
Inflation and Money Supply in Nigeria

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ABSTRACT

The objective of this paper is to examine the relationship between inflation and money supply. Based on the Quantity Theory of Money (QTM) model by Irving Fisher, we have used the OLS estimation techniques and the Chow test to empirically investigate the proposition and to test for the structural significance. In testing for the relationship between inflation and money supply we used two models, M1 (Narrow Money Supply) and M2 (Broad Money Supply) model. The innovation of this study is that we divided the study period into pre Structural Adjustment Programme (SAP) and since SAP. Our basic result indicates that there is a strong correlation between inflation and money supply and that inflation and money supply have a significant impact on the Nigerian economy. However, the chow test result rejected the hypothesis that there is a significant difference between the two periods. In general there is a stronger correlation between inflation and broad money supply (in the second model); therefore, we concluded that it is a better estimate of inflation.

Keywords: Inflation, Money Supply,

Introduction

Among other problems affecting the world economy is the problem of inflation defined as an increase in general price level in a given currency and how it is affected by money supply and other factors in the economy. However, these problems are more pronounced in developing countries. These problems are associated with instabilities in economy.

In the case of Nigeria, this problems, which causes the monetary authorities in the country to seek remedies on a continual basis, have brought about rapid decline in the standard of living of its people. The problem of inflation is measured by observing the change in the price of a large number of goods and services in an economy (usually based on data collected by government agencies). The prices of goods and services are combined to give a *price index* measuring an **average price level**: the average price of a set of products.

Tools being used to fight this problem of inflation are mainly monetary and fiscal policies. Monetary theory predicts a strong long run correlation

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between money growth and inflation. According to Frain (2003) citing Mc Candles and Weber (1995), "in the long-run there is high (almost unity) correlation between the rate of money supply and the rate of inflation".

Prior to the upsurge of inflation in the 1970s, many economists did not bother to look at the money stock when analyzing the sources of the (low) inflation rates during the period of study. A general increase in price level was first noticed in the early 1970's. The high rate of inflation, which Nigeria has been experiencing since the 1970's, has its origin in the economic measures and controls that were first enacted during the Nigerian Civil War of 1967-1970.

Prior to that War, Nigeria practiced the open-market economic policy with very little governmental controls on these policies. However, this changed during the War which, for the first time, made governmental controls necessary. This, then, gave rise to increasing economic planning and to greater centralization of economic decisions in Nigeria.

Such governmental controls related among others, to the fixing of prices for certain consumer goods, the determination of the volume of imports and its distribution among consumer and capital goods, the direct participation in the production and the marketing of goods, the determination of the share of wages in income and the control of profit; and the stricter control of foreign investment within the Nigerian economy. The maintenance of price stability is one of the macroeconomic challenges facing the Nigerian government in our economic history. This elusive factor is known and referred to as inflation in our economic history and this is defined by economists as a continuous rise in prices.

By definition, inflation is a persistent and appreciable rise in the general level of prices (Jhingan, 2002). Not every rise in the price level is termed inflation. Therefore, for a rise in the general price level to be considered inflation, such a rise must be constant, enduring and sustained. The rise in the price should affect almost every commodity and should not be temporal. But Demberg and McDougall are more explicit referring to inflation as a continuing rise in prices as measured by an index such as the Consumer Price Index (CPI) or by the implicit price deflator for Gross National Product (Jhingan 2002). In an inflationary economy, it is difficult for the national currency to act as medium of exchange and a store of value without having an adverse effect on income distribution, output and employment (CBN, 1984). Inflation is characterized by a fall in the value of the country's currency and a rise in her exchange rate with other nation's currencies. This is quite obvious in the case of the value of the Naira (N), which was N1 to \$1 (one US Dollar) in 1981, average of N100 to \$1 in year 2000 (Okeke, 2000) and over N128 to \$1 in 2003. This

decline in the value of the Naira coincides with the period of inflationary growth in Nigeria, and is an unwholesome development that has led to a drastic decline in the living standard of the average Nigerian. To measure inflation are three approaches. These are the Gross National Product (GNP) implicit deflator, the Consumer Price Index (CPI) and the wholesome or producer price index (WPI or PPI). The period to period changes in these two latter approaches (CPI and WPI) are regarded as direct measures of inflation. There is no single one of the three that rather uniquely best measure inflation. The Consumer Price Index (CPI) approach, though it is the least efficient of the three is used to measure inflation rates in Nigeria as it is easily and currently available on monthly, quarterly and annual basis (CBN, 1991).

