the price level (Blanchard, 2009). Inflation is commonly understood as a situation of substantial and rapid general increase in the level of prices and consequent deterioration in the value of money over a period of time (Mithani, 2010). Similarly, Umo (2007) defines Inflation as a generalized increase in the level of prices sustained over a long period in an economy. Inflation can simply be referred to as a continuous upward movement or increase in the general price level. It refers to a sustained rise or general increase in prices of goods and services over a period of time.

Inflation is generally seen as a monetary phenomenon. However, the literature identifies a number of theories of inflation. These theories are: demand-pull, cost-push, structural, monetary and internationally transmitted inflation (i.e, imported inflation). However, for the purpose of this paper, the relevant theory of inflation is the demand-pull theory as viewed by the Neoclassicals and monetarists. The demand pull theory holds that inflation occurs when the aggregate demand for goods and services exceeds the aggregate supply assuming that the economy is operating at full employment level.

2.1.1. Neoclassical or Old Quantity Theory

The origin of the quantity theory of money is traceable to Irving Fisher. Fisher (1911), explained in detail how the quantity of money influences both the level of prices (inflation or deflation) and the rate of production and employment (depression or prosperity) in the economy. He used the "equation of exchange" to illustrate this theory.

$$MV = PQ$$

Where M =Money Stock; V=Velocity of Circulation; P=General Price level;

Q=Quantity of output of goods and services produced and sold in the economy.

V and Q are assumed to be fixed given full employment level of income. Thus any change in M leads to a proportionate change in P. that is,

$$M = P Q / V \quad \text{therefore, } \overline{M} = P$$

2.1.2. Monetarist Theory

Friedman (1968) sees inflation as a monetary phenomenon. According to Jhingan (2008). The monetarists hold that inflation arises as a result of increase in the money supply. This model is based on a stable money demand function in which money is demanded for transactions and precautionary purposes only. They assume that money supply is exogenously determined and controlled by the monetary authorities. Here, inflation occurs when money supply expands more rapidly than money demand.

The theory holds that an increase in money supply increases the nominal income of people which leads to an increase in their demand for goods and services. This leads to increase in production and hence, increase in the demand for more production inputs. If the economy is at full employment level, this leads to an increase in production costs which then reduces the profit margin and which in turn increases the prices of goods and services. Inflation occurs depending on how people react to this price increase. If it is a temporary price increase, people will increase their money demand (Jhingan, 2008)

2.2. Empirical Literature Review

The linkage between Money supply and inflation has been an important issue in the global economy. Several studies have empirically investigated the relationship between money supply and inflation in most countries of the world. Waingade (2011), analysed the relationship between Money supply and price level in India. The Regression results revealed that, over a long period, there exists a positive correlation between growth in money supply and price level. The association between the two has however not been proportional. The growth in money supply has most of the time exceeded the growth in price level. The gap between the two is explained by the growth in real national income. Waingade(2011) further explains that if the combined growth in price level and real national income over a long period is considered, then it comes very close to the growth in money supply, implying a near proportional relationship between the two. This means the impact of change in money supply gets distributed between the change in price level and change in real national income, depending upon the state of the economy.

Heidari, H. and P. Salmasi (2011) re-investigated the long-run relationship between money growth and inflation for the period of 1989 to 2007 using quarterly data of the Iranian economy. Using the Bounds test approach to cointegration, the results revealed that there is a long-run relationship between money growth and inflation. The results showed that in the long-run, 1 percent increase in money growth leads to a 72 percent increase in inflation rate, which means that money is the most important variable that affect inflation in the long run. The study concludes that inflation is largely a monetary phenomenon.

Darrat (1986) conducted a study to test the direction of causation between money and prices for Morocco, Tunisia and Libya over the period 1960Q1 and 1980Q2. The results indicated a unidirectional causality running from money to prices without feedback for all the three countries. Jones and Uri (1987) used three econometric methods to examine causality between money and inflation in the USA during the period 1953 - 1984. Failing to find a clear causal direction, they

concluded that the broad money stock does not determine inflation, though the effect of narrow money on inflation was suggested.

