Full Length Research Paper

An empirical study of the determinants of money supply growth and its effects on inflation rate in Nigeria

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This study 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 Nigeria's secondary data were processed using E-view for windows econometric packages. The results of the regression showed that credit expansion to the private sector determines money supply growth by the highest magnitude in Nigeria. The results also showed a positive relationship between money supply growth and inflation in Nigeria. It demonstrated that a one (1) percent rise in money supply in the current period leads to 5.6 percent rise in inflation. All in all, our findings discovered that changes in money supply are concomitant to inflation in Nigeria and strongly support the need for regulating money supply growth in the economy. This affirms the usual argument of the Monetarist school of thought that says money matters.

Keywords: Money supply, economic growth, inflation, monetarist, domestic credit expansion.

INTRODUCTION

Money supply is a very sensitive variable, the size of which determines the pace of any economic activities. 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 amount of money in the circulation are the sources of other economic changes. In other words, the changes in the size of money supply have a number of implications on the macroeconomics variables especially inflation. According to Nyong (2001), inflation varies ceteris paribus positively in relation to the growth in money supply and negatively with respect to growth in real income or output. In support of this argument, Ogun and Adenikinju (1995) found that the period of oil boom in Nigeria characterized by rapid monetary growth was consistent with the periods when the country experienced double-digit inflation.

The growth in money supply and its economic implications is therefore an issue to be thoroughly investigated. This subject has bordered the minds of Nigerian policy makers for decades. Despite the lacks of consensus among different schools of thought on its effectiveness as an instrument of monetary policy, the Central Bank of Nigeria (CBN) relies on it as its major barometer for shaping economic activities. The design and shift of the monetary measures taken by the central bank in recent times have been either expansionary or contractionary. Expansionary policy tools have been used to increase money supply with the intent of increasing output. Contractionary policy tools have been used on the other hand to decrease money supply in the economy in order to discourage consumption thereby curtailing inflation.

Nevertheless, the Nigerian money supply process is revealed to derive more from the consolidated balance sheet of the commercial bank plus the high powered money. A policy decision based on such data might be misleading and sometimes its conceived implication on economic activities especially on inflation might equally be misleading. It is instructive therefore to go beyond the

usual multiplier approach in determining money supply and properly investigate the factors that empirically determine money supply and its implication on the trend of inflation in Nigeria. This phenomenon inspired this study and formed its basic objective.

The paper is broadly divided into five sections. Following this introduction, section II features on literature reviews. The methodology and the theoretical under-pinning of the study are in Section III. The data analysis and interpretations of results are provided in section IV. Section V summarizes, gives policy recommendation and concludes the paper.

LITERATURE REVIEW

Conceptual Clarifications

The problem of defining money supply is still associated with a lot of controversy. According to Anyanwu (1993), money supply is the total amount of money (e.g. currency and demand deposits) in circulation in a country at any given time. Currency in circulation is made up of coins and notes, while demand deposits or current account are those obligations which are not related with any interest payment and accepted by the public as a means of exchange drawn without notice by means of cheque. The stock of money can be measured in any given time in an economy. There are two criteria employed in measuring money supply. The first criteria defines the stock of narrow money (usually designated by M1) as currencies and coins in circulation in the hands of the non-banking public and the demand deposit (of the non-banking public) with commercial bank (Ajakaiye, 2002). This definition can be synonymous with that given by Anyanwu (1993). The second concept defines money stock (designated by M_2) as M_1 plus time and savings (fixed) deposit. Thus, economists use the stock of money to mean narrow money since savings and time deposit are not usually a medium of exchange. The component of narrow money is usually called the stock of high-powered money (Iyoha,. 1998).

Empirical Literature

The relationship between money supply and inflation in Nigeria has been empirically examined by several authors like Malina (1980), Chibber and Nemat (1990); Adeyeye and Fakiyesi (1980), Osakwe (1983), and Ogunmuyiwa (2004). In an earlier study, Ogunmuyiwa (2004) while conducting an enquiry into the factors that cause of inflation in Nigeria noted that although M_2 is insignificant in explaining inflation movements in Nigeria, the Central Bank's monetary tools are more responsive to inflation and could be used to control it.   In addition, Os-akwe (1983) found that increase in money supply and

money wages (with lag-in-effect) were the important factors influencing price movements between 1970 and 1980 in Nigeria. Furthermore, Adeyeye and Fakiyesi (1980) found that there exist some significant relationship between growth in bank credit, growth of money supply and growth of government expenditure and inflation rate while an unclear relationship exists between government revenue and inflation.