We can not fail to recognize here that, the increase in government involvement in all aspects of the Nigerian economy would reduce the role of the market mechanism in the development process of that country. Likewise, it should be recognized that these economic policies were firmly rooted in a strategy of "development through stricter government controls". The strategy was, also, extended to give the government the leading role of maintaining "economic fairness" in the country. Therefore in the Nigerian case, by looking at the 1970's, we should be able to evaluate the suitability of greater government controls as a means to solving the problems of Nigeria.

Although the economic problems of Nigeria are many, in this paper, our attention will be focused on one particular problem, which is inflation and how it is affected by money supply or put differently how it relates to money supply.

Because of the energy crisis of the 1970's, high inflationary rates became widespread. Even, industrialized countries like Britain and Italy recorded annual inflation figure of over 20% respectively. Significantly however, Nigeria, an oil exporting country, also began to experience high inflation rate during this period too; of the magnitude of about 15% - 30% per year. Let us, now, consider the effects of higher inflationary rates on economic growth in Nigeria. If we excluded the 1966-1969 War period from our analysis, then we observed that Nigeria was characterized, on the one hand, by a low inflationary rate of about 4% annual average, in the 1960's. Nigeria was also characterized by a higher growth rate in that period, than in the 1960's. But, one should not be misled to think that the higher inflation rate had led to the higher growth rate; as we shall see in our result.

In addition, in the late 1980's, following the Structural Adjustment Program, the effects of wage increases created a cost-push effect on inflation. In the long run, it was the structural characteristics of the

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economy, coupled with the growth in money supply that translated these into permanent increases. Nigeria has experienced high volatility in inflation rates. The growth of money supply is correlated with the high inflation episodes because money growth was often in excess of real economic growth.

Literature Review

Since mid 1960s, inflation has become so serious and contentious a problem in Nigeria. Though inflation rate is not new in the Nigerian economic history, the recent rates of inflation have been a cause of great concern to many. During the period under review (1981–2003), there has been an upsurge in the inflationary rates leading to major economic distortions. The continued over valuation of the naira in 1980, even after the collapse of the oil boom engendered significant economic distortions in production and consumption as there was a high rate of dependence on import which led to balance of payment deficits. This resulted to taking loans to finance such deficits. An example was the Paris Club loan, which was a mere Five Billion, Thirty nine million dollars (\$5.39billion) in 1983 rose to twenty one billion, six million dollars (\$21.6billion) in 1999 (CBN 2001).

According to Yahaya (2000) (cited in Odiba *et al* 2013), the major explanations of inflation include fiscal, monetary and balance of payment aspects. On the one hand inflation is considered to be due to an increase in the money supply. On the other, the fiscal explanation views inflation as rising from budget deficits which are considered fundamental causes of inflation. However, the fiscal aspect is closely linked to the 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. The collapse of the exchange rate usually brings about inflation through higher import prices and increases in inflationary expectations which are often accommodated through an accelerated wage indexation.

Money supply is defined differently in different countries depending on the level of development of their financial system. In Nigeria, this level is low. Savings and Time deposits first have to be converted into cash or demand deposits before they can be used as medium of exchange. Consequently, the official definition of money supply in Nigeria is M1 which comprises notes and coins in circulations and demand deposits in commercial and central bank. Other wider definitions of money merely add to M1. For instance, M1 is obtained by adding savings and time deposits at commercial banks to M1.

The supply of money is the stock of money at a particular point in time. The supply of money at any moment is the total amount of money in the economy (Jhingan, 2006). According to Anyanwu and Oaikhenan (1995), money supply is the assets which represent immediate purchasing power in the economy and which as a result function as a medium of exchange. In Nigeria, the narrow money supply (M1) is defined as currency outside bank plus demand deposits of commercial banks plus domestic deposits with the central banks less Federal Government deposits at commercial banks.

In simple terms, M1 is defined as;

$$M1 = C + D$$

Where:

- M1 = Narrow money supply
- C = Currency outside banks
- D = Demand deposits.

Ajayi (1978) contends that M2 is the appropriate definition of money in Nigeria. In the UK narrow money includes M0, M1 and M2. M0 includes only notes and coins in circulation and in bank tills, m1 includes notes and coins in circulation and sight deposits with banks, M2 includes not only notes and coin and bank current accounts, but also 7-days bank deposits and some building society deposits. In the Nigerian context board money (M2) is defined as M1 plus quasi money. Quasi-money as used here is defined as the sum of savings and time deposits with commercial banks.