Tyrkalo and Adamyk (1990) and Doroshenko (2001), investigated relations between both money supply and inflation and between money supply and GDP. Their results indicate a long-run relationship between money growth and inflation. Similarly, Cheng and Tan (2002) investigated the long-run equilibrium relationship and causality between inflation and its determinants (i.e. money supply, output, interest rate, exchange rate and trade balance) in Malaysia. Employing the Johansen's Cointegration test and VECM approach, their results indicated the existence of cointegration among the variables. Their results also showed no evidence of direct causality running from money supply to inflation in Malaysia. Similarly, Tang and Lean (2007) examined the relationship between supply (MI) and inflation in Malaysia. Their regression results showed that the effect of money supply (MI) on inflation in Malaysia is negative and statistically significant at 1 percent level. Their conclusion did not support the monetarists view that inflation is purely a monetary phenomenon.

Lahiri (1991) investigated the causal relationship between money and inflation in Yugoslavia. The empirical results showed bi-directional relationship between both variables. On the contrary, Makinen and Woodward (1989) revealed from their empirical studies on hyper-inflation in Taiwan that, there exists a unidirectional causality between money and inflation with the causality running from inflation to money. Choudhry (1995) also studied the relationship between money stock and inflation in Argentina during the period 1935 – 1962. The results indicated the existence of a bi-directional causality between real aggregate money and inflation. Alternatively, Beltas and Jone's (1993) studied the relationship between money and inflation in Algeria for the period 1970 – 1988. Their results revealed the existence of a unidirectional causality between money and inflation in Algeria with the direction of causality running from money to inflation.

Within the Nigeria context, there have been several attempts to empirically determine the relationship between money supply and inflation. Chimobi (2010) employed econometric techniques to test for long run relationship and the direction of causality between money and inflation in the Nigerian economy for the period 1970 to 2005. The results indicated the existence of cointegration at 5% level, which also indicate a long term relationship existing between money supply and inflation in Nigeria. The Granger causality tests revealed a uni-directional causality running from money supply to inflation. Similarly, Yahya (2000), using a basic macroeconomic accounting framework, developed a framework for analyzing Nigeria's inflationary experience. His results indicated that inflation in Nigeria could be traced ultimately to excessive monetary growth.

Adenuga, Bello and Ejumedia (2012) examined whether inflation is purely a monetary phenomenon using annual data from 1970 – 2009. Employing the Ordinary Least Squares (OLS) technique, the study showed that, though money supply is highly significant in explaining inflation in Nigeria, inflation is not a purely monetary phenomenon in Nigeria as the coefficient of broad money supply is less than unity.

The summary of the empirical literature reviewed on the diverse issues of interest is that there exists a long-run relationship between money supply and inflation with a uni-directional causality running from money supply to inflation.

3. METHODOLOGY

3.1. Model Specification

This study adopts a multivariate co-integration regression analysis in order to find out if there is any long-run relationship between money supply and inflation in Nigeria. This is done in order to avoid spurious correlation and regression results often encountered in non-stationary time series data. The primary model is thus specified.

$$\text{INF} = f(\text{MS}_t, \text{FD}, \text{ER}, \text{IR}, \text{PGDP}_t, \text{IMP}_t) \dots \dots \dots 3.1$$

(+ +) (+) (+) (-) (+)

Where:

INF = Inflation rate

MS_t = Growth rate of Real Broad Money Supply (M₂)

FD = Fiscal Deficit (as a % of GDP)

ER = Exchange Rate

IR = Interest Rate (proxied by prime lending rate)

PGDP_t = Growth rate of Real GDP

IMP_t = Changes in Import Price (proxied by changes in the value of imports)

A Priori Expectations

The figures in parentheses represent a priori expectations about the signs of the coefficients.

3.2. Data

The series employed are annual observations of Inflation Rate, Broad Money Supply (M₂) and Budget deficit (% of GDP) for the period 1970 to 2010; they were sourced from various issues of the Central Bank of Nigeria Statistical Bulletin.

3.3. Estimation Techniques

3.3.1. Unit Root Test

The Unit Root Test involves testing for the order of integration of each time series (variable). A series is said to be integrated of order I (1) if it needs to be differenced once to become stationary. The same holds for an I (2) series which will need to be differenced twice to become stationary. Thus a stationary series is integrated of order zero I(0) (i.e, no differencing is necessary). Both the Augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1979,1981), and the Philips-Perron (Philip and Perron,1988) "unit root" tests are employed to determine the order of integration of each series.

3.3.2. The Co-Integration

This involves testing for the existence or otherwise of co integration between series that have the same order of integration. The existence of co-integration between series implies the existence of a long-term relationship between such variables and vice versa. This study employs the maximum likelihood test procedure established by Johansen and Juselius (1990) and Johansen (1991).

