The dynamics of money supply, exchange rate and inflation in Nigeria

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Abstract

This paper aims at providing quantitative analysis of the dynamics of money supply, exchange rate and inflation in Nigeria. The paper utilizes secondary data that were obtained from the International Financial Statistics (IFS), of all variables investigated in the model. The sample covers quarterly data from 1986:01 to 2008:04. The model was estimated using Vector Error Correction Mechanism (VECM).

The empirical results confirms that in the long run, money supply and exchange rate have significant inverse effects on inflationary pressure, while real output growth and foreign price changes have direct effects on inflationary pressure. The possible justification for the inverse effect of money supply on price level is that inflation may not be due to aggregate demand pressure but rather due to hiccups in the supply chain of goods both from the domestic and foreign supply outlets. Empirical deductions also signify the presence of significant feedback from the long run to short run disequilibrium. However, there exists a causal linkage between inflation, money supply and exchange rate in Nigeria.

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1 Introduction

Nigeria's weak economic base became problematic from the early 1980's with the persistence of both internal and external disequilibria. The oil boom of the 1970's engendered by the Middle East crisis raised the revenue accruing to government from this non-renewable resource remarkably. The consequence of the boom on the country's economy was that it drastically reduced the competitiveness of Nigeria's Export Sector.

For example, between 1970 and 1987, Nigeria lost over 96.6 percent of her agricultural exports in nominal terms. Food import bill rose astronomically to about US$4 billion in 1982. Nominal non-oil exports earnings fell from N363.5 million in 1973 to N203.3 million in 1982 (NCEMA, 1996). With the vast expansion of government expenditures, enhanced by oil revenues, there were huge increases in aggregate demand. Partly because of the inelastic supply of domestic output, inflation resulted inevitably. Parallel to this was the rapid growth in domestic money supply, exacerbated by the monetization of the earnings from oil. This also exerted upward pressure on the general price level.

The structural weaknesses of the oil-driven economy were exposed with the collapse of oil prices in the world market from the early 1980's as a result of a sharp decline in the demand for crude oil. This development in the world oil market adversely affected the Nigerian economy resulting in a serious short fall in foreign exchange earnings as well as the emergence of serious balance of payments and debt crisis. The accumulation of huge budget deficits, which cumulated to almost N17.4 billion in the five years, 1980-1984, is one prime example. Monetary policy became highly expansionary, as a large part of the deficits incurred during this period was financed through the central bank credit. Thus, two-digit inflation at an average yearly rate of 20.2 percent was registered.

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

Due to the energy crisis of the 1980's, high inflationary rates became widespread. Even, industrialized countries like Britain and Italy recorded annual inflation figure of over 20% during this period. The emergence of substantial inflation in Africa, most especially Nigeria has led to widespread debate about its causes. Many economists that favour traditional adjustment strategies contend that monetary growth, arising particularly from the domestic bank financing of large budget deficits, is the major source of inflationary pressures. By contrast, some

critics of the traditional approach, such as the United Nations Economic Commission on Africa (UNECA) in its "African Alternative Framework for Structural Adjustment Programmes", have identified exchange rate depreciation as a major factor (UNECA, 1989).

Controversy between these two viewpoints has led to differing prescriptions about the appropriate policy response. Those focusing on monetary factors have emphasized reducing government budget deficits and restraining credit to public enterprises, while advocating exchange rate depreciation to offset any overvaluation resulting from past inflation and deterioration in the terms of trade. Those emphasizing the role of exchange rate depreciation, by comparison, have argued against further exchange rate adjustments, preferring instead a combination of incomes policies, price controls, and demand reduction measures. In addition, the recent literature has begun to emphasize more on the linkages between exchange rate policy and other tools for macroeconomic management, noting that a fixed exchange rate can serve as a "nominal anchor" to an economy and thus limit inflation if supported by appropriate monetary and fiscal policies.

Although the problems of developing economy, most especially Nigeria are many, but attention shall be focused on one particular problem, which is inflation. Inflation has been attributed to either expansion in monetary supply, structural imbalance in the economy, international motivation or an interrelationship of all these factors. Inflation is one of the causes of economic retardation, and also it is a cause of both social and political unrest in many developing economies. Moreover, there is no other economic problem over which the market mechanism has so much influence, and therefore; more appropriate for evaluating the capability of a government in the process of economic development. Indeed investigating this issue empirically in Nigeria is a worthwhile challenge that is overdue in view of the enormous significant importance attached to it.

Until recently, there was relatively less empirical research on the relationship between exchange rate, money supply and inflation in Nigeria. As described in this paper, the few empirical studies on this issue have used traditional econometric techniques best suited to identifying whether individual variables are related to inflation (see Festus et al (1994)). It has also been shown in the literature that previous studies have examined the determination and targeting of inflation, Asogu, 1991; Moser, 1995; Mahamadu and Philip, 2003 among others. As such, this paper finds out if long-run relationship exists between monetary growth, exchange rates and inflation in Nigeria. It also addresses the possible effects of exchange rate policies and monetary policies on inflation in Nigeria.

This paper explores the Vector Error Correction Mechanism (VECM) which has become popular in economic analysis during the last decade. The study spans over the period 1986 to 2008, this is of course based on the premise that structural economic reforms started in Nigeria in 1986. The Vector Error Correction Mechanism (VECM) method, corrects the lapses often associated with OLS, also using VECM method, one can investigate the relationship between the variables of interest in both the short-run and long run. The rest of the paper is divided into

survey of literature in section two; section three is on a review of monetary and exchange rate policies in Nigeria. While section four describes the methodology of research, section five is on results, policy implications and conclusion.

2 Survey of Literature

Literature on recent theories of inflation that have emerged in the past few years emphasised the role played by political stability, policy credibility and the reputation of the government and the political cycles in determining or explaining inflation. According to Selialia (1995), this emerging literature on inflation has come to be known as the political economy approach to macroeconomic policy. These recent theories of inflation have shifted attention away from traditional direct economic causes of inflation, such as money creation, towards political and institutional determinants of inflationary pressures. However, these theories have been criticised as they are theoretical and put emphasis almost exclusively on industrial countries.

Structural factors are also believed to influence the rate of inflation. Examples of these are the weather conditions, and protective industrial and trading policies of the government. It can be argued that government protects infant industries from intra currency area trade and regulates domestic marketing of agricultural products by quantitative import restrictions through import permits or licensing. These policies are believed to have created monopolistic and oligopolistic structures of firms, which usually set their prices well above border prices. The general feeling is that these policies may be highly inflationary as prices of some of the controlled items may rise quickly.

Weather conditions, crop failures or drought are some of the structural factors that are also believed to have a direct impact on the inflation rate given that food items carry the biggest weight in the computation of the Consumer Price Index (CPI). During good weather (rainy agricultural year), prices in general, are expected to fall in the future and vice versa.

Several studies have been conducted examining the impact of exchange rate and money supply on inflation. A review of these empirical studies from the viewpoint of developed, developing countries and Nigeria are briefly exposed.

Marta et al. (2004), examines monetary policy in Albania during the transition period. Estimates from a vector Auto Regression Model (VAR) of key macroeconomic variables which include money growth, inflation, exchange rate, remittances and the trade balance, demonstrate the weak link between money supply and inflation up to mid 2000. They conclude that exchange rate stability has played a key role in keeping inflation low for most of the transition period, and that the range of monetary policy instruments available to the authorities has widened in recent years and this has been associated with more stable and predictable changes in money supply and the price level. The result demonstrates that Albania has come a long way in terms of controlling inflation, liberalizing

financial markets and improving the predictability of inter-relations among key macroeconomic variables.