Symbolically shown as;

$$M2 = C + D + T + S$$

Where:

- M2 = Board money
- T = Time deposit
- S = Savings deposits
- C and D as defined above.

As the economy expands, the role of government becomes even more important, hence the expenditure requirements of programmes do not always coincide with projected revenue. This sharp drop in revenue can be attributed to external shocks among other variables. This then results to fiscal deficits which necessitates money creation to meet the resources gap (CBN 1998) It is therefore, believed that fiscal deficits over the years have led to inflation rates on the average remaining double digits. The

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effectiveness of demand is primarily based on the willingness and ability to buy a good or service. This ability is therefore, dependent of the availability of money. Hence, an increase in aggregate demand is a function of an increase in money supply. Therefore, money supply is the relationship between the quantity of money supplied in the form of currency and checkable deposits and the level of interest rates prevailing at a given point in time (Hyman, 1996). Itua (2000), in his work on the structural determinants of inflation in Nigeria between 1981 and 1998 combined the conventional causes of inflation demand pull, cost push and structural as inflation over the years in Nigeria has been determined by all the three alternating at various times. Therefore, variables like fiscal deficits and money supply (M1) will be used to depict the demand pull factors, the percentage contribution of agriculture to the Gross Domestic product (GDP) to highlight the structural factor while exchange rate will show the cost push factor.

METHODOLOGY

In specifying our model, since the QTM does not specify which definition of money supply should be used in the empirical tests of the theory; there is no theoretical reason why M1 or M2 should be used as the appropriate variable. Accordingly, many authors use both or more monetary aggregates to compare the results obtained for various definitions of money. Since the theoretical framework is not consistent in its opinion about which monetary aggregate is correlated more with the price level, we are using both M1 and M2 in our study. We are also using Government Expenditure (GE) and Real Gross Domestic Product (RGDP).

$$P_t = F (M1, M2, GE, RGDP, \mu) \quad (1)$$

This is the model to be used that is the apriori specification. It simply states that inflation is a function of money supply, government expenditure, real gross domestic product and the error term which is used to capture other unspecified variables.

In analyzing the equation we are going to divide the equation into two so as to be able to estimate the effect of narrow money and broad money separately on inflation.

$$\begin{aligned} P_t &= f (M1, GE, RGDP, \mu) \\ P_t &= f (M2, GE, RGDP, \mu) \end{aligned} \quad (2)$$

Equation two is an identity we simply used it to state that inflation is equal to or the same as the summation of money supply government expenditure, real gross domestic product and the error term.

$$\begin{aligned}
 P_t &= \alpha_0 + \alpha_1 M_{1t} + \alpha_2 GE_t - \alpha_3 RGDP_t + \mu_t; \\
 P_t &= \beta_0 + \beta_1 M_{2t} + \beta_2 GE_t - \beta_3 RGDP_t + \mu_t;
 \end{aligned}
 \tag{3}$$

Equation three is a linear equation, Where P_t is consumer price index for period t which will be used to represents inflation for period t which is usually a year; The β 's and α 's are the estimators; M_{1t} is the narrow money supply for period t ; M_{2t} is the broad money supply for period t ; GE_t is the government expenditure for period t ; $RGDP_t$ is the real gross domestic product for period t this is used to capture the Nigerian economy in terms of her level of growth; The μ 's are the stochastic term which is also known as the error term.

A Priori Specification

On a priori: $\alpha_1 > 0$, $\alpha_2 > 0$, $\alpha_3 < 0$, $\beta_1 > 0$, $\beta_2 > 0$, $\beta_3 < 0$.

There is a positive relationship between price level and money supply. There is an inverse relationship between price level and Government Expenditure and also between price level and Nominal GDP.

We can transform equation two into a double logarithm by taking the logarithm of both sides of the equation:

$$\begin{aligned}
 \log P_t &= \log \alpha_0 + \alpha_1 \log M_{1t} + \alpha_2 \log GE_t + \alpha_3 \log RGDP_t + \log \mu_t; \\
 \log P_t &= \log \beta_0 + \beta_1 \log M_{2t} + \beta_2 \log GE_t + \beta_3 \log RGDP_t + \log \mu_t;
 \end{aligned}
 \tag{4}$$

In equation four we have taken the logarithm of the whole equation giving us a log linear equation.

$$\begin{aligned}
 \log P_t &= A + \alpha_1 \log M_{1t} + \alpha_2 \log GE_t + \alpha_3 \log RGDP_t + \log \mu_t; \\
 \log P_t &= B + \beta_1 \log M_{2t} + \beta_2 \log GE_t + \beta_3 \log RGDP_t + \log \mu_t;
 \end{aligned}
 \tag{5}$$

In equation five above, $A = \log \alpha_0$ and $B = \log \beta_0$ equation five is the model with which we will run our regression

RESULTS

Interpretation of Narrow Money Supply Model of Inflation

Here, we are testing for the relationship between the inflation, narrow money supply, real gross domestic product and government expenditure, in the period 1970-2010, before SAP and since SAP.