Other studies that have found support for empirical relationship between money supply and inflation while considering a host of other factors include Asogu (1991), Fakiyesi (1996) and Manser and McDonald (1988). Asogu (1991) provided empirical evidence using ten specifications that encompassed structural, Monetarist and open economy characteristics of Nigerian inflation. He found that, the major determinants of inflation in Nigeria included real output, especially industrial output, net exports, current money supply, domestic food prices and exchange rate changes. Fakiyesi (1996) studied inflation under long run and dynamic error correction model. He found that the monetary effect was substantial as well as real income and the exchange rate at the 1% significance level. Short run adjustments to disequilibria in the contemporaneous period were captured in the study. Fakiyesi (1996) studied inflation in Nigeria using the autoregressive distributed lag model and argued that inflation depended on the growth in broad money, the rate of exchange of the naira vis-à-vis the dollar, the growth of real income, the level of rainfall, and the level of anticipated inflation, which is based on the previous year's level of inflation. Manser and McDonald (1988), studied the role of a veritable source of variation in the level of prices, albeit often neglected, the parallel market for foreign currency, which is relied upon for the finance of unofficial short-term trade in intermediate inputs and consumer durables. Applying a partial equilibrium model based on micro foundations, and using annual data, a solution was obtained for the price level using the two stage least squares (2SLS) instrumental variable method. The results confirm for the period 1971 to 1995 that the parallel market exchange rate dynamics, in addition to the traditional Monetarist variables contribute to the inflation behavior in Nigeria.

METHODOLOGY OF THE STUDY

This section discusses the methodology and theoretical significance of the study. Issues relating to the choice of research design and strategies, model, specification, data requirements and sources, the nature and scope of data collected, the data processing technique and the theoretical significance of parameter estimate are discussed. The models were adjudged reliable before they were used. The components of the model were defined and a prior expectation of the relationship among the variables explained for the purpose of giving the

reviewers and users a deep insight into the phenomenon under study.

Research Design and Strategies

The study uses quasi experimental research design approach for the data analysis. This approach combines theoretical consideration (a prior criterion) with the empirical observation and extracts maximum information from the available data. It enables us therefore to observe the effects of explanatory variables on the dependent variables.

Model Specification

The study employs two macroeconomic models to analyze the salient objective of the study. These models permit the estimation of the determinants of money supply in Nigeria and its implication on inflationary trends using Nigeria Data. Thus, we have the money supply growth determinants model and the inflationary implication model.

Model 1: The money supply growth determinant model

The study adopts the economic model developed by Fry (1985). According to Fry, a change in money supply is determined by Domestic credit expansion to private sector, domestic credit to public sector, net foreign asset and nets other items. Fry applied the model to Turkish economy. The choice of this model was informed by the striking similarities in the economic situation of both countries i.e. Nigeria and Turkish. Fry specified the model as:

$$\Delta M = \Delta DCP + \Delta NDCg + \Delta NFA - \Delta NOI \dots\dots\dots\dots (1)$$

where Δ implies changes, **M** is broad money supply, **DCP** is domestic credit expansion to the private sector, **NDCg** is domestic credit expansion to the government or public sector, **NFA** is net foreign assets and **NOI** is net other times. Changes in the money supply would result from overall changes on the right hand side of Equation 1. Hence, the explanations of changes in domestic credit, net foreign assets and net other items would combine to explain changes in the money supply.

Putting it in a stochastic form, the above equation can be written as:

$$\Delta M = a_0 + a_1 DCP + a_2 NDCg + a_3 NFA - a_4 NOI + \mu i \dots\dots\dots\dots\dots 2)$$

where a_0, a_1, a_2, a_3, a_4 are the elasticity and μi is the error term.

a_1, a_2, $a_3 \geq 0$; $a_4 \geq/\leq 0$

The elasticity parameters also known as the a-priori expectation of the variables proposes that: an increase in domestic credit expansion to the private sector, domestic credit expansion to the government or public sector, net foreign assets and net other times would cause an aggregate expansion in the money supply. Whereas an increase (decrease) in net other times may cause decrease (increase) in money supply all things being equal. It is therefore proposed that the sign of these parameters would be positive.

Model 2: The money supply growth and Inflation Model

The inflationary model adopted in this study combines the structuralist, Monetarist and fiscalist approaches. Given the structure of the Nigerian economy as well as voluminous empirical evidence on Nigeria and other nations of the world, it could be argued that the inflationary model in Nigeria is traceable largely to the dynamism of its key determinants such as: fiscal deficit, money supply, interest and exchange rate. Thus, this research work adopted the model developed by Folorunso and Abiola (2000) and modified it as follows:

$$IR = b_0 + b_1 GFD + b_2 MSR + b_3 RT + b_4 EXR + \mu i \dots\dots\dots\dots\dots(1)$$

Where:
IR = percentage of inflation rate
GFD = percentage of government fiscal deficits
MSR = percentage of money supply (M1) growth rate
RT = percentage of interest rate
EXR = percentage of real exchange rate
Where μ_1 is the error term which is assumed according to Ordinary Least Square (OLS) assumption to be distributed in zero mean and constant variance $\mu_1 \sim N(0, \delta^2)$ where $i \neq j$ and b_0, b_1, b_2, b_3, b_4 are the elasticity parameters and μi is the error term.
In consonance with economic theory, it is expected that increase in GFD, MSR, RT, EXR will result in increase in inflationary tendencies.