3.3.3. The Error Correction Model

If the existence of Co-integration is established amongst the series, then an Error Correction Mechanism (ECM) first used by Sargan (1964) and later popularized by Engel and Granger(1969) is constructed to correct for any dis-equilibrium in the short run. In an ECM, the dynamics of both short-run (changes) and long-run (levels) adjustment processes are modeled simultaneously, thereby offering the possibility of revealing information about both the short-run and long-run relationship.

3.3.4. Granger Causality Test

The Granger causality test is used to detect the nature and direction of influence or causality between two variables. If two variables are co-integrated then the causality of the co-integrated variables are captured in a vector error correction model (VECM).

4. ANALYSIS AND DISCUSSION OF RESULTS

4.1. Unit Root Tests

Tables 4.1a and 4.1b present the results of the Augmented Dickey Fuller (ADF) and Phillip Peron (PP) Unit root tests for the order of integration of the variables under investigation. The essence of the test is to determine whether the series: Inflation rate (INF); Growth rate of real Broad Money Supply (MS_t); Fiscal deficit (FD); Real Exchange Rate (ER); Interest Rate (IR); Growth

rate of real Gross Domestic Product (PGDP_t); and Changes in value of Imports (IMP_t); are Stationary (i.e have unit roots) and their order of integration. Thus, the essence of the test is the null hypothesis of nonstationarity. To reject this, the ADF and PP statistics must be more positive or negative than the critical values and significant.

Table 4.1a. Result of Unit Root Tests Based on Augmented Dickey-Fuller (Constant, time and trend included).

Variables	ADF Statistic	1% critical level	5% critical level	10% critical level	Order of Integration
INF	-3.414874	-3.600987	-2.935001	-2.605836	I (0)
MS _t	-4.466297	-3.600987	-2.935001	-2.605836	I (0)
FD	-3.853311	-3.600987	-2.935001	-2.605836	I (0)
ER	-5.869694	-3.605593	-2.936942	-2.606857	I (1)
IR	-9.993997	-3.605593	-2.936942	-2.606857	I (1)
PGDP _t	-6.713883	-3.600987	-2.935001	-2.605836	I (0)
IMP _t	-7.659700	-3.600987	-2.935001	-2.605836	I (0)

Source: Computed Result (E-View 5)

Table 4.1b. Result of Unit Root Tests Based on PHILLIP Perron (Constant, time and trend include)

Variables	PP Statistic	1% critical level	5% critical level	10% critical level	Order of Integration
INF	-3.283566	-3.600987	-2.935001	-2.605836	I (0)
MS _t	-4.350954	-3.600987	-2.935001	-2.605836	I (0)
FD	-4.016259	-3.600987	-2.935001	-2.605836	I (0)
ER	0.550916	-3.600987	-2.935001	-2.605836	I (1)
IR	-10.07826	-3.605593	-2.936942	-2.606857	I (1)
PGDP _t	-6.876119	-3.600987	-2.935001	-2.605836	I (0)
IMP _t	-7.660086	-3.600987	-2.935001	-2.605836	I (0)

Source: Computed Result (E- view 5)

1. Variables: The acronyms for variables are as earlier defined in section 3.3 under model specification).
2. The test was performed with trend and intercept and the critical values of the test are – at 1%, 5% and 10% levels of significance respectively
3. Order (0) and order (1) indicate stationarity of the various variables at level and at first difference respectively
4. The Ho is that series is non –stationary against alternative hypothesis H1 of a series being stationary. The rejection of the Ho for the ADF and PP tests are based on the Mackinnon critical values. The Lag lengths were determined in accordance with the SIC.

After comparing the test statistic value against the Mackinnon critical value at 5% level of significance, it was noticed that most of the variables in the two tests employed, that is ADF and PP were stationary at levels. The results of both the ADF and PP test show that INF, MS_t, FD, PGDP_t and IMP_t were stationary at levels while ER and IR are stationary at first difference.

4.2. Granger Causality Results

In the Granger causality test, the null hypothesis is rejected if the calculated F- statistic is significant but it is accepted if the F-statistic is not significant. The Granger result is presented in table 4.2.

Table 4.2. Granger Causality Results

Null Hypothesis:	Obs	F-Statistic	Probability
MST does not Granger Cause INF	40	1.73053	0.19201
INF does not Granger Cause MST		0.41295	0.66488

From the Granger causality test results presented in table 4.2 above, the following inferences are made There is no causality existing between growth rate of real broad money supply (MSt) and Inflation rate (INF). By implication, increase in real Broad Money Supply does not cause an

increase in the rate of inflation. Similarly an increase in Inflation rate does not cause an increase the money supply. This result is quite different from the findings of Chimobi(2010) in which a uni-directional causality from money supply to inflation was found.

4.3. Cointegration Test Results

After establishing the order of integration as demonstrated in section 4.1, using ADF and PP tests, we proceed to obtain the co-integrated vectors from the Inflation model specified in Equation (3.1). If two series are integrated of the same order, then the two series are said to be cointegrated and the regression on the same levels of the two variables is meaningful (not spurious) and long run information is not lost. We estimate co-integration regression to determine whether there exists any long-run relationship between the growth rate of real broad money supply (MS_t), fiscal deficits (FD), exchange rate (ER), interest rate (IR), growth rate of real gross domestic product (PGDP_t), changes in the value of Imports (IMP_t) and inflation rate (INF). The Johansen procedure used here also enables us to know the number of co-integration equations or relationships. Table 4.3a and 4.3b presents the results of the cointegration test based on unrestricted cointegration Rank Test (Trace) and unrestricted cointegration Rank Test (Maximum Eigenvalue)

Table 4.3a. Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.753445	162.2915	125.6154	0.0000
At most 1 *	0.628686	106.2847	95.75366	0.0077
At most 2	0.519538	66.65639	69.81889	0.0871
At most 3	0.438829	37.33614	47.85613	0.3318
At most 4	0.211770	14.22695	29.79707	0.8276
At most 5	0.110166	4.708355	15.49471	0.8390
At most 6	0.000988	0.039541	3.841466	0.8423

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

** denotes rejection of the hypothesis at the 0.05 level*

***MacKinnon-Haug-Michelis (1999) p-values*

Table 4.3b. Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.753445	56.00674	46.23142	0.0034
At most 1	0.628686	39.62833	40.07757	0.0561
At most 2	0.519538	29.32025	33.87687	0.1590
At most 3	0.438829	23.10919	27.58434	0.1689
At most 4	0.211770	9.518594	21.13162	0.7885
At most 5	0.110166	4.668813	14.26460	0.7829
At most 6	0.000988	0.039541	3.841466	0.8423

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

** denotes rejection of the hypothesis at the 0.05 level*

***MacKinnon-Haug-Michelis (1999) p-values*

When cointegration is present, it means that there is clear long- run relationship between the variables under investigation and that they follow a common trend. The rule states that, for variables to have long run relationship there should be at least one cointegrating equation. The results of the cointegration tests presented here reveals that there exists a clear long- run relationship between the variables. This is confirmed by both the trace value and Eigenvalue results. The trace test indicates the existence of 2 cointegrating equations at the 5% level thus denoting the rejection of the null hypothesis of zero cointegrating relationship at 5% level of significance. Similarly, the Max-Eigen test indicates the existence of 1 cointegrating equation at the 5% level thus denoting the rejection of the null hypothesis of zero cointegrating relationship at

5% level of significance. This, is because their statistical values are greater than their critical values. Hence there exists a long run equilibrium relationship between inflation rate, growth rate of real broad money supply, fiscal deficit (as % of GDP), exchange rate, interest rate, growth rate of real GDP and changes in the value of Imports.

4.4. Error Correction Model Results of Macroeconomic Factors Influencing Inflation

The error correction mechanism for macroeconomic factors influencing inflation was estimated. The primary reason for this is to capture the dynamics in the Inflation equation in the short run and to identify the speed of adjustment as a response to departures from the long run equilibrium. To obtain a parsimonious dynamic ECM for the Inflation equation, an initial over-parametised model was estimated which was too difficult to interpret. It was therefore reduced and simplified into an interpretable, standard and appropriate parsimonious model of Inflation in Nigeria. This was achievable by gradually eliminating insignificant lagged variables until the parsimonious result was obtained. The result of the parsimonious model is presented in table 4.4.