Ordinary Least Square Estimation from 1970-2004

$$\log P_t = \alpha_0 + \alpha_1 \log M_{1t} + \alpha_2 \log GE_t + \alpha_3 \log RGDP_t + \mu_t;
 \tag{1}$$

$$\begin{aligned}
 \log P_t &= 8.4215 + 0.26882 \log M_{1t} + 0.74162 \log GE_t - 1.1917 \log RGDP_t + \mu_t \\
 t & \quad (3.9001) \quad (1.8812) \quad (4.8184) \quad (-5.8862)
 \end{aligned}
 \tag{2}$$

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R-Squared = 0.98976, R-bar-Squared=0.98877 F (3, 31) = 998.5 SEE = 0.22743
Mean of Dependent Variable = 5.3804 RSS = 1.6034 DW-Statistics = 1.2069

The above is the estimated inflation equation, where t-values are reported in parentheses below the coefficients. Given the value of the R-squared it can be concluded that the independent variables explain over 98% of the symmetric variation in inflation during 1970-2004. The F value of 998.5 is highly significant, passing the significant test at the 1% level. Therefore the hypothesis of the impact of inflation and money supply on the Nigerian economy is validated. The signs of all the coefficients are correct. The T values of all the variables are significant that is they passed the two-tailed test of significance at the 1% level, except for Narrow Money supply which passed the test at 10%. The Durbin-Watson Statistics is very low indicating the presence of first order serial correlation.

After correcting for auto correlation we obtained the following results:

$$\text{Log } P_t = -1.1816 + 0.77973\text{logM1} + 0.15970\text{logGE} - 0.27538\text{logRGDP} \quad (4.1.3)$$

(-5.2143) (6.7076) (1.3778) (-1.4265)

$$U = 1.0687*U(-1) + -.31562*U(-2) + E \quad (4.1.4)$$

(5.8504) (-1.8022)

R-Squared = 0.99516 R-Bar-Squared = 0.99426 F - Stat = 1109.3 S.E.E. = 0.15755

Mean of Dependent Variable = 5.3804 RSS = 0.67020 DW-statistic = 2.0604

The t-values are reported below the coefficients. An examination of Equation (4.1.3) and (4.1.4) confirms that we have improved significantly on equation (4.1.2). The serial correlation has been eliminated as indicated by Durbin-Watson statistic of 2.0604. The second order autoregressive parameters $\hat{\rho}_1$ and $\hat{\rho}_2$ lie between zero and two in absolute value. Their t-values are significantly different from zero at 1% level and 10% level, respectively. With an R-squared of 0.99516 it is apparent that we are able to explain over 99% of the systematic variations in inflation by our independent variables. All of the variables have the correct signs but only the Narrow Supply of Money passes the two-tailed test of significance at 1% level. Real Gross Domestic product and Government Expenditure passed the two tailed test at 20% level.

The F-Statistics of 1109.3 is significant at 1% level. A unit increase in money supply will increase inflation by over 77%. Thus the hypothesis that there is a link between inflation and money supply is valid, and the hypothesis that the supply of money is a tool used in controlling inflation by the monetary authorities. A unit change in Government Expenditure will cause a change in inflation by over 15%. Also a unit increase in

inflation will fall Real Gross Domestic Product by over 27%. Therefore the hypothesis that inflation and money supply has an impact on the Nigerian economy is valid since an increase in money supply increases inflation and this increase in turn reduces the gross domestic output of the Nigerian economy.

Ordinary Least Square Estimation for the Pre SAP Era (1970-1985)

$$\log P_t = 3.5389 + 0.72034\log M1 - 0.076356\log GE - 0.47027\log RGDP \quad (4.1.5)$$

(1.8116) (5.0086) (-0.38009) (-2.1723)

R-Squared = 0.97351 R-Bar-Squared = 0.96689
 S.E. of Regression = 0.13328 F- Stat = 146.9897
 Mean of Dependent Variable = 3.4202 Residual Sum of Squares = 0.21315
 DW-statistic = 0.65202

The above is the estimated inflation equation for the period 1970-1985, where t-values are reported in parentheses below the coefficients. Given the value of the R-squared it can be concluded that the independent variables explain over 97% of the symmetric variation in inflation before SAP. The F value of 146.9897 is significant, passing the significant test at the 1% level. Thus the hypothesis that there is a link between inflation and money supplied is validated. Also the hypothesis of the impact of inflation and money supply on the Nigerian economy is validated. The signs of the coefficients Narrow Money Supply and Real Gross Domestic Product are correct but that of Government Expenditure is not correct indicating that there is an inverse relationship between inflation and government expenditure. The T values of all the other variables are significant that is they passed the two-tailed test of significance at the 5% level; only Narrow Money supply passed the test at 1% level of significance. The Durbin-Watson Statistics is very low indicating the presence of first order serial correlation.

After correcting for auto correlation we obtained the following results:

$$\log P_t = 3.7243 + 0.72034\log M1 - 0.25544\log GE - 0.43336\log RGDP \quad (4.1.6)$$

(1.7570) (7.5764) (-2.335) (-2.4835)

$$U = 1.1091*U(-1) + -0.49668*U(-2) + E \quad (4.1.7)$$

(3.2635) (-1.6975)

R-Squared = 0.99004 R-Bar-Squared = 0.98381
 S.E. of Regression = 0.085677 F (5, 8) = 159.0256
 Mean of Dependent Variable = 3.4202
 Residual Sum of Squares = 0.058724
 DW-statistic 1.9359

The t-values are reported below the coefficients. An examination of Equation (4.1.6) and (4.1.7) confirms that we have improved on equation

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(4.1.5). The serial correlation has been eliminated as indicated by Durbin-Watson statistic of 1.9359. The second order autoregressive parameters $\hat{\rho}_1$ and $\hat{\rho}_2$ lie between zero and two in absolute value. Their t-values are significantly different from zero at 1% level and 15% level, respectively. With an R-squared of 0.99004 it is apparent that we are able to explain over 99% of the systematic variations in inflation by our independent variables. All the variables, except Government expenditure, have the correct signs but only the Narrow Supply of Money passes the two-tailed test of significance at 1% level. Real Gross Domestic product and Government Expenditure passed the two tailed test at 5% level. The F-Statistics of 1109.3 is significant at 1% level. A unit increase in money supply will increase inflation by over 72%. Thus the hypothesis that there is a link between inflation and money supply is valid, and the hypothesis that the supply of money is a tool used in controlling inflation by the monetary authorities. Also a unit change in Real Gross Domestic Product will cause a change in inflation by over 43%. Therefore the hypothesis that inflation and money supply has an impact on the Nigerian economy is valid.

The Ordinary Least Square Estimation for the Period Since SAP (1986-2010)

$$\log P_t = 3.5841 + 0.35092 \log M1 + 0.63956 \log ge - 0.74521 \log rgdp \quad (4.1.8)$$

(0.83150) (1.4697) (2.6092) (-1.8196)

R-Squared = 0.97954

R-Bar-Squared = 0.97545

S.E. of Regression = 0.21927

F (3, 15) = 239.3780

Mean of Dependent Variable = 7.0310

Residual Sum of Squares = 0.72120

DW-statistic = 0.86042

This is the estimated inflation equation for the period 1986-2010 that is the period since SAP, where t-values are reported in parentheses below the coefficients. Given the value of the R-squared, 0.97954, it can be assumed that the independent variables explain over 97% of the symmetric variation in inflation during SAP. The F value of 239.3780 is significant, passing the significant test at the 1% level. Thus the hypothesis of the impact of inflation and money supply on the Nigerian economy is validated. All the signs are correct but only Government Expenditure is significant at 2% level, real gross domestic product is significant at 10 % level.

The low level of significance in the t-ratio of narrow money supply during this period indicates that the supply of money did not have significant impact on inflation. The Durbin-Watson Statistics is very low indicating the presence of first order serial correlation.

After correcting for auto correlation we obtained the following results:

$$\text{Log } P_t = -2.0538 + 0.55031\text{logM1} + 0.28922\text{logge} - 0.082876\text{logrgdp} \quad (4.1.9)$$

(-0.61175) (3.4186) (2.0582) (-0.28845)

$$U = 1.0964*U(-1) + -0.42653*U(-2) + E \quad (4.1.10)$$

(4.0116) (-1.5309)

R-Squared = 0.98757

R-Bar-Squared = 0.98192

S.E. of Regression = 0.16180

F (5, 11) = 174.7508

Mean of Dependent Variable = 7.0310

Residual Sum of Squares = 0.28797

DW-statistic = 1.9861

The t-values are reported below the coefficients. The examination of Equation (4.1.9) and (4.1.10) confirms that we have improved significantly on equation (4.1.8). The serial correlation has been eliminated as indicated by Durbin-Watson statistic of 1.9861. The second order autoregressive parameters $\hat{\rho}_1$ and $\hat{\rho}_2$ lie between zero and two in absolute value. Their t-values are significantly different from zero at 1% level and 20% level, respectively. With an R-squared of 0.98757 it is apparent that we are able to explain over 98% of the systematic variations in inflation by our independent variables. All of the variables have the correct signs but only the Narrow Supply of Money passes the two-tailed test of significance at 1% level, with the t-value of 3.4186, which is a significant improvement on the original result where the t-value was just 0.35092. The F-Statistics of 174.7508 is significant at 1% level. A unit increase in money supply will increase inflation by over 55%. Thus the hypothesis that there is a link between inflation and money supply is valid, and the hypothesis that the supply of money is a tool used in controlling inflation by the monetary authorities. A unit change in Government Expenditure will cause a change in inflation by over 28%. Also a unit change in Real Gross Domestic Product will cause around 8% change in price level (inflation). Therefore the hypothesis that inflation and money supply has an impact on the Nigerian economy is valid.

The Interpretation of Broad Money Supply Model of Inflation in Nigeria

Here we are testing for the relationship between the inflation, broad money supply, real gross domestic product and government expenditure, in the period 1970-2004, before SAP, during SAP, and after SAP.

Ordinary Least Square Estimation from 1970-2004

$$\text{Log } P_t = \beta_0 + \beta_1\text{logM2}_t + \beta_2\text{logGE}_t + \beta_3\text{logRGDP}_t + \mu_t \quad (4.2.1)$$

$$\text{Log } P_t = 8.1929 + 0.25458\text{logM2} + 0.75602\text{logge} - 1.1839\text{logrgdp} \quad (4.2.2)$$

(3.7040) (1.7933) (4.9292) (-5.7584)

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R-Squared = 0.98966 R-Bar-Squared = 0.98866
S.E. of Regression = 0.22850 F (3, 31) = 989.0617
Mean of Dependent Variable = 5.3804
Residual Sum of Squares = 1.6185
DW-statistics = 1.2020

The above is the estimated inflation equation, where t-values are reported in parentheses below the coefficients. Given the value of the R-squared it can be concluded that the independent variables explain over 98% of the symmetric variation in inflation during 1970-2004. The F value of 989.0617 is highly significant, passing the significant test at the 1% level. Therefore the hypothesis of the impact of inflation and money supply on the Nigerian economy is validated. The signs of all the coefficients are correct. The T values of all the variables are significant that is they passed the two-tailed test of significance at the 1% level, except for Broad Money supply which passed the test at 10%. The Durbin-Watson Statistics is very low indicating the presence of first order serial correlation.

After correcting for auto correlation we obtained the following results;
$$\log P_t = -1.7654 + 0.84769 \log M_2 + 0.097801 \log ge - 0.26794 \log rgdp \quad (4.2.3)$$

(-.83167) (7.4085) (0.88302) (-1.4862)

$$U = 1.1026 * U_{(-1)} + -.33856 * U_{(-2)} + E \quad (4.2.4)$$

(6.1803) (-1.9951)

R-Squared = 0.99571 R-Bar-Squared = 0.99492
S.E. of Regression = 0.14820 F (5, 27) = 1254.4
Mean of Dependent Variable = 5.3804
Residual Sum of Squares = 0.59301
DW-statistic = 2.0536