Holod (2000) explores the identified vector autoregression to model the relationship between CPI, money supply and exchange rate in Ukraine. The results show that exchange rate shocks significantly influence price level behaviour. Further, the study also found that money supply responds to positive shocks in price level. The study contributes to the sizable literature on IT using overly sophisticated vector error correction model with complex identification structure. There is however an element of data mining in the generation of impulse response functions.

Nicolleta and Edward (2001), updates and extends Friedman's (1972) evidence on the lag between monetary policy actions and the response of inflation. Their evidence is based on UK and US data for the period 1953-2001 on money growth rates, inflation and interest rates, as well as annual data on money growth and inflation. Their findings reaffirm the result that it takes over a year before monetary policy actions have their peak effect on inflation.

There is a relatively large literature dealing with relations between monetary indicators and other macroeconomic variables. Tyrkalo and Adamyk (1999) and Doroshenko (2001), consider relations between both money supply and inflation and between money supply and GDP. Their findings confirm a long-run relationship between money growth and inflation. The period of money expansion and high inflation in the decade of the 1990's was accompanied by contraction of output. Novoseletska (2004) also discusses this issues taking note of the break point in the statistical relationship. In a more recent period of financial stability (1999-2003) rising monetary aggregate were accompanied by falling inflation and a rebound of output. Novoseletska and Myhaylychenko (2004), note that nominal exchange rate stability could contribute to moderate growth rates of prices during the last few years.

Clemens and Alex (2002) empirically estimate and test the relationship between exchange rate accommodation and the degree of inflation persistence using a non-linear autoregressive inflation equation for ten European countries for the period 1974:1-1998:2. In the estimation procedure they allow for the presence of an unknown number of shifts in the mean of inflation. Their results provide supportive evidence for the existence of a positive link between exchange rate accommodation and inflation persistence for most of the smaller and more dependent exchange rate mechanism (ERM) countries, even when mean level shifts in inflation are appropriately accounted for. For the larger countries and the countries that remained outside the ERM for most of the period they find hardly any evidence of such positive link. Overall, their results provide modest support for the existence of the theoretically hypothesized positive link between exchange rate accommodation and inflation persistence. Bleaney (2000) implicitly recognizes that at least two problems arise from the literature. First, the identification of periods within which persistence is constant using the prevailing exchange rate regime is generally inappropriate. However, he explicitly links the

variation in persistence within constant regime periods to independent changes in the main level of inflation, which is questionable as well.

Bernhardsen and Holmsen (2005) discusses whether inflation forecasts should be based on technical exchange rate assumptions like a constant exchange rate and uncovered interest rate parity (UIP) or on assumptions reflecting the central bank's best prediction of future exchange rate movements. Because of the strong link between the interest rate and the exchange rate, the exchange rate does not principally differ from other variables that are endogenous in inflation projections.

Debelle and Galati (2005), argues that along with changes in output growth, exchange rate changes have historically played a key role in the adjustment of external imbalances in industrial countries. Zettelmeyer (2004), and Kearns and Manners (2005) finds that, a surprise monetary policy shock that increases the interest rate has a significant appreciating effect on the exchange rate. As Frankel (1999) observes, fixing the exchange rate has the advantage of providing an observable commitment to monetary policy. Atkenson and Kehoe (2001), believes that fixing the exchange rate has the advantage of providing an observable commitment to monetary policy. They formalize the argument that because it is more transparent, the exchange rate has a natural advantage as an instrument for monetary policy.

Bleaney (2001) asserts that there has been stronger monetary policy response to inflation shocks in recent decades. He finds that monetary growth in the United States was strongly accommodative of immediate past inflation in the Bretton Woods period, but has been much less so under floating rates. Comparing floating-rate countries with members of the European Monetary System (EMS) for the 1980s and 1990s, according to him, estimates of inflation persistence are highly sensitive to shifts in mean inflation during exchange rate regimes.

The impact of exchange rate regimes and exchange rate movements on inflation and growth has also been discussed in many empirical studies of developing countries. But the findings of these studies differ and cannot be generalized. As to inflation, there is a broad consensus about the role of monetary growth either as a main driving force behind inflation or, otherwise, as a necessary element in accommodating inflation triggered by other factors. However, the impact of nominal exchange rate flexibility on inflation is more ambiguous. All empirical researches confirm that depreciations of nominal exchange rate are correlated with temporary increases in consumer prices.

Moreover, Gosh et al (1997) found evidence that the average rate of inflation was lower in countries with pegged exchange rate than in countries with more flexible rate. Aghevli et al. (1991) obtained similar results but note that many countries with pegged exchange rate regimes have experienced high rate of inflation as a result of inappropriate fiscal policies. Conversely, many of the countries with more flexible arrangement have obtained lower rates of inflation by adopting prudent fiscal policies.

Quirk (1994) observes that the differences between the various exchange rate regimes have narrowed, once adjustments in the case of fixed exchange rate regimes are taken into account. Furthermore, he pointed out that the stability of the exchange rate and thus of inflation has become a "by-product" of other policy choices. As already mentioned, many developing countries have been subjected, since the mid-1980's, to frequent terms-of-trade shocks and have therefore adopted more flexible exchange rate regimes in order to avoid deterioration in external competitiveness. But, as Kamin (1997) showed in the case of Mexico, the real depreciation of the peso had a strong inflationary impact. Similar results were obtained by Calvo et al. (1994), who found that in the cases of Brazil, Chile and Columbia undervalued real exchange rates were associated with higher consumer price inflation. Overall, it thus appears that not only changes in the nominal exchange rate but also the level of the real effective exchange rate are correlated with the rate of inflation.

Mahamadu and Philip (2003), explore the relationship between monetary growth, exchange rates and inflation in Ghana using Error Correcting Mechanism. The empirical result confirms the existence of a long run equilibrium relationship between inflation, money supply, exchange rate and real income. In line with theory, the findings demonstrate that in the long-run, inflation in Ghana is positively related to the money supply and the exchange rate, while it is negatively related to real income. Elsewhere, several authors have been pre-occupied with the factors determining inflation, especially in the last few years. In this regard, the work by Chhibber et al (1989) is revealing. These authors employed a highly disaggregated econometric model that considers both monetary and structural factors in the cause of inflation in Zimbabwe. Findings from this study indicate that monetary growth, foreign prices, exchange and interest rates, unit labour cost and real outputs are the determinants of inflation in this country.

A similar model was employed for Ghana by Chibber and Shafik (1990) covering 1965 to 1988. Their results suggest that growth in money supply is one principal variable that explains the Ghanaian inflationary process. Such variables as official exchange rate and real wages could only exert negligible influence on inflation. However, significant positive relationship was found between the parallel market exchange rate and the general price level. One plausible direct translation from all this is that recent price movements in Ghana have little relationship with recent exchange rate policy implemented by government.

Probably motivated by the findings of Chhibber and Shafik (1990), Sowa and Kwakye (1993) also undertook a study of inflationary trends and control in Ghana. A simple model was employed to determine the relative effects of monetary factors and structural elements on the general price level. Their results indicate that monetary expansion exerted little influence on inflation. On the effect of exchange rate (official), this variable could not have a significant direct relationship with price inflation, a confirmation of one of the findings of Chhibber and Shafik's. Despite this result, Sowa and Kwakye had an important uncompromising conclusion that the Ghanaian inflation is structural in nature.

Elbadawi's (1990) research is with particular reference to Uganda. He attributed the inflation of 1988-89 to the rapid growth of domestic money supply and the precipitous depreciation of the parallel exchange rate. He concludes that the devaluation of the official exchange rate is not inflationary – since prices have adjusted to the parallel exchange rate. Obviously, this conclusion is consistent with the findings of Chhibber and Shafik (1990), and Sowa and Kwakye (1993) with respect to Ghana.

Canetti and Greene (2000) separated the influence of monetary growth from exchange rate changes on prevailing and predicted rates of inflation. The sample covers ten African countries: The Gambia, Ghana, Kenya, Nigeria, Sierra-leone, Somalia, Tanzania, Uganda, Zaire, and Zambia. Using the Vector autoregression analysis, they suggest that monetary dynamics dominate inflation levels in four countries, while in three countries; exchange rate depreciations are the dominant factor.

Earlier, London (1989) had examined the role of money supply and exchange rate in the inflationary process in twenty-three African countries. The application of the pure monetarist model of the Harberger-type, reveals that the growth of money supply, expected inflation and real income were significant determinants of inflation for the period between 1974 and 1985. Exchange rate was later introduced as one of the explanatory variables in the pure monetarist model. The results show that exchange rate movements had a remarkable influence on the inflationary process in the 1980s.

Ndung'u (1993) estimated a six variable VAR model with the following - money supply, domestic price level, exchange rate index, foreign price index, real output, and the rate of interest- in an attempt to explain the inflation movement in Kenya. He observed that the rate of inflation and exchange rate explained each other. A similar conclusion was also reached in the extended version of this study (Ndung'u 1997).

Dick and Ndung'u (1998), develops an Error Correction Model with the aim of analyzing the behaviour of prices in Kenya during 1974-1996. Using the Johansen procedure, they carried out a test for co integration in the money and foreign exchange markets. They found that in the long run, inflation emanates from movements in exchange rate, foreign prices, and terms of trade, while money supply and interest rate influence inflation in the short-run. The dynamics of inflation are also influenced by food supply constraints proxied by maize-price inflation. These findings indicate that the exchange rate is likely to be a more efficient nominal anchor than money supply.

Rutasitara (2004) investigates the influence of exchange rates on inflation in Tanzania. Model estimation lend support to the structural view of inflation and show a high degree of persistence as the current rate reflects about 0.6 of its value four quarters back. The study contributes to the debate on the controversies about the relative role of exchange rates in discussion of Structural Adjustment Programmes (SAP) and stabilization policies. Unfortunately, most key reforms occurred in the second half of 1990s, which are not captured by the study since the

study period ends in 1995. It is also interesting to note that, almost all macro variables in the model, are stationary in levels.

Asogu (1991) undertook an empirical investigation based on ten different specifications that covered monetary, structural and open economy aspects of inflation in Nigeria. Variables used in the regressions include money supply and its lagged value. Others are industrial production index, import price index and the official exchange rate. All variables were expressed in terms of their rate of change. In all the models estimated, the character of inflation seems to be well captured. Real output had the right signs in all the models, but was significant in only one case. Money prices and exchange rates were significant in all the equations where they featured. In summary, the result of the estimation suggested that real output, especially, industrial output, net exports, current money supply, domestic food prices and exchange rate changes, were the major determinants of inflation in Nigeria. The study therefore confirms the importance of the structural character of the economy, open economy and monetary aspects of inflationary trend in Nigeria.

In another study, Moser (1995) identifies the main determinants of inflation in Nigeria; he presents both a long-run model and a dynamic error correction model, and discusses the policy implications of the results. All the coefficient estimates had their expected signs. The monetary effect was quite large and significant at the one percent level, while real income and the exchange rate were also significant at that level. Interest rate, on the other hand, had no significance in the long run. In addition to the above estimates of the structural parameters in a long run relationship, he also estimated a dynamic version specified as an error correction model. The model utilizes information in the error term of the long run model to approximate deviations from the equilibrium and presents the short-run response necessary to move the system back towards its equilibrium.

An attempt was also made by Ajakaiye (1994), to assess the impact of exchange rate depreciation on sectoral prices over 1986/89 periods, using a version of the input-output price model in an economy such as Nigeria where prices are determined primarily on the basis of full mark-ups on costs. He reports that the continuous depreciation on the naira exchange rate contributed to a continuous rise in sectoral prices. He states further that these contributions seem to be greater in the short-run than in the medium term because other policies such as those on petroleum prices review interest rates on loans and prices of imported inputs that triggered upward movement of prices were executed. He found also that all sectoral prices rose because of the effects of exchange rate depreciation on the structure of prices. It was observed that the increases in prices vary across sector such that exchange rate depreciation can induce relative prices changes. His expectation that exchange rate depreciation will cause prices of tradeables to rise more than those of non-tradeables was not met.

Yahya (2000) concluded in his work that despite the distorting effects of a civil war followed by an oil commodity boom and burst, Nigeria's inflationary experience could be traced ultimately to excessive monetary growth. Using a basic

macroeconomic accounting framework, he developed a framework for analyzing Nigeria's inflationary experience, and found that any adjustment policy that does not take into account the role of money and credit is likely to fall short of the overall goal of non-inflationary economic growth.

Odusola and Akinlo (2001) examine the link between the naira depreciation, inflation and output in Nigeria, adopting Vector Autoregression (VAR) and its structural variant. Their results tend to suggest that the adoption of flexible exchange rate system does not necessarily lead to output expansion, particularly in the short-term. Issues such as discipline, confidence and credibility on the part of the government (as argued by Dordunoo and Njinkeu, 1997) are essential. Evidence from impulse response functions and structural VAR models suggested that the impacts of the lending rate and inflation on the output were negative.

While most previous studies focus more on the determinants of inflation, using explanatory variables, ours deviates by adopting the Vector Error Correction Mechanism (VECM) which eliminates the need to develop explicit economic models and thus impose apriori restrictions on the relationships among variables, VECM analysis permits a more general test of causation among different economic variables than is possible in conventional econometric analysis.

3   Model Specification

While the traditional monetarist's approach to the study of inflation stress the importance of the link between money supply and inflation; and also that increases in aggregate demand lead to increases in the price level, depending on demand shifts and the level of economic activity or unemployment. In econometric specification, we specify

$$P = f (M, S, U) \qquad (1)$$

where
M = Money supply
S = Demand shifts
U = Unemployment.

The structuralist on the other hand, emphasize the parts played by deficit financing or government expenditure, export earnings variations, import prices, demand shifts, agricultural bottlenecks and availability of foreign reserves.

A close look at these factors reveals that the export earnings variation could be an explanatory of availability of foreign reserves. The latter is a good proxy for ability to import. Deficit financing is an important explanatory of the growth of money supply. Thus, the structuralists are inadvertently emphasizing money supply when they emphasize deficit financing. Import prices stands on its own as it explains the contribution of imported inflation. Demand shifts in the structuralists school do not differ from that of the monetarist school. The level of

economic activity is already subsumed in the structuralists theory since their theory pertains to developing economies where full employment is yet to be attained. One could therefore econometrically specify the structuralist theory of inflation as

$$P = f (DF, Exr, Pm, S, A, R, U) \qquad (2)$$

where the symbols in bracket stands for deficit finance, exchange rate, import prices, demand shifts, agricultural bottlenecks, foreign reserves availability and level of economic activity respectively. By removing DF and substituting M (Money supply), we have:

$$P = f (M, Exr, Pm, A, S, R, U) \qquad (3)$$

The main structuralist point is that inflation can result from a number of special problems and not just from excessive money growth. Their search for explanations of inflation usually centers around "structural" problems such as supply bottlenecks or high dependency on imported intermediate goods. Inflation could also arise from the cost side. Costs could change through a supply shock, an increase in local earning power arising from a boom in export earnings, (in this case oil), or devaluation. Any of these could result in a push for higher nominal wages, which drive up production costs and increases final goods prices.

A synthesis of the Monetarists and the Structuralist specification would give us the latter specification since M, S, and U are common to both, and R, Pm and A are peculiar to the structuralists. Our model for identifying the factors responsible for price increases in Nigeria in the period under review is an adaptation of this latter specification:

$$P = f (M, Exr, Pm, A, S, U, R) \qquad (4)$$

In our model, M stands and measures money supply, defined as currency outside banks plus private sector demand deposits in the banking system. Pm is replaced by P^f, which represents foreign prices; A, for agricultural bottleneck which could be measured by food prices. But as food price is known to be the dominant component of the consumer price index in Nigeria, there will be a clear case of collinearity between it and the consumer price index. Therefore, A is removed. S for demand shift and R for the ability to import are yet to be acceptably specified. As such, they cannot be used in the model. Unemployment represented by U and measuring only the unemployment of labour does not appear an adequate specification of the level of economic activity as it leaves out the unemployment of other factors of production. A better specification of the level of economic activity could be the level of real output. This datum represented by Y, measures how much all the factors of production in an economy are producing at a given time and therefore a good indicator of the level of economic activity. Also included in the model is expected rate of inflation (P_{t-1}).

Thus, the model becomes

$$P = f (M, Exr, P^f, Y, P_{t-1}) + U; \qquad (5)$$

$$f(M) > 0, \quad f(Exr) > 0, \quad f(P^f) > 0, \quad f(Y) < 0, \quad f(P_{t-1}) > 0$$

where U is the error term.

Sequel to the model developed from our theoretical framework, the general price level can be expressed as a weighted average of the price of tradable goods (P^T) and non-tradable goods (P^N):

$$\text{Log } P = \theta (\log P^N) + (1 - \theta)(\log P^T) \qquad (6)$$

where $0 < \theta < 1$.

The price of tradable goods is determined in the world market and depends on foreign price (P^f) and on the exchange rate (e). In domestic currency terms, P^T can be depicted by the following expression:

$$\text{Log } P^T = \log e + P^f \qquad (7)$$

As can be seen from (7), both an increase in the exchange rate and a rise in foreign prices lead to an increase in domestic prices.

The price of non-tradable goods is assumed to be determined in the domestic money market, where it is assumed that the demand for non-tradable goods moves in line with the overall demand in the economy. Accordingly, the price of non-tradable goods is determined by the money market equilibrium condition, where real money supply (M^S/P) equals real money demand (m^d)

$$\log P^N = \beta (\log M^S - \log m^d) \qquad (8)$$

where β is a scale factor illustrating the relationship between economy-wide demand and demand for non-tradable goods. It is assumed that the demand for real balances is a function of real output (y) and inflationary expectations (π^e). Due to relatively underdeveloped financial markets in Nigeria, it is assumed that the relevant substitution is between goods and money and not among different financial markets. Consequently, the opportunity cost of substitution between goods and money is the expected inflation rate.

$$m^d = f(y, \pi^e) \qquad (9)$$

The expected rate of inflation is assumed to be determined by inflation in the previous period:

$$\pi^e = \Delta \log P_{t-1} \qquad (10)$$

The theory predicts that an increase in real income will lead to an increase in money demand, while an increase in expected inflation will lead to a decrease in money demand. Substituting and rearranging, we obtain the following estimable equation:

$$\text{Log } P_t = \alpha_0 + \alpha_1 \log M_t + \alpha_2 \log y_t + \alpha_3 \log P_{t-1} + \alpha_4 \log e_t + \alpha_5 \log P^f + \mu_t \qquad (11)$$

where

$$\alpha_1 > 0, \quad \alpha_2 < 0, \quad \alpha_3 > 0, \quad \alpha_4 > 0, \quad \alpha_5 > 0$$

α_0 = constant
M_t = growth in money supply
y_t = growth in real output
P_{t-1} = expected rate of inflation
e_t = exchange rate
P^f = foreign prices
μ_t = error term.

Where theory predicts that an increase in money supply, expected inflation, the exchange rate and foreign prices will drive prices up, while an increase in real output will lead to a decline in the inflation rate. Adding the effect of lagged prices to the equation can capture the effect of sluggish adjustment due to rigidities and inertia.

This is in line with the definition employed in a study by Olopoenia (1986). The inflation equation considers the monetarists variables in addition to exchange rate. Thus, inflation is hypothesized to depend on growth in money supply, real output (measured by real GDP), expected rate of inflation, exchange rate changes and foreign prices.

4 Estimation Results, Policy Implications and Conclusion

We explore the cointegration and Vector Error Correction Mechanism (VECM) method. This is due to the fact that the variables of interest are simultaneously related, hence the need to treat each variable symmetrically and allow feed back among them. Second, VECM analysis is superior to a single equation approach for capturing the long-run dynamics of variables (Enders, 1995; Feasel, Kim and Smith, 2001). This technique enables us to verify the stationarity as well as the order of integration of the variables used in the model. The method also enables us to establish the long-run relationship between exchange rate, money supply and inflation.

Data were sourced from the International Financial Statistics (IFS) yearbook and Central Bank of Nigeria's (CBN) Economic and Financial Review of Various years. The data covers the period of estimation, that is, 1986 to 2008. Quarterly data for this period was used (1986: 01 to 2008: 04) rather than annual data, this is in order to have enough degrees of freedom for estimation and also the desire to minimize any problems with temporal aggregation (see Christiano and Eichenbaum, 1992).

4.1 Time Series Properties of the Data

Table 1 presents the estimates of the unit roots test for the stationarity of the variables at their levels and first difference. As apriori expected all the variables

are non stationary at level however, stationarity is induced after the first difference. Since the series are integrated of order one or I(1) that is, the first differences were stationary, the presence of significant cointegration relationships among the variables could be determined. Thus, the unit roots test further requires that the variables must cointegrate at the same order. This is confirmed by conducting cointegration test among the variables used in the model. The multivariate cointegration test established whether there was at least one linear long run relationship among the variables of interest found to be integrated of order one. The Johansen Maximum Likelihood procedure was applied, the estimates are as presented in Table 2 below.

Table 1: ADF statistics for Testing Unit Roots in the Variables

Variables*	Series	Levels	First Differences
Broad Money Supply	LM2	-0.5725	-4.1978
Narrow Money Supply	LM1	-0.9287	-5.6918
Nominal Exchange rate	LNEER	-0.9054	-7.3969
Real Exchange Rate	LREER	-0.9008	-7.9243
Gross Domestic Output	LGDP	-0.6129	-4.7089
US Wholesale price	LCPUS	-0.1907	-4.6574
Inflation rate	LCPI	-1.3069	-6.5934
Critiacal values	1%	-3.5281	-3.5267
	5%	-2.9042	-2.9035

* All the variables are expressed in log forms.

The result of the cointegration test in Table 2 confirms that there are more than one cointegration relationships among the variables included in the model. Specifically, the result of the cointegration test suggests that both money supply and exchange rate, irrespective of the ways they are defined, have equilibrium conditions with inflation, which kept them in proportion to each other in the long run[2]. This evidence of cointegration among the variables rules out spurious correlations and implied that at least one direction of influence could be established among the variables.

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[2] Both nominal exchange rate (NEER) and narrow money supply (M1) were also used to represent exchange rate and money supply in the cointegration tests. The results are similar with the result reported in Table 2 hence are not reported to conserve space as it will amount to unnecessary duplication but are available on request.

Table 2: Cointegration Tests

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.765171	316.0358	94.15	103.18	None **
0.591042	214.6130	68.52	76.07	At most 1 **
0.544134	152.0230	47.21	54.46	At most 2 **
0.511709	97.03408	29.68	35.65	At most 3 **
0.311625	46.85499	15.41	20.04	At most 4 **
0.256165	20.71548	3.76	6.65	At most 5 **

Sources: Data Analysis
Series: GCPI GRGDP GREER GM2 GCPS GLR
Lags interval: No lags

NOTE : *(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 6 cointegrating equation(s) at 5% significance level

4.2 Analysis of Long run Effects of Money Supply and Exchange rate on Inflation

To examine the long run effect of money supply and exchange rate on inflation, Vector Error Correction Mechanism (VECM) which incorporates both the long run and short run effect simultaneously is estimated. The beauty of VECM is that once variables are non stationary but cointegrated, the estimates from VECM are more efficient than either the Ordinary least Square or orthodox VAR estimates. The VECM also saves one from the agony of endogeneity problem and the inherent spurious inferences associated with OLS estimates.

Table 3 presents the estimates for the VECM model. The VECM has two parts. In the first part, the estimates of the long run effects are presented while the second part contains the estimates of the short run dynamic interaction among the variables. The Second part is also linked with first part (long run relation) by the ECM. The ECM is a measure of the speed of adjustment of the short run relation to unexpected shocks. It is measured as the effects of residual from the long run model. This long run feedback effect is indicated by significant ECM terms while the short run causality is measured by the significant coefficient on the individual variables. The cointegration test conducted earlier is mainly to establish whether this ECM term (derived from the residual of long run regression) is stationary at level or not and to determine how many of such relationships exist. As confirmed thereof, there is significant long run relationship among the variables. However, the fact that there is presence of long run relationship among the variables included in the model does not automatically imply that all the variables in the model have significant effects on the dependent variable. Therefore to determine

which variable actually elicit the observed long run relationship, there is the need to estimate the long run model and then analyse the estimates.

As estimates in first part of the Table 3 show, all the variables except foreign price, have negative and significant effects on the fluctuation of price level in long run. While the negative effects of real GDP and real exchange rate can easily be justified, the negative effects of money supply raises further issues about the usual theoretical linkage between money supply and price. According to traditional macroeconomic theory, money should have positive and significant effect on price level in the long run. The possible justification for the negative effect of money supply on price level is that inflation may not be due to aggregate demand pressure but rather due to hiccups in the supply chain of goods both from the domestic and foreign supply outlets. In other words the fluctuation in the price level is more of aggregate supply induced rather than aggregate demand. Also, given the higher coefficient of exchange rate, it seems that exchange rate is more relevant in price determination in Nigeria than monetary expansion and real output production. This corroborates many other studies (see Kamin 1996; Brouwer and Ericsson 1998; Durevall 1998 and Harberger 1963).

Considering the short run effects of these variables on inflation; only money supply is the significant variable which is in line with apriori theoretical expectation. It confirms the overwhelming influence of monetary expansion both from fiscal impulses and financial intermediation on the liquidity level in the country. Increases in the liquidity volume in the economy raises the real money balances of the people which induces aggregate demand. The sluggishness of supply to respond to the short run and unexpected increase in demand put pressure on the price to rise and hence generates inflationary tendency in the short run. As the long run estimates shows, the aggregate supply would have increased and the effect of monetary expansion dies down while supply remains the only determinant of the price fluctuation. There have been several arguments on the possible factor generating persistent increase in price level in Nigeria. While some studies (Akinlo, 2003; Ajisafe and Folorunso, 2002) argue that it is the excessive government spending that result in expansion in money supply, others (Masha, 2000; Ajayi and Awosika, 1980) argue that it is externally induced by the petrol dollar income. While these two positions may still be valid, there is some evidence that the major cause of price fluctuation in most developing countries is the exchange rate fluctuation. There are several reasons for this. In import dependent country like Nigeria, changes in exchange rate are directly reflected in the prices of the goods and services.

Table 3: The Multivariate Causality (VECM) Results (Model I)

Cointegrating Eq:	CointEq1				
LCPI(-1)	1.000000				
LRGDP(-1)	1.090160 (1.99525)				
LM2(-1)	-1.164565 (-2.13838)				
LREER(-1)	-0.553013 (-3.38066)				
LCPUS(-1)	0.173883 (0.35484)				
C	-2.993602				
Error Correction:	D(LCPI)	D(LRGDP)	D(LM2)	D(LREER)	D(LCPUS)
CointEq1	-0.020961 (-3.63633)	-0.027923 (-1.35374)	0.026359 (1.90384)	1.675878 (5.46949)	0.012037 (0.43881)
D(LCPI(-1))	0.470172 (4.59783)	-0.112793 (-0.68500)	-0.119321 (-1.07956)	-1.268182 (-0.51847)	0.143677 (0.65611)
D(LRGDP(-1))	-0.014942 (-0.19643)	0.370573 (3.02538)	0.053928 (0.65591)	-1.145135 (-0.62936)	-0.114020 (-0.69996)
D(LM2(-1))	0.313672 (2.72678)	-0.116520 (-0.62905)	-0.042118 (-0.33875)	-1.140130 (-0.41435)	0.119246 (0.48408)
D(LREER(-1))	-0.004406 (-0.86329)	-0.009672 (-1.17685)	0.011916 (2.16008)	-0.043320 (-0.35484)	0.003255 (0.29784)
D(LCPUS(-1))	0.044695 (0.72751)	-0.048735 (-0.49265)	0.037845 (0.56994)	0.095202 (0.06478)	-0.092845 (-0.70573)
C	0.007153 (0.65924)	0.022085 (1.26403)	0.070359 (5.99943)	0.129546 (0.49914)	0.057403 (2.47051)
R-squared	0.362388	0.179388	0.107094	0.490663	0.026316
Adj. R-squared	0.301663	0.101235	0.022056	0.442155	-0.066416
S.E. equation	0.049290	0.079369	0.053275	1.179016	0.105552
F-statistic	5.967686	2.295333	1.259363	10.11505	0.283784
Log likelihood	115.0637	81.71686	109.6216	-107.1657	61.76050
Akaike AIC	-3.087535	-2.134767	-2.932045	3.261877	-1.564586
Schwarz SC	-2.862685	-1.909918	-2.707196	3.486726	-1.339736
S.D. dependent	0.058983	0.083720	0.053873	1.578567	0.102212
Determinant Residual Covariance	3.06E-10				
Log Likelihood	270.1841				
Akaike Information Criteria	-6.576689				
Schwarz Criteria	-5.291834				

4.3 Analysis of Impulse Response and Variance Decomposition

There are suspicion about the statistical efficiency of the coefficient estimates from the VECM hence most often scholars are more comfortable with the impulse response and variance decomposition as a better way of analyzing the contribution of policy variables to target variables in macroeconomic model. This approach is followed in this study to analyse the relative contribution of both money supply and exchange rate to fluctuation in price level. As in any standard VAR model analysis, the way the variables entered the model is extremely important for the interpretation of the results. Therefore, in this study, the policy variables were placed first then followed by the target variables. This is based on the economic intuition that the policy variables influence the target variables contemporaneously, while the target variables influence the policy variables through the system overtime. It may alternatively be said that the target variables are 'less' endogenous than the policy variables (Akinlo, 2003). The ordering used are: foreign price indices (CPUS), exchange rate (REER), money supply (M2), real GDP and domestic price indices (CPI). The Tables 4, 5, and Figure 1 depict the impulse response and variance decomposition of price changes due to innovations to exchange rate, money supply , real GDP and foreign price indices measured by US price indices of economic growth variables of the model using a horizon of ten quarters.