Data Requirement and Sources

Given the nature of the models, it is imperative that the data will permit the estimation of the stochastic equations representing the determinants of money supply, and its implication on inflationary trend can be collected. These include the domestic credit expansion to the private

sector (DCp), domestic credit expansion to the government or public sector (NDCp), net foreign assets (NFA), the net other item (NOI), fiscal deficit, money supply, interest rate and exchange rate. Time series data were used for the study and they are purely secondary data. The data series covered the periods between 1981 and 2006. The data were obtained from Central Bank of Nigeria (CBN) and National Bureau for statistics (NBS).

Data Processing Techniques

The secondary data used for the study were processed using E-view for windows econometric packages. The empirical study uses a simulation approach to investigate the determinants of money supply and its implications on inflation in Nigeria. The E-View is preferred to SSPS because it enables us to correct the serial correlation in the data. It has an in-buit Error Correction Mechanism (ECM) that can overcome the problems of spurious regression often associated with non-stationary time series data. The ECM reveals that the change in a variable at time **t** is not only dependent on lagged changes in the variable but also on its own lagged changes.In other word, E -view econometric pakage enable us to examine the influence of time in the model. With it, we can determine the short run and long run relationships among the variables.   It enables us to induce flexibility by combining the short run and long run dynamics in a unified manner.

RESULTS AND DISCUSSIONS

Model 1 Results

The results of the data analysis and estimation were obtained using the ordinary least square regression method. The results obtained from the electronic computation of the data are presented below. The values of the standard error for each variable are stated in the parentheses.

MS = 16704.34 + 1.546 DCp – 0.037 NDCp + 0.075 NFA + 0.108 NOI
(326.2460) (0.315)   (0.002)   (0.002)
(0.002)
Adjusted R^2 = 0.99 ;Durbin-Watson = 2.14

Discussions

(i) The independent variables, direct credit expansion to the private sector, direct credit expansion to the government, the Net foreign assets and net other items are all statistically significant. The values of the standard error for all the variables, which are less than half of the

value of their coefficients, prove this. The results equally show a negative serial autocorrelation in the data used for the computation. This is because the Durbin-Watson statistics fell within the determinate/ acceptable region. This being 2.14.

(ii) The adjusted R^2 is 0.992. This depicts that variations in the credit expansion to the private sector, credit expansion to the public or government sector, net foreign assets and net other items explains over 95 percent variation in the independent variable (i.e. the money supply). This testifies to the goodness of fit of the regression line. This further proves that the remaining one percent variation in money supply is explained by other variables outside the model.

(iii) Aside from the credit expansion to the government sector, which manifests a wrong sign, all the other independent variables show expected correct signs, which is in consonance with the 'a priori' expectations. Contrary to expectation, the credit expansion to the public sector (NDCg) manifests a negative sign. Net Domestic Credit Expansion to government sectors shows that the credit expansion to public sector during the period under study was less than required. The data shows that the net release of credit to government sector were negative thus lowering the total money supply in the circulation

(iv) The results show that the independent variable, credit expansion to the private sector (DCp) is higly significant according to the standard errors and exerts the highest impact on the money supply given its highest coefficient of 1.546. This is followed by Net other items (NOI) with a coefficient of 1.08. Net foreign assets (NFA), placed third in terms of impact with a coefficient of 0.074.

(v) The result shows that a N1.00 increases in the DCp cause the money supply to expand by N1.55 In the same vein, a N1.00 increases in the NDCg caused the money supply to shrink by N0.037. A N1.00 increases in the NFA however caused the money supply to expand by N0.075 while a N1.00 increase in the NOI caused money supply to expand by N0.108. These findings are in tandem with the findings of Ogun, O. and Adenikinju, A. (1995).