The t-values are reported below the coefficients. An examination of Equation (4.2.3) and (4.2.4) confirms that we have improved significantly on equation (4.2.2) although our intercept is negative. The serial correlation has been eliminated as indicated by Durbin-Watson statistic of 2.0536. The second order autoregressive parameters $\hat{\rho}_1$ and $\hat{\rho}_2$ lie between zero and two in absolute value. Their t-values are significantly different from zero at 1% level and 10% level, respectively. With an R-squared of 0.99571 it is apparent that we are able to explain over 99% of the systematic variations in inflation by our independent variables. All of the variables have the correct signs but only the Broad Supply of Money passes the two-tailed test of significance at 1% level. Real Gross Domestic product and Government Expenditure passed the two tailed test at 20% level. The F-Statistics of 1254.4 is significant at 1% level. A unit

increase in money supply will increase inflation by over 84%. Thus the hypothesis that there is a link between inflation and money supply is valid, and the hypothesis that the supply of money is a tool used in controlling inflation by the monetary authorities. A unit change in Government Expenditure will cause a change in inflation by over 9%. Also a unit increase in inflation will fall Real Gross Domestic Product by over 26%. Therefore the hypothesis that inflation and money supply has an impact on the Nigerian economy is valid since an increase in money supply increases inflation and this increase in turn reduces the gross domestic output of the Nigerian economy.

Ordinary Least Square Estimation for the Pre SAP Era (1970-1985)

$$\log P_t = 2.5705 + 0.76680 \log M2 - 0.14326 \log ge - 0.40160 \log rgdp \quad (4.2.5)$$

$$\begin{matrix} (1.8787) & (8.1060) & (-1.0776) & (-2.7200) \end{matrix}$$

R-Squared = 0.98736
 S.E. of Regression = 0.092073
 Mean of Dependent Variable = 3.4202
 Residual Sum of Squares = 0.10173
 DW-statistic = 0.70833
 R-Bar-Squared = 0.98420
 F - Stat = 312.3716

The above is the estimated inflation equation for the period 1970-1985, where t-values are reported in parentheses below the coefficients. Given the value of the R-squared it can be concluded that the independent variables explain over 97% of the symmetric variation in inflation before SAP. The F value of 146.9897 is significant, passing the significant test at the 1% level. Thus the hypothesis that there is a link between inflation and money supplied is validated. Also the hypothesis of the impact of inflation and money supply on the Nigerian economy is validated. The signs of the coefficients Broad Money Supply and Real Gross Domestic Product are correct but that of Government Expenditure is not correct implying that there is an inverse relationship between inflation and government expenditure. Only Broad Money supply passed the test at 1% level of significance while Real Gross Domestic Product is significant at the 2% level. The Durbin-Watson Statistics is very low indicating the presence of first order serial correlation.

After correcting for auto correlation we obtained the following results:

$$\log P_t = 3.2336 + 0.82935 \log M2 - 0.23516 \log ge - 0.43617 \log rgdp \quad (4.2.6)$$

$$\begin{matrix} (1.7686) & (9.0367) & (-2.7446) & (-3.1156) \end{matrix}$$

$$U = .98925 * U (-1) + -.33610 * U (-2) + E \quad (4.2.7)$$

$$\begin{matrix} (2.5937) & (-1.1103) \end{matrix}$$

R-Squared = 0.99441
 S.E. of Regression = 0.064156
 R-Bar-Squared = 0.99092
 F - Stat = 284.8637

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Mean of Dependent Variable = 3.4202

Residual Sum of Squares = 0.032928 DW-statistic = 1.9080

The t-values are reported below the coefficients. An examination of Equation (4.2.6) and (4.2.7) confirms that we have improved on equation (4.2.5). The serial correlation has been corrected as indicated by Durbin-Watson statistic of 1.9080. The second order autoregressive parameters $\hat{\rho}_1$ and $\hat{\rho}_2$ lie between zero and unity in absolute value. Their t-values are significantly different from zero at 5% level and 30% level, respectively. With an R-squared of 0.99441 it is apparent that we are able to explain over 99% of the systematic variations in inflation by our independent variables. All the variables, except Government expenditure, have the correct signs but only the Broad Supply of Money passes the two-tailed test of significance at 1% level. Real Gross Domestic product passed the two-tailed test at 2% level. The F-Statistics of 284.8637 is significant at 1% level. A unit increase in money supply will increase inflation by over 82%. Thus the hypothesis that there is a link between inflation and money supply is valid, and the hypothesis that the supply of money is a tool used in controlling inflation by the monetary authorities. Also a unit change in Real Gross Domestic Product will cause a change in inflation by over 43%. Therefore the hypothesis that inflation and money supply has an impact on the Nigerian economy is valid. Although the problem of serial correlation has been corrected the sign of Government Expenditure estimate still remains unchanged. Thus implying that for this period, in Nigeria, there was an inverse relationship between government expenditure and inflation.

Ordinary Least Square Estimate Since the SAP Period (1986-2010)

$$\log P_t = 3.2415 + 0.23989 \log M_2 + 0.76003 \log g_e - 0.73948 \log r_{gdp} \quad (4.2.8)$$

(0.72305) (0.88732) (2.8470) (-1.7292)

R-Squared = 0.97776

R-Bar-Squared = 0.97331

S.E. of Regression = 0.22861

F-Stat = 219.8288

Mean of Dependent Variable = 7.0310 Residual Sum of Squares = 0.78391

DW-statistic = 0.93750

This is the estimated inflation equation for the SAP period, 1986-2010, where t-values are reported in parentheses below the coefficients. Given the value of the R-squared, 0.97776, it can be assumed that the independent variables explain over 97% of the symmetric variation in inflation during SAP. The F value of 219.8288 is significant, passing the significant test at the 1% level. Thus the hypothesis of the impact of inflation and money supply on the Nigerian economy is validated. All the signs are correct but only Government Expenditure is significant at 10% level. The low level of significance in the t-ratio of broad money supply

during this period indicates that the supply of money did not have significant impact on inflation. With the Durbin-Watson Statistics result which indicates that we are in the indecision zone that is it is uncertain whether there is positive auto correlation or not.

A unit increase in money supply will increase inflation by over 23%. Thus the hypothesis that there is a link between inflation and money supply is valid, and the hypothesis that the supply of money is a tool used in controlling inflation by the monetary authorities is also valid. A unit change in Government Expenditure will cause a change in inflation by over 76%. Also a unit change in Real Gross Domestic Product will cause around 73% change in price level (inflation). Therefore the hypothesis that inflation and money supply has an impact on the Nigerian economy is valid. The estimated result indicates that after SAP there has been a strong relationship between inflation rate and the growth of real gross domestic product in Nigeria.

CONCLUSION AND RECOMMENDATION

In this paper we have tried to look into the relationship between inflation and money supply and how they affect the economy as a whole. We based our research hypothesis and work on Irving Fisher's QTM. In testing for this relationships we looked into literatures discussing similar issues, across different countries and how relevant are this literatures to the subject been discussed. After this we tested for our hypothesis, all our hypotheses were significant in the study that is were accepted. On testing another hypothesis for the structural stability we discovered that there is no significant difference between the periods studied. We confirmed in our work that inflation is always and everywhere a monetary phenomenon even in Nigeria.

Hence, it is recommended that the structural aspect of the economy should not be ignored in estimating and determining inflation, if the fiscal, the monetary and structural aspects could be looked into and made to complement one another the problem of inflation would be dealt with more adequately. Secondly for there to be reduction of inflation to a digit value there must first be a change in the relationship between inflation and its major determinants especially money supply, this can be achieved following the argument of Dwyer and Hafer (1999) that as monetary growth progresses towards zero the relationship between monetary growth and inflation weakens. Therefore the increase in the supply of money each year should be less than the last so that as the relationship weakens other factors that cause inflation can be examined and policies would be designed to reduce inflation using this newly discovered determinant. If this is put in place, the country may be free from the dilemma of inflation.

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REFERENCES

- Ajayi, S.I. (1983). On The Directional Causality Between Money and Prices, *The Nigerian Journal of Economics and Social Studies*, Nigerian Economics Society, pp. 319-326, V. 25;3.
- CBN (Dec. 2004). *Statistical Bulletin*, Research Department, Garki Abuja, Vol;15 pp 13-14, 203-206, 253, 328-344.
- Fatukasi B. (2011). Determinants of Inflation in Nigeria: An Empirical Analysis. *International of Humanities and Social Sciences*. Vol.1 No. 18 Pp. 262-271.
- Itua, G. (2000). "Structural Determinants of Inflation in Nigeria (1981 – 1998)". Unpublished Work, ABU, Zaria.
- Iyoha, M. (2002). "Budget of Economic Growth and Development". Bullion Publication of CBN, Vol. 26 No. 2 April/June.
- Jhingan, M.L. (2002). "Macroeconomic Theory". 10th Edition, Vrinda Publications Ltd, New Delhi.
- John C. Frain (2003). *Inflation and Money Growth: Evidence from a Multi-Country Data-Set*, The Economic and Social Review, Winter, pp. 251-266, Vol. 35, No. 3.
- Odiba, E.O., Apeh, A.S. and Daniel E.J. (2013). Money Supply and Inflation in Nigeria. *Journal of Business and Organization Development*. Vol. 5 No.1 Pp. 35-53.

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