Table 4: Impulse Responses to One-S.D Innovations

Period	LCPI	LRGDP	LM2	LREER	LCPUS
1	0.044448	-0.006173	0.011353	0.006629	-0.000191
2	0.064414	-0.011750	0.032147	0.014717	0.008856
3	0.071706	-0.014541	0.040288	0.021947	0.013698
4	0.074544	-0.015690	0.042793	0.020370	0.015711
5	0.075972	-0.015894	0.044120	0.019586	0.016464
6	0.076635	-0.015854	0.044766	0.019334	0.016804
7	0.076922	-0.015801	0.045056	0.019270	0.016942
8	0.077039	-0.015769	0.045178	0.019261	0.016997
9	0.077084	-0.015754	0.045226	0.019263	0.017018
10	0.077101	-0.015748	0.045244	0.019266	0.017026

Ordering: LCPUS LREER LM2 LRGDP LCPI

The following conclusions emerge from the examination of the impulse response functions. From Table 4 and Figure 1 the dominance of expansionary impact of money supply shock on the inflation rate all through the ten-quarter horizon is established and confirms the results elicited by the VECM model above. Followed in effects is real exchange rate and foreign inflation. The least effect is from the real GDP. Moreover, the result of the impulse response also confirms the weakness of both exchange rate and real GDP to influence inflation in the short run. Indeed while all the coefficients of money supply shocks have positive effects, real GDP has negative effects all through out the ten periods. Exchange rate and foreign price also have positive effect on price level. This implies that a unit S.D shock to either money supply or exchange rate or both will result in higher inflation rate in Nigeria. Likewise a reduction in monetary expansion and exchange rate will be an effective instrument in taming excessive price fluctuation in Nigeria.

Table 5 present the variance decomposition of the variables used in the model. The salient results from the variance decomposition are as follows: In general 'own shock' constituted the predominant source of variations for price variable in the model. Apart from own shock, the most dominant variable is money supply. All through the ten-period horizon, it maintained an average significant influence of about 20%. The next most significant determinant of Inflation is real exchange rate which maintains an average of 5% through out the ten periods. Foreign price and real GDP trailed behind and both explained less that 5% of the variation in price fluctuation in Nigeria.

Table 5: Variance Decomposition Results

| Period	S.E.	LCPI	LRGDP	LM2	LREER	LCPUS
1	0.046761	90.35127	1.742943	5.894207	2.009904	0.001676
2	0.088331	78.50026	2.257897	14.89704	3.339078	1.005732
3	0.124289	72.93254	2.509124	18.03122	4.804579	1.722546
4	0.154090	70.85331	2.669205	19.44379	4.873385	2.160311
5	0.179915	69.80359	2.738326	20.27616	4.759854	2.422064
6	0.202864	69.17437	2.764600	20.81770	4.652118	2.591209
7	0.223627	68.75753	2.774306	21.19090	4.570895	2.706374
8	0.242680	68.46239	2.777987	21.45968	4.511288	2.788660
9	0.260365	68.24320	2.779527	21.66068	4.466657	2.849935
10	0.276931	68.07435	2.780294	21.81595	4.432244	2.897171

Ordering: LCPUS LREER LM2 LRGDP LCPI
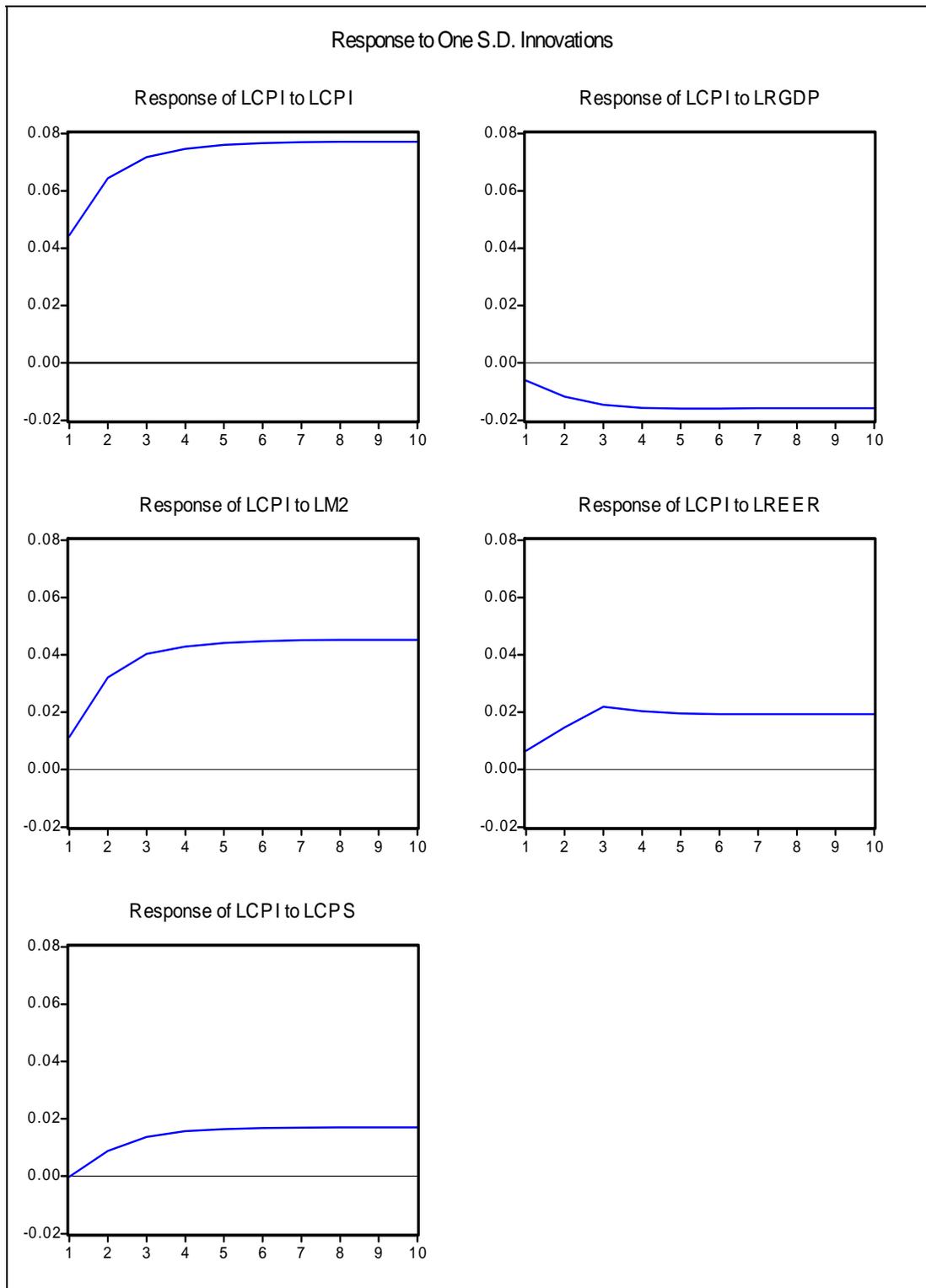
Figure 1

The general observation from the estimates so far is that inflation pressure in Nigeria has been much more occasioned by the expansionary monetary policy and exchange rate. Though in the long run real output has some influence on price level but such influence is less is in most cases dominated by the influence of money supply and real exchange rate. In terms of relative effect of money supply and exchange rate, money supply seems more influential than exchange rate in price determination in Nigeria.

5 Policy Implications and Conclusion

The estimation result shows that increase in money supply will lead to increase in inflation rate in short run but an insignificant effect in the long run. Therefore it implies that monetary expansion has remained the main causal factor of the persistent increase in price level in Nigeria. There is controversy on whether inflation in developing countries like Nigeria could be explained from monetarist perspective in view of the enormous bottleneck in the supply chain in food and material resources flow in Nigeria. The excessive monetary expansion in Nigeria where endemic corruption and conspicuous spending is a general trait of the government makes the monetary argument more potent than the supply side argument where inflation is seemed to be caused by supply rigidity. Therefore to tame inflationary pressure in Nigeria, the excessive fiscal expansion has to be curtailed. The banks credit management approach need be tailored in line with the monetary objective of the government. Since the banks can on their own increase the liquidity of the economy through their money creation capacity, then banks must be involved in articulating and implementing monetary policy. The era where the monetary policy guidelines were just passed down to the financial operators should be a thing of the past. To properly and effectively curtail inflation in Nigeria, all stakeholders must be made to make input into monetary policy and be convinced about the sincerity of the government. The evidence from the study that exchange rate does not significantly influence inflation may explain the current observation in Nigeria where exchange rate is appreciating but both imported and domestically produced goods continue to experience rise in prices. It means that exchange rate fluctuation have little or no influence on inflationary pressure in Nigeria. Foreign price seems not to be a crucial factor in inflation dynamism while real output growth seems to play more or less a little role in price fluctuation in Nigeria.

One other important implication arising from the result is that real variable that is, real output has an inverse effect on inflation; thus implying that the supply side argument also holds. That is, increasing the supply of goods and services will reduce the pressure on price level. This means that increase in real output can also be used to stop excessive inflationary pressure.

        To attain the goal of price stability in Nigeria, the fundamentals have to be right. Exchange rate depreciation to the extent that it is persistent, is inflationary. Similarly, increases in the money supply above output growth is also inflationary. Thus, policies to reduce monetary growth are most particularly welcome.

        The overall conclusion is therefore that for effective inflation control in Nigeria, both monetary policy and fiscal policy must be well coordinated to prevent excessive monetary expansion. Though exchange rate may not be the most important factor in inflation determination in Nigeria, the fact that it influence inflation positively, suggests that exchange rate stability is a necessary condition for stable domestic prices. Increase output production and diversifying the economy from import based economic activity to export based activity will increase output supply. Increasing the food supply and ensuring fiscal and monetary discipline seems to be a panacea for a sustainable macroeconomic stability in Nigeria.

References

[1] Pierre-Richard Agenor, Money, Exchange Rates and Inflation in Africa: A Vector Autoregression Analysis, *unpublished Paper*, International Monetary Fund, (1986).

[2] Bijan B. Aghevli, Mohsin S. Khan and Peter J. Montiel, Exchange Rate Policy in Developing Countries: Some Analytical Issues, *Occasional Paper*, **78**, *International Monetary Fund*, (March, 1991).

[3] D.O. Ajakaiye, Exchange Rate Depreciation and Sectoral Prices in Nigeria (1986-89), National Institute of Social and Economic Research (NISER), *Individual Research Project Report*, Ibadan, (1994).

[4] R.A Ajisafe and B.A. Folorunso, The relative Effectiveness of Fiscal and Monetary Policy in Macroeconomic Management in Nigeria, *African Economic and Business Review*, **3**(1), (2002).

[5] A.E. Akinlo, The Determinants of Inflation in Nigeria, *Indian Journal of Economics*, **LXXXVI**(341), (2003).

[6] J.O. Asogu, An Econometric Analysis of the Nature and Causes of Inflation in Nigeria, Central Bank of Nigeria (CBN), *Economic and Financial Review,* **29**(3), (September, 1991).

[7] Andrew Atkenson and Patrick Kehoe, The Advantage of Transparent Instruments of Monetary Policy, *Federal Reserve Bank of Minneapolis, Research Department Staff Report*, **297**, (2001).

[8] T. Bernhardsen and A. Holmsen, The choice of exchange rate assumption in the process of forecasting inflation, *Staff Memo*, **3**, Central Bank of Norway, (2005).

[9] M. Bleaney, Exchange Rate Regimes and Inflation Persistence, *IMF Staff Papers*, **247**, (2000), 387-402.

[10] M. Bleaney, Exchange Rate Regimes and Inflation Persistence, *IMF Staff Papers*, **47**(3), (2001).

[11] G. Brouwer and N.R. Ericsson, Modelling Inflation in Australia, Forthcoming, *Journal of Business and Economic Statistics*, (October, 1998).

[12] Guillermo A. Calvo, M. Reinhart Carmen and A. Végh Carlos, Targeting the Real Exchange Rate: Theory and Evidence, *IMF Working Paper*, **94/22**, (1994).

[13] Elias Canetti and Joshua Greene, Monetary Growth and Exchange Rate Depreciation as Causes of Inflation in African Countries, International Monetary Fund, Washington, D.C., *World Bank Working Paper*, (2000).

[14] Central Bank of Nigeria (CBN), Annual Reports and Statement of Accounts - Various Years.

[15] A. Chhibber, and al., Inflation, Price Controls and Fiscal Adjustment in Zimbabwe, *World Bank Working Papers*, **WPS 192**, World Bank, Washington DC., (1989).

[16] A. Chibber and N. Shafik, Exchange Reform, Parallel Markets and Inflation in Africa: The Case of Ghana, *World Bank Working Paper*, **WPS 427**, World Bank, Washington DC, (1990).

[17] E. Christiano and M. Eichenbaum, Comments on Interpreting the Macroeconomic Time Series Facts: The Effects of Monetary Policy, *European Economic Review*, **36**, (1992), 1001-1011.

[18] J.M.K Clemens and L. Alex, Inflation Persistence under Semi-Fixed Exchange Rate Regimes: The European Evidence, 1974-1998, (2002).

[19] G. Debelle and G. Galati, Current account adjustment and capital flows, *BIS Working Papers*, **169**, (February, 2005).

[20] D. Dick and S.N. Njuguna, A Dynamic Model of Inflation for Kenya 1974-1996, *Working Papers in Economics*, **7**, (1998).

[21] David A. Dickey and A. Fuller Wayne, Distribution of the Estimators for Autoregressive Time Series With a Root, *Journal of the American Statistical Association*, **74**, (1979), 427-431.

[22] C. K. Dordunoo and Domonique Njinkweu, Foreign Exchange Rate Region and Macroeconomic Performance in Sub-Saharan Africa, *Journal of African Economics*, Supplementary to **6**, (1997), 121-149.

[23] Ihor Doroshenko, *Monetary Policy of Economic Growth in the Transitional Economy, Shevchenko National University*, Kyiv, Ph.D Dissertation, 2001.

[24] D. Durevall, The Dynamics of Chronic Inflation in Brazil, 1968 – 1985, forthcoming, *Journal of Business and Economics Statistics*, (October, 1998).

[25] Ibrahim A. Elbadawi, Inflationary Process, Stabilisation and the Role of Public Expenditure in Uganda, Washington, D.C., *World Bank Working Paper*, (1990).

[26] W. Enders, *Applied Econometrics Time Series*, New York, John Wiley and Sons, 1995.

[27] R.F. Engle and C.W.J. Granger, Co-Integration and Error-Correction: Representation, Estimation and Testing, *Econometrica*, **55**, (1987), 251-276.

[28] Ed. Feasel, Y. Kim and S.C. Smith, A VAR Approach to Growth Empirics: Korea, *Review of Development Economics*, **53**, (2001), 421-432.

[29] O. Festus, L. Egwaikhide and O. Gabriel, Exchange Rate, Money Supply and Inflation in Nigeria: An Empirical Investigation, *African Journal of Economic Policy (AJEP)*, **1**(1), (1994).

[30] Jeffrey Frankel, No Single Currency Regime is Right for all Countries at Times, *NBER Working Paper*, **7338**, (1999).

[31] Milton Friedman, Have Monetary Policies Failed?, *American Economic Review*, *Papers and Proceedings*, **62**(2), (May, 1972), 11-18.

[32] Atish Ghosh, Anne-Marie, Gulde and Jonathan D. Ostry, Does Nominal Exchange Regime Matter?, *NBER Working Paper*, **5874**, (1997).

[33] A.C Harberger, *The Dynamics of Inflation in Chile*, in C.F. Christ, (ed.), Measurement of Economics; Studies in Economics and Econometrics in Memory of Yehunda Grunfield, Stanford University Press, 1963.

[34] Dmyto Holod, The Relationship Between Price Level, *Money Supply and Exchange Rate in Ukraine*, A thesis submitted to the National University of Kiev-Mohyla Academy, 2000.

[35] S. Johansen, Statistical Analysis of Cointegration Vectors, *Journal of Economic Dynamics and Control*, **12**, (1988), 231-254.

[36] S. Kamin, Real Exchange Rates and Inflation in Exchange Rate-Based Stabilizations: An Empirical Examination, Board of Governors of the Federal Reserve System, Washington, D.C., *International Finance Discussion Papers*, **554**, (1996).

[37] Steven B. Kamin, A Multi-Country Comparison of the Linkages Between Inflation and Exchange Rate Competitiveness, *BIS Working Papers*, **45**, (1997).

[38] J. Kearns and P. Manners, The Impact of Monetary Policy on the Exchange Rate: A Study Using Intra-day Data, Reserve Bank of Australia, *Research Discussion Papers*, (2005), 2005-02.

[39] P. Krugman, *External Shocks and Domestic Policy Responses*, in Dornbusch R. and Helmers, F.L.C.H.(ed.), The Open Economy Clarendon press, Oxford, 1991.

[40] Aslem London, Money, Inflation and Adjustment Policy in Africa: Some Further Evidence, *African Development Review*, **1**(1), (1989), 87-111.

[41] B. Mahamadu and Phillip Abradu-Otoo, Monetary Growth, Exchange Rates and Inflation in Ghana: An Error Correction Analysis, *Working Paper,* **WP/BOG-2003/05**, (2003).

[42] M. Marta, S. Peter and T. Anita, Inflation, Exchange Rates and the Role of Monetary policy in Albania, *Working Paper*, **88**, (2004).

[43] Iyabode Masha, New Perspectives on Inflation in Nigeria in Central Bank of Nigeria, *CBN Economic and Financial Review,* **38**(2), (June, 2000).

[44] Gary Moser, The Main Determinants of Inflation in Nigeria, *IMF Staff Papers*, **42**, (1995).

[45] NCEMA (National Center for Economic Management and Administation), Macroeconomic Policy Analysis and Management, *Training and Programme Report*, Ibadan, Nigeria, (1996).

[46] Njuguna S. Ndung'u, *Dynamics of the Inflationary Process in Kenya Goteborg*, Sweden, University of Goteborg, 1993.

[47] Njuguna S. Ndung'u, Monetary and Exchange Rate policy in Kenya, African Economic Research Corsortium (AERC), *Research Paper*, (1997).

[48] B. Nicolleta and N. Edward, The Lag from the Monetary Policy Actions to Inflation: Friedman Revisited, *External MPC Unit Discussion Paper*, **6**, (2001).

[49] Oksana Novoseletska and Mykyta Myhaylychenko, *Ukrainian Money Market*, Mechanisms of Monetary Policy Influence on the Economy, CASE-Ukraine, Kyiv, 2004.

[50] A.F. Odusola and A.E. Akinlo, Output, Inflation and Exchange rate in Developing Countries: An Application to Nigeria, (2001).

[51] Razaq Olapoenia, The Equilibrium Exchange Rate on the Second Tier Market in the Presence of Black Market Dealings in Foreign Exchange, *Nigerian Journal of Economics and Social Studies (NJESS)*, **28**(1), (March, 1986).

[52] Peter J. Quirk, Fixed or Floating Exchange Regimes: Does It Matter for Inflation?, *IMF Working Paper*, **94/134**, (1994).

[53] L. Rutasitara, Exchange rate regimes and inflation in Tanzania, *Research Paper*, African Economic Research Consortium, Nairobi, Kenya, **138**, (2004).

[54] F. L. Selialia, *The Dynamics of Inflation in Lesotho*, Unpublished M. A. Thesis, University College, Dublin, 1995.

[55] N.K Sowa and J.K. Kwakye, Inflationary Trends and Control in Ghana, *Research Paper*, African Economic Research Consortium, Nairobi, **22**, (1993).

[56] Roman Tyrkalo and Bohdan Adamyk, Monetary Policy Trsansmission and its meaning to the effectiveness of NBU activity, *Herald of NBU*, **7**, (1999), 6-11.

[57] United Nations Economic Commission on Africa (UNECA), *An African Alternative to Structural Adjustment Programs*, Addis Ababa, (1989).

[58] K.A. Yahya, *Structural Disequilibrium and Inflation in Nigeria: A Theoretical and Empirical Analysis*, Center for Economic Research on Africa, School of Business, Montclair State University, Upper Montclair, New Jersey, 07043, 2000.

[59] J. Zettelmeyer, The impact of monetary policy on the exchange rate: evidence from three small open economies, *Journal of Monetary Economics,* **51**, (2004), 635-652.

The CBN has employed two monetary policy frameworks: exchange rate targeting up to 1973 and monetary targeting subsequently in pursuit of the price stability mandate. In Nigeria, it has been observed that moderation in inflation has not kept pace with the slowdown in growth of the monetary aggregates, particularly since the global financial crisis; raising concerns about the stability of the underlying assumption of the theoretical relationship between the intermediate target of monetary policy, broad money supply, and prices. It is in this context that this paper re-visits the thesis (money/inflation) underpinning the conduct of monetary policy in Nigeria. Trend in the Monetary Aggregates and Inflation in Nigeria. Nigeria should guarantee an exchange rate pol icy that is essentially determined by the. state of the economy and not by speculators being a net importation economy. Also, the. Central Bank of Nigeria should look inwards into the current interest rate and see how it. can be regulated in such a way that will en courage private and foreign investors to be. able to invest in the country. in the inflation rate has accounted for a bout 100% rise in price levels of com-. modities and facilities (First Secur ities Discount House [FSDH], 2016). Re Changes in the exchange rate therefore, have implications for individual spending and investments behaviour of firms, all of which can affect aggregate demand. A market based exchange rate will change whenever the values of either of the two component currencies change. · What is the relationship between exchange rate variations and inflation in Nigeria? This study will attempt to answer these questions and find out ways through which the vagaries that occur as a result of these can be cushioned in the economy. 1.3 objective of study. This study will be guided by the following objectives For example, Money supply could be defined as the total sum of money in any currency of a country held by commercial banks and other financial institutions.