Model 2

The results of the data analysis and estimation were obtained using the parsimonious error correction mechanism. This is presented in the table below:

Results

i.   The t-statistic and the standard error test revealed that the parameters were significant except the money supply (lagged once). For all the variables in the model, the values of standard error are less than half of the values of the coefficient of the variables. This shows

Table 1. Error Correction Model, LS/ Dependent Variable is D(IR) Sample adjusted: 1983-2006. Included observation after adjusting endpoints: 24

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.200965	0.000913	0.010683	0.0012
GFD	1.173508	0.831239	0.7388442	0.0802
GFD (-1)	1.342906	0.004896	-1.435470	0.0412
MSR	0.056795	0.002145	-0.160398	0.0148
MSR (-1)	0.746710	0.333512	1.743645	0.2311
RT	1.029752	0.486321	1.234692	0.0005
RT(-1)	0.959611	0.124987	-0.952032	0.0132
EXR	0.195056	0.096863	-0.802261	0.0166
EXR(-1)	0.202801	0.002486	-0.727500	0.0002
ECM(-1)	-0.143953	0.002466	0.512106	0.0023

R-squared	0.831965	Mean dependent	var.22.47083
Adjusted R-squared	0.613519	S.D. dependent var.	19.41401
S.E. of regression	12.06922	Akaike info criterion	8.110391
Sum squared resid	1456.660	Schwarz criterion	8.797590
Log likelihood	-83.32470	F-statistic	3.808570
Durbin-Watson stat.	2.24825609	Prob (F-Statistic)	0.020324

that the data used for the computation are statistically significant. The Lagged error correction term ECM (t-1) included in the model to capture the long run dynamics between the co-integrating series are correctly signed (negative) and statistically significant. The coefficients indicated adjustment of 14% for the model. These adjustments imply that errors are corrected within seven year. In other words, the ajustment process to long run steady state equilibrium conditions takes place nearly within seven years. (i.e. Only 14% adjustment is completed within one year). The ECM thereby reveals a long run relationship between explanatory and dependent variables in each model.

ii. The value of the coefficient of all the independent variable manifest correct signs which is in consonance with the 'a priori' expectations.

iii. The result show that changes in money supply determines inflation in Nigeria in the current period but reveals that money supply did not determine inflation in the past years (lagged once). It shows that a 1% rise in money supply in the current period leads to 5.6% rise in inflation. Also, a rise in real exchange rate has positive effect on inflation as expected. It shows that a 1% rise in real exchange rate will raise inflation by 19.5%. However, there was no significant effect of real exchange rate in the past one decade (lagged once) on inflation in Nigeria.

iv. Similarly, the interest rate determines inflation by the highest magnitude. It shows that 15 increase in interest rate leads to 102.9% rise in inflation in Nigeria. The positive effect of government fiscal deficit was also expected but not significant. However, in the past (lagged once), the coefficient of government fiscal deficit was quite significant and enormous.

v. The value of the adjusted R^2 for the model is high, pegged at 0.613519 or 61.4%, which implies that government fiscal deficit, money supply, interest rate and exchange rate explained about 61.4% systematic variation on inflation over the observed years in the Nigerian economy while the remaining 38.6% variation is explained by other determining variables outside the model.

vi. The value of Durbin Watson is 2.2 for the model. This fall within the determinate region and imply that there is a negative first order serial autocorrelation among the explanatory variables in the model.

SUMMARY

This paper investigated the factors that determine the growth of money supply in Nigeria and how it affects inflation. This is to refute or affirm the usual argument of the Monetarist school of thought that says money matters, and stresses that changes in the amount of money in the circulation are the sources of other econo-mic changes. In analyzing the determinants of the growth

of money supply, the study discovered that credit expansion to the private sector, Net foreign assets; net other items are the major determinant of the growth of money supply in Nigeria. The results also show that credit expansion to the private sector (DCp) exerts the highest impact on the money supply growth going by its highest coefficient of 1.541. This is followed by Net other items (NOI) with a coefficient of 0.1.08. The Net foreign assets (NFA), placed third in terms of its impact on the money supply growth with a coefficient of 0.074.

The result further show that changes in money supply determines inflation in Nigeria in the current period. It shows that a 1 percent rise in money supply in the current period leads to 5.6 percent rise in inflation. Also, a rise in real exchange rate has positive effect on inflation as expected. It shows that a 1 percent rise in real exchange rate will raise inflation by 19.5 percent in Nigeria.

Similarly, the interest rate determines inflation by the highest magnitude. It shows that 15 increase in interest rate leads to 102.9 percent rise in inflation in Nigeria. The positive effect of government fiscal deficit was also expected but not significant.

CONCLUSION

All in all, our findings suggest that changes in money supply are concomitant to inflation in Nigeria. This affirms the usual argument of the monetarist that says money matters. Furthermore, the findings are in tandem with the findings of Ogun, and Adenikinju (1995).

POLICY RECOMMENDATION

Before the study can be considered completed, more research is necessary into the ways of stabilizing money supply growth. It remains to be seen whether or not the policy-makers are mindful of the evil effects of money supply growth. Our results strongly support the need for regulating money supply growth in the economy. The findings of the study have shown that much money in circulation is responsible for the current double digit inflation in Nigeria.

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