Table 4.4. *Parsimonious Error Correction Result of Factors Influencing Inflation*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.230680	0.166711	-1.383711	0.2604
D(LOG(MST(-1)))	-0.887013	0.317979	-2.789534	0.0684
D(LOG(FDT(-1)))	-0.721600	0.624089	-1.156244	0.3313
D(LOG(ER(-1)))	-0.119711	1.834911	-0.065241	0.9521
D(LOG(IR(-1)))	-4.470727	1.153663	-3.875246	0.0304
D(LOG(PGDPT))	-0.362453	0.145347	-2.493709	0.0882
D(LOG(PGDPT(-1)))	0.450846	0.153327	2.940418	0.0605
D(LOG(IMPT(-1)))	-0.114477	0.107891	-1.061036	0.3665
ECM(-1)	-0.089964	0.034711	-2.591842	0.0809
R-squared	0.966610	Mean dependent var		0.121323
Adjusted R-squared	0.877572	S.D. dependent var		0.929026
S.E. of regression	0.325064	Akaike info criterion		0.704115
Sum squared resid	0.316999	Schwarz criterion		1.067795
Log likelihood	4.775310	F-statistic		10.85606
Durbin-Watson stat	2.621894	Prob(F-statistic)		0.037690

The parsimonious model of Table 4.4 reveals a well-defined error correction term ECM which is negative and statistically significant at 10% probability level. The significance of the coefficient of the error term supports our earlier positions that the variables under study are indeed cointegrated. The absolute value of the coefficient of the error term indicates that the disequilibria in the long run trend of the dependent variable (that is inflation rate) takes approximately 1/0.09 years (that is 11 years) to be corrected back to the equilibrium level. This coefficient represents the speed of adjustment and it is also consistent with the hypothesis of convergence towards the long-run equilibrium once the inflation equation fluctuates from its equilibrium in the short-run.

The R² (R-squared) value of the ECM model shows that about 96% of the adjusted total variations in inflation rate (INF) is explained by the specified explanatory variables. The F-Statistic of 10.856 is significant at 5% probability level indicating that the R² is significant and the model has goodness of fit. However, the Durbin-watson value of 2.62 indicates the existence of minor serial correlation.

Table 4.4 equally reveals that the coefficients of growth rate of real broad money supply (MSt) at lag 1 and Interest rate (IR) at lag 1 are statistically significant at 10% and 5% probability level respectively. Similarly, the coefficients of growth rate of real gross domestic product (PGDP_t) at level and at lag 1 are statistically significant at 10% probability level. On the contrary, the coefficients of fiscal deficits (FD), real Exchange rate(ER) and changes in the value of Imports (IMP_t) are not statistically significant. This implies that MS_t(at lag 1), FD(at lag 1), ER(at lag 1), IR(at lag 1), PGDP_t(at level), PGDP_t(at lag 1) and IMP_t(at lag 1), are all macroeconomic factors that influence Inflation in the short-run.

5. POLICY RECOMMENDATIONS AND CONCLUSION

The major thrust of this study is to empirically investigate the relationship between money supply and inflation in Nigeria using data for the period of 1970-2011. Specifically, the paper sought to determine the nature and direction of causality between money supply and inflation in Nigeria. Employing Granger causality and cointegration techniques, the study found that: 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. This implies that the past one year value of real broad money supply has a negative influence on current inflation rate. This is because the coefficient of real broad money supply (at lag 1) is negative and significant at 10% probability level. This relationship is such that for a unit decrease in the past one year value of real broad money supply, inflation rate will increase by 0.8 units.

From the findings of this study, the policy implications can be easily discerned. While there exists a long-run relationship between money supply and inflation, policy action requires that money supply should be managed properly to avoid causing inflation. Particularly, policies and measures to check and sustain the money stock at non-inflationary levels need to be promoted. The study recommends that based on the major findings of this study, 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. Monetary growth should be closely monitored and relevant authorities should be proactive in disallowing its growth rate from attaining alarming and inflationary heights.

REFERENCES

- Adenuga, I. A., Bello, H.T. and P. E. Ejumedia (2012). Is Inflation a Purely Monetary Phenomenon? Empirical Investigation from Nigeria.(1970-2009). *European Scientific Journal*, 8(17): 236 -249.
- Akpakpan, E. B.(1999). The Economy (Towards A New Type of Economics). Belpot Publishers, Port- Harcourt, Nigeria.
- Amassoma, D., Nwosu, P.I. and S. A. Olaiya (2011). An Appraisal of Monetary Policy and Its Effects on Macro Economic Stabilization in Nigeria. S on Macro Economic Stabilization in Nigeria. *Journal of Emerging Trends in Economics and Management Sciences (JETEMS)*. 2(3): 232 - 237.
- Beltas, A. and Jones, T. (1993), Money, Inflation and Causality in Financially Regressed Economy: Algeria, 1970 - 1988. *Journal of Applied Economics*. 25: 473 - 480.
- Blanchard, O. (2009). *Macroeconomics* Fifth Edition, Pearson Education, Inc., U.S.A.
- CBN (1993). *Perspectives of Economic Policy Reforms in Nigeria*. Research Department, CBN, Lagos.
- CBN (2010). *Statistical Bulletin*. Research Department, CBN, Lagos.
- Cheng, M. and H. Tan (2002). Inflation in Malaysia. *International Journal of Social Economics*. 29(5): Pp.411 - 425.
- Chimobi, O.P.(2010): Causality Between Money and Inflation in the Nigerian Economy, *International Journal of Economic Perspectives*, 3 (2)
- Choudhry, T. (1995), Long-Run Money Demand Function in Argentina during 1935 - 1962: Evidence from Cointegration and Error Correction Models. *Journal of Applied Economics*. 27: 661-667.
- Darrat, A. F. (1986), Money, Inflation and Causality in the North African Countries: An Empirical Investigation. *Journal of Macroeconomics*, 8:87-103.
- Dickey D. A. and W. A Fuller (1981). Likelihood Ratio Tests for Auto regression Time Series with A Unit Root, *Econometrica*, 49:1057-1072.
- Dickey, D. A. and W. A Fuller (1979). Distribution of the Estimators for Auto Regression Time Series with A Unit Root, *Journal of American Statistical Association*, 74(4):27-31.
- Doroshenko, I. (2001). Monetary Policy of Economic Growth in the Transitional Economy, *Ph.D Dissertation*, Shevchenko National University, Kyiv.
- Friedman, M. (1968): The Role of Monetary Policy. *American Economic Review*. Vol. 58, Pp 1-17.

- Heidari, H, and P. Salmasi (2011). Re-Investigation of the Long Run Relationship between Money Growth and Inflation in Iran: An Application of Bounds test approach to Cointegration. *2010 International Conference on Business and Economic Research* Vol. 1 (c) (2011) IALSIT press, Kuala Lumpur, Malaysia. 192-195
- Jhingan, M. L. (2008) *Monetary Economics*, Sixth Edition, Vrinda Publications Ltd, Delhi.
- Johansen, S. and K. Juselius (1990). Maximum Likelihood Estimation and Inference on Cointegration with Applications To The Demand For Money. *Oxford Bulletin of Economics and Statistics* 52:169-210.
- Johansen, S. and K. Juselius (1991) Testing Structural Hypothesis In a Multivariate Cointegration Analysis of PPP and UIP for U.K.. *Journal of Econometrics*. 55:211-214.
- Lahiri, A. K. (1991), Money and Inflation in Yugoslavia. *IMF Staff Papers*, 38(4): 751 - 788.
- Makinen, G. E. and T. G. Woodward, T. G. (1989), The Taiwanese Hyperinflation and Stabilization of 1945 - 1952, *Journal of Money, Credit and Banking*, 21(1): 90-105.
- Mishkin, F. S. (2010): *The Economics of Money, Banking and Financial Markets*, Ninth Edition (Global Edition). Pearson Education INC., Boston, MA.
- Mithani, D. M. (2010): *Money Banking, International Trade and Public Finance*. 16th Edition, Himalaya Publishing House PVT Ltd., Mumbai.
- Onwioduokit, E. A (1996) Fiscal Deficit and Inflation Dynamics In Nigeria: An Empirical Investigation of causal relationship. Central Bank of Nigeria (CBN) *Economic and Financial Review* Vol.37. No. 2.
- Philips, P. C. B and Perron, P. (1988) Testing for A Unit Root In Time Series *Journal of Monetary Economics*. 9:141-43.
- Tyrkalo R. and Adamyk, B. (1999). Monetary Policy Transmission and Its Meaning to the Effectiveness of NBU activity, *Herald of NBU*, 7,6,11
- Udah, E. B. (2009). Macroeconomic Stabilization and Monetary Policy in Nigeria, in *Proceedings of the 2009 Conference of the Nigerian Economic Society (NES)*. Ibadan.
- Umo, J. U. (2007): *Economics-An African Perspective*. Second Edition, Millennium Text Publishers, Lagos, Nigeria
- Waingade, R. A. (2011). Money Supply and Inflation; An Historical Analysis. *The IUP Journal of Monetary Economics*, Vol. IX, No. 1 PP 22-45.
- Yahya, K. A. (2000) Structural Disequilibrium and Inflation in Nigeria: A Theoretical and Empirical Analysis, *Centre for Economic Research on Africa*, School of Business, Montclair State University, Upper Montclair, New Jersey.

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