FISCAL DEFICIT, INFLATION AND OUTPUT GROWTH IN THE NIGERIA: A VECTOR ERROR CORRECTION MODEL APPROACH

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Fiscal Deficit is basically the excess of government's expenditure over its receipts in an accounting year. If one were to list the factors that have impeded Nigeria from attaining a higher growth path, high fiscal deficit would feature prominently. While fiscal deficits are not necessarily inconsistent with economic growth, especially in a developing economy, persistent fiscal deficits irrespective of its mode of financing could adversely impact economic growth.

Deficits are a feature of many economies, especially the developing economies due to the cravings of investing for future growth. However, if the country's expenditure were to be categorised, there emerges a bare reality: A sizable fraction of the government's receipts was used to finance unproductive expenditure, including, interest payments and subsidies. And this has been one of the foremost reasons for the country's slow rate of growth in the past. Regarding interest payments, their prominence can be established from the fact that the government's outstanding internal debt to GDP currently is around 16.8 per cent, which is high by any standards. And this high absorption of capital by the government seems to have had a crowding out effect on private investments that further resulted in the slow rate of economic growth. Admittedly, the government in recent time had embarked on the process of restructuring its debts to achieve a sustainable level.

Although subsidies are a form of protectionism that is provided to make domestic goods and services artificially competitive against imports, in most cases, subsidies in Nigeria like in most developing countries have failed to serve the real purpose. In Nigeria over the years subsidies were given to the agricultural sector in the form of support prices for crops and fertilizer supplies. Due to the implementation problems these subsidies were hijacked by the elites to the detriment of the targeted population.

Higher fiscal deficit in Nigeria has been identified as one of the major reasons for relatively higher level of inflation (Onwioduokit, 1996). The cycle of high deficit and high inflation can be explained in two different ways. High fiscal deficit results in a high government borrowing that has a tendency to reduce the availability of capital. This leads to lower liquidity and consequently higher interest rates and higher inflation. On the

other hand, assuming that the government is borrowing to invest in the economy, this leads to increased spending that leads to greater money supply which further leads to inflation if output growth fails to keep pace with this increased amount of spending. Furthermore, to curb a rise in the level of inflation, the central bank resorts to a hike in interest rates, which in turn adversely affects the productive sector of the economy by constraining output growth. Thus, high fiscal deficits lead to higher interest rates which further fuel inflation in the economy. The main objective of this paper is to empirically analyze the relationship between fiscal deficit, inflation and output in Nigeria.

Following this introduction, the rest of the paper is arranged as follows: part II contains theoretical issues as well as review of literature on the linkages among the variable of interest. In part III, methodological issues are discussed. Part IV discusses empirical findings, while part V contains policy recommendations and some concluding remarks.

II Theoretical and Empirical Issues

Fiscal deficit is the difference between the government's total expenditure and its total receipts (excluding borrowing). The elements of the fiscal deficit are (a) the revenue deficit, which is the difference between the government's current (or revenue) expenditure and total current receipts (that is, excluding borrowing) and (b) capital expenditure. Fiscal deficit can be financed by borrowing from the central Bank (which is also called deficit financing or money creation) and market borrowing (from the money and/or capital market).

Two arguments are generally given in order to link a high fiscal deficit to inflation. The first argument is based on the fact that the part of the fiscal deficit which is financed by borrowing from the central bank leads to an increase in the money stock. Some maintain that a higher money stock automatically leads to inflation since "more money chases the same goods". There are, however, two counter arguments to this school of thought: Firstly, it is not the "same goods" which the new money stock chases since output of goods may increase because of the increased fiscal deficit. In an economy with unutilized resources, output is held in check by the lack of demand and a high fiscal deficit may be accompanied by greater demand and greater output. Secondly, the speed with which money "chases" goods is not constant and varies as a result of changes in other economic variables. Hence even if a part of the fiscal deficit translates into a larger money stock, it may not lead to inflation.

The second argument linking fiscal deficits and inflation is that in an economy in which the output of some essential commodities cannot be increased, the increase in demand caused by a larger fiscal deficit will raise prices. The flip side of this argument is that even

if some particular commodities are in short supply, rationing and similar strategies can check a price increase. Finally, if the economy is in a state which the proponents of this argument believe it to be in, that is, with output constrained by supply rather than demand, then fiscal deficits that leads to increasing demand (such as private investment) is inflationary.

However, given interest rate, a larger fiscal deficit by raising the accumulated debt of the government raises the interest burden. In the particular case of an economy undergoing liberalization, a large part of the increasing interest burden is because of the rise in the interest rates. This is related to the process of liberalization since the rate of interest has to be kept high in a liberalized economy to prevent capital outflow.

Fiscal literature accepts deficits and debt if they contribute to higher economic growth, but in the case of Nigeria, like other developing countries with similar economic conditions, budget deficit as measured in ratio of GDP are the major impediments to economic growth (Ashinze and Onwioduokit, 1996).

From another perspective, the linkage between fiscal and monetary policies can be described under the fiscal dominance hypothesis. Kydland and Prescott (1977, show that any attempts by policymakers to solve the output-inflation trade lead to an inflationary bias, because such policy is time inconsistent. The dynamic inconsistency problem arises, because in the absence of binding commitments, government, which objective is low unemployment, pursues expansionary policy. This leads to the rate of inflation being higher than expected and economic agents, such as wage-setters, correct their expectations about future inflation and push output to its natural level. This general idea can be easily explained with the use of simple model:

$$y = y' + b(\pi - \pi \exp), b > 0 \qquad (1)$$

Where y is the log of output and y' is the log of its flexible price level, b is the discount rate and π and π_{exp} are inflation and expected inflation rates, respectively. Kydland and Prescott (1977) also assume that flexible price output level is less than socially optimal because of positive marginal tax rate (individuals do not realize the full benefits of additional labour supply) or imperfect competition (firms do not capture all benefits of additional output). Assuming that $y^* > y'$, we see that when actual inflation rate equals expected; output is lower than socially optimal, because now it equals its

flexible price level. Thus, policy-makers have incentive to set inflation rate higher than it is expected by public.

Loss function of policymaker is the sum of costs from output being lower than socially optimal level and inflation being higher than some threshold value. By assumption, loss function is quadratic in both output and inflation:

$$L = 1/2\left(y - y^{*}\right) + 1/2a\left(\pi - \pi_{\exp}\right),\ y^{*} > y\ \ a > 0 \qquad (2)$$

Where a the weight is placed by society on inflation relative to output and y^{*} is the natural level of output.

First, we portray the situation when there is a binding commitment between policymaker and public. Here actual inflation rate simply equals expected, and so, according to equation (1) output equals its natural rate. The problem of policymaker is to choose π to minimize equation (2). This is done by setting=. Suppose now that time inconsistency problem arises: the policy maker chooses inflation rate taking expectations of inflation as given. The objective of policymaker is to minimize equation (2) with respect to, so substituting equation (1) into equation (2) and minimizing it with respect to, we finally obtain the following expression for: (3) is optimal inflation rate.

Since the maximum amount of issued government debt that private sector and foreign banks are willing to absorb, sets a limit at a relatively small level to the size of the deficit, monetary authorities are supposed to release government from this binding constraint through accommodation of the remainder.

Thus on the theoretical front, there are some other possible channels through which debt creation may lead to money creation: political pressures to stabilize interest rates, the time-inconsistency of monetary policy, and the theory of optimal seignorage. If an increase in the government debt places an upward pressure on interest rates, the central bank is forced to monetize the fiscal deficit. The public determines the expected rate of inflation and the monetary authorities determine the actual rate of inflation. Government may be tempted to create surprise inflation in order to reduce the real value of the interest-bearing debt. A trade-off exists between the short-term benefits of creating surprise inflation and the long-term costs in terms of lost reputation and credibility because developing countries generally have a small taxable capacity (GDP), it is sometimes argued that the

seignorage or inflation tax is an adequate means of financing government expenditures. There are, however, some problems with this view.

A permanent monetary expansion may eventually drop the seignorage revenues. A Laffer-type trade-off between the seignorage tax rate and the tax base exists, since permanently rising inflation rates raises inflationary expectations. At a sufficiently high inflation rate the increase in inflationary expectations reduces the tax base by more than the increase in money growth. Consequently, the seignorage revenue drops. Like conventional taxes, the inflation tax may cause dead-weight losses. Therefore, maximizing seignorage revenues may not be socially optimal. Thus, recourse to central bank financing in no way frees the country from constraints.

Whether the government borrows directly from the central bank or indirectly by going to the commercial banks and, at the same time, inducing the central bank to increase the lending capacity (reserves) of the commercial banks, the net result is similar. In both cases there is an increase in the money supply with negative inflationary consequences for economic growth, as the meaningful economic growth can occur only in an atmosphere of stable or gradually rising prices, and for the budget itself. The latter is of serious consequence when the financial instability is reinforced by the Tanzi effect, which predicts that because of time gaps in tax collections real tax revenues decline as inflation rises and thus the fiscal deficit is higher at higher inflation rates (Gaidar, 1999).

Empirical evidence suggests a dominant effect that runs in the other direction through declining real spending level – as governments delay payments of salaries and wages – *the Patinkin effect.* Nonetheless, it is hard to predict the repercussions of dual interference of these effects, as there is no guarantee against emergence of vicious circle of fiscal deficits, debt, and hyperinflation. Government is tempted to curb inflation with administered leverages. The policy of disinflation requires hard sacrifices in the real sector. Under conditions of dynamic growth with favorable external market terms and a balanced financial situation the overall propensity of enterprises and the population to save is stronger, which ultimately results in more favourable credit sources for the budget. However, there are limited other sources of deficit's financing in most developing countries besides money creation. The basic explanations for the limitation of government deficit financing avenues are varied.

In the first place, to maintain stability and sustain growth it is necessary to mobilize sufficient savings and channel them into capital formation. But an increase in current spending ratio to GDP reduces the private savings ratio – reflecting higher taxation reducing disposable income and incentives to save, a stronger redistribution of incomes from higher

to lower saving households, and weaker precautionary motives to save due to a more generous social safety net. Besides, monetary expansion inflames inflationary expectations and lowers the rates of return on savings, thus undermining the source of potential capital formation. The minor transfer-of-funds role of undeveloped financial system intensifies the problem of efficient investment, which is also subject to controls in sight of scarcity of resource availability. Persistent for a long period and raising the costs of credit controls substantially depress investments and lead to adverse structural changes in financial system and real economy on account of losses in efficiency and resources' misallocation.

Secondly, the thinness of the domestic financial market reduces the ability of the authorities to sell government debt. It is also very difficult to implement open market operations and sterilization measures, which are the primary tools of monetary management. Since the commercial banking system in Nigeria until recently was dominated by banks with share of capital stock owned by the state, it was characteristic of this arrangement to coerce banks into the purchase of government's bonds at specified ratio of their assets leaving only a fraction on free lending. Banks were also saddled with non-performing assets with poor return and no actual guarantees of repayment that originate in the quasi-fiscal responsibilities imposed on them by the government. Since the major buyers of government papers are juridical not natural persons, first of all, banks, insurance companies and investment funds, government securities distract investments away from production sphere.

Thirdly, although privatization could give a one-off reduction in budget's deficit this method often ignores the possible reciprocal offset by unpredictable private sector responses like cutting purchases of government obligations to release money for purchase of state enterprises. Actually, state property is not a success with both domestic and foreign investors on the strength of stifling administrative and tax pressure. It would be also unreliable to count on deficit's financing by revenues from privatization, because the lion's share of ineffective state objects offered for sale has a miserable net worth. A sound argument for sale is a necessity to get rid of wasteful burden and create fair business environment.

The misunderstanding of the unavoidable necessity of the restrictive budgetary policy often brings paradoxical and problematic results, as most of the burden of stabilization and macroeconomic adjustment falls in the sphere of monetary policy, but fiscal discipline isn't maintained at the same time. Monetary policy becomes quickly overburdened and even though the central bank actions are intended to control inflation and contribute to financial stability, such policy can have short run expansionary impact

on the government budget deficit. Tight monetary policy typically results in higher short-term interest rates and may lead to slower growth in output. Thus tax revenues might be reduced, while government may try to smooth out fluctuations by increasing expenditures. Deceleration in the rate of money creation through open market operations leads to an increase in debt creation, which servicing becomes more expensive as interest rate rises. All these costs may increase the fiscal deficit and signify the failure to achieve inflation, creating a vicious cycle of instability and economic stagnation.

Whether larger fiscal deficits are associated with higher inflation has been contentious over the last two decades. While Sargent and Wallace's (1981) "monetarist arithmetic" answers this question positively, others have noted that the relationship is blurred because government finance deficits by borrowing as well as by printing money. The relationship is further distorted by other influences such as unstable money demand, inflationary exchange rate depreciations, widespread indexation, and inflationary expectations (Kiguel and Liviation, 1988). However, whether or not deficits financing is inflationary depends on source of borrowing and the impact on money supply.

Hafer (1997) averred that government's resort to money creation to finance its expenditure increases the nominal stock of money and consequently increase demand for goods and services. If output does not grow in tandem to meet this increase in demand, an upward pressure on prices will result. In synopsis, inflation results from increased government deficit which is financed by further money creation. With full employment of resources achieved, Aghevli and Khan, (1978) and Tanzi, (1978), have shown that inflation tax can be used as instruments to finance investment in developing countries. However, full employment situation rarely holds in most developing countries.

The monetarists argued that inflation is caused by excessive monetary growth. That is to say that the rate of increase in the monetary stock is substantially in excess of the rate of growth of real output. This monetarist argument was earlier advanced by Friedman (1971). To him, changes in money supply have been seen to cause changes in prices. It follows, therefore, that an increase in money supply is likely to cause an increase in prices, and hence inflation. Inflation in the Cagan model is caused specifically by expansion in the money supply and there is no feedback.

This unidirectional cause of inflation has been queried by several other studies which supported the causation of inflation as running both ways (Jacobs, 1977; and Aghevli and Khan, 1978). In essence, the excessive/hyper-inflation is brought about by two-way causation between fiscal deficit through money supply and prices. Aghevi and Khan (1978) relate this feedback to attempt by government to extract real resources at a faster

rate than was sustainable at a given rate of inflation, thus resulting in increase in the money supply and further inflation. As a self feeding process, Aghevi and Khan (1978) also related inflation theoretically and empirically to fiscal deficits. They argue that inflation results in widening fiscal deficits which are often financed through the banking system, leading to excessive liquidity in the system and inflation.

Heller (1980) observed that there exist simultaneous relationship between fiscal deficits and inflation and noted that inflation raises the cost of government services and investments and increases budgetary demands for distributional transfer while simultaneously increasing, the amount of revenue collected. Furthermore, Blejer and Khan (1984) confirmed the two way causation between fiscal deficits and inflation and noted that "fiscal deficits whether financed from borrowing from the public or the banking system are necessarily inflationary". Ariyo and Raheem (1991) maintained that an acceleration of inflation by whatever means has a strong tendency to punch up government outlays on its consumption profiles.

The structuralists explain the long-run inflationary trend in developing countries in terms of structural rigidities, market imperfection and social tensions in these countries: relative inelasticity of food supply, foreign exchange constraints, protective measures, rise in demand for food, fall in export earnings, hoarding, import substitution, industrialization, political instability, etc. (see Agbhevli and Khan, 1978).

Apart from the monetarists and the structuralists, there are also those who believe in cost -push as the main cause of inflation. The cost-push proponents attribute inflation to a host of non-monetary supply-oriented influences of shocks that raise costs and consequently prices. In their view, inflation was attributed to: Union wage pressure; Monopoly pricing policies; Competitive struggle for relative income shares; Labour and Capital immobility; and, Job information deficiencies (Bowen, 1965). However, in recent times, this school of thought has attributed inflation to such random non-monetary shocks such as crops failures, commodity shortages and increase in the price of oil (Humphery, 1986).

Empirical evidence is almost conclusive that excessive fiscal deficits pose a significant threat to inflation (Easterly, et. al., 1994). The issue is not without controversy, however. Sargent and Wallace (1981) explored the "unpleasant arithmetic" of monetarism, arguing that, in an environment of increasing inflation, even short-term financing of government deficits via bonds would be insufficient to contain the inflationary impulse. Their model implies that, although tight monetary policy may be able to fight inflation temporarily, it will eventually lead to higher inflation. The argument of Sargent and

Wallace (1981) is that monetary policy to check inflation fails in the long run because the real stock of bonds grows faster than the rate of growth of the economy as a whole. For some period, such supernormal growth is possible; however, a limit will be reached where the demand for bonds grows no further. Once that point is reached, debt service on bonds already issued would have to be financed through additional money creation. Knowing that they are to be repaid with cheaper currency, bond investors simply stop buying the government's paper. Thus, in the long run, Sargent and Wallace conclude that tight money must yield to additional inflation. The alternative, of course, is for the government to stabilize immediately. Such a situation logically results only where monetary policy fully accommodates fiscal laxity. Unfortunately, Nigeria has not fully devised an independent monetary authority capable of imposing fiscal discipline on the government.

Buiter (1987) contradicts Sargent and Wallace, arguing that runaway inflation under conditions of large and growing budget deficits cannot lead to higher inflation. He argues that unsustainably high deficits actually may cause inflation to decline, and even lead to deflation. Buiter's arguments hold important implications for countries like N'geria, insofar as his analysis circumvents the standard "heterodox" recommendation to stamp out inflation through a stringent process of fiscal reform. The controversy basically turns on whether a "rational expectations" or an "adaptive expectations" process is at work in the public's evaluation of future inflation.

Buiter (1987) essentially argues that, with rational expectations, "hyperinflation is impossible, but hyper-deflation may get under way". The reason is that people will be on their money demand function in rational expectations equilibrium. If we assume that the demand for real balances is a function only of expected inflation, then seigniorage equals the sum of the inflation tax plus the change in real balances. Where lax fiscal policy is accommodated through money issuance, seigniorage will cover government deficits. However, in a steady-state equilibrium, with constant real balances, seigniorage equals the inflation tax, and the rate of inflation is constant (that is, inflation is stable from period to period). If the fiscal deficit grows to be too large to be financed by the revenue-maximizing steady-state equilibrium rate of inflation, then real balances must grow to provide additional seigniorage. That is, real money demand has to increase. This would require that inflation actually falls. Hence, Buiter concludes that, under rational expectations, unsustainable government deficits will give rise, not to hyperinflation, but to declining inflation.

Under rational expectations, the public would fairly accurately anticipate the government's moves to inflate the currency, incorporating such assessments in its money demand function, thereby (at least partially) counteracting and frustrating the government's actions. Under adaptive expectations, the public largely reacts to the government's actions, based on new price information as it becomes available. The government obviously has greater advantages under adaptive expectations, insofar as the public's expectations will tend to remain below actual inflation.

Von Hagen (1994) essentially argues that, even in a rational expectations regime, if expected inflation is below current inflation, a deficit larger than that which can be financed using the maximum steady-state seigniorage level can still be covered through an increase in real balances.

Oyejide (1972) made empirical enquiry into the impact of deficit financing on inflation and capital formation. He related theoretically domestic money supply to inflation using Fisher's type of equation since there seems to be a direct correlation between general price level and measures of deficit financing over the 1957 - 1970 time period, he concluded that less emphasis on deficit financing may limit the growth of price inflation.

In Akinnifesi (1984) factors such as changes in money supply, lagged changes in money supply, credit to government by banking system, government deficit expenditure, industrial production and food price indices were variables captured, while changes in the annual data for 1960 - 1983 were used in empirical estimation. The study showed that changes in the above factors jointly explained inflationary tendencies in Nigeria. The study, however, emphasised that increases in government expenditure financed by monetisation of oil revenue and credit from banking system were responsible for the expansion of money supply, which in turn, with a lagged-in-effect contributed immensely to inflationary tendencies.

Adeyeye and Fakiyesi (1980) tested the hypothesis that the main factor responsible for instability of prices and inflationary tendencies in Nigeria has been government expenditure. Using annual time-series data, spanning 1960 - 1977, they tested the hypothesis that the rate of inflation in Nigeria is linearly related to the rates of growth of money stock, government expenditure, especially deficits, and growth of government revenue, especially monetization of foreign exchange from oil exports. The results established some significant positive relationship between inflation rate and growth in bank credit, growth of money supply and government expenditure growth, while the relationship with growth of government revenue was uncertain.

The impact of inflation on growth has been discussed in many empirical studies in developing countries. But the findings of these studies differ and cannot be generalized. Regarding inflation, there is a broad consensus about the role of monetary growth either as the main driving force behind inflation or, otherwise, as a necessary element in accommodating inflation triggered by other factors. Gosh et al. (1995) found evidence that the average rate of inflation was lower in countries with pegged exchange rates than in countries with more flexible rates. Aghevli et al. (1991) arrived at similar results but noted that many countries with pegged exchange rate regimes have experienced high rates of inflation as a result of inappropriate fiscal policies. Devarajan and Rodrik (1991) also observed that, despite low inflation rates, the CFA franc countries were unable to adjust their economies to the large terms-of-trade shocks of the mid-1980s, and that the inability to use nominal devaluation as an instrument led to a real appreciation. The resulting deterioration in external competitiveness triggered a contraction in economic activity.

Feldstein (1996) suggested that even relatively low inflation imposes significant deadweight loses on the economy when the tax system is not fully indexed. Furthermore, inflation also has social costs because it has differing effects on economic agents, with some benefiting and others being harmed. These differential effects add to the uncertainty that agent's face, which may be undesirable even for those who turn out to benefit. Furthermore, private actions taken to avoid these effects may hurt the overall economy but yield to overall benefits. For example, in an inflationary economy talented individuals may devote their resources to mitigate the effect of inflation rather than to developing products and process that would raise overall living standards. Unfortunately, these activities often are included in measured GDP, which may make it difficult to identify the negative effects of inflation.

Finally, inflation may affect saving and investment decisions reducing the proposition of GDP devoted to investment and so causing the economy to accumulate less human or physical capital. For instance, when inflation is high, it often is more variable, thus harder to forecast. This may make it more difficult to deduce the real returns on investments from available market information and may cause savers and investors to be less willing to make long-term nominal contracts or to invest in long-term projects. The resulting reduced stocks of productive capital may, in turn, imply lower level of future GDP. However, this negative effect of inflation on capital formation might be offset by the so-called Mundell – Tobin effect. Mundell (1963) and Tobin (1965) each argued that although inflation makes financial assets less attractive, it might increase the willingness of investors to hold tangible assets because these may act as a hedge against inflation.

The resulting greater accumulation of tangible capital could result in an increase rather than a decrease in the capital- labour ratio in an inflationary environment.

These arguments suggest that there are a number of reasons why persistent inflation might tend to reduce the level or growth rate of GDP in the long run. Barro (1995), Cozier and Selody (1992), and Fisher (1993) conclude that countries with higher rate of inflation tend to have lower rate of real growth in the long run. However, Levine and Renett (1992) and Levine and Zervos (1993) argue that cross-section regression estimates of the relationship between GDP growth and variety of potential causal variables including inflation rate, tend to be fragile in the sense that the results are sensitive to the precise set of variables included in the equation.

Although the negative relation between real output growth and inflation within the quantity theory framework has been observed sporadically in a number of previous studies (see Duck, 1993 and Fama, 1982). Fama (1982) called attention to a stagflation phenomenon in which inflation and falling output occur concurrently. He explains that a fall in real output lowers the demand for money, which, holding other things constant, is accommodated by the rising price level. Conversely, the negative relation between prices and output can also result from a rising real output that raises the demand for money, which, in turn, depresses price levels.

The negative impact of real output growth on the inflationary process via its positive influence on the demand for money is based on the presumption of the proportionality between real output and the level of transactions. Friedman and Schwartz (1982) observed the negative relation between price and output. Their explanation for the negative relation was primarily the differences in the temporal reaction pattern of output and prices to autonomous monetary forces.

Fischer (1993) noted that large budget deficits and growth are negatively related. Among other variables such as inflation and distorted foreign exchange markets, he emphasizes the importance of a stable and sustainable fiscal policy, to achieve a stable macroeconomic framework. Easterly and Rebelo (1992) found a consistent negative relationship between growth and budget deficits. Fischer (1993) presents cross-sectional and panel regressions showing that growth are negatively associated with inflation. Levine and Renelt (1992) state that high growth countries are also lower inflation countries. While most authors find growth and inflation to be inversely related, with the implication that inflation is quite costly, there are exceptions: in his comments on Fischer's (1993) re-estimates, (Clark, 1993) and reported an insignificant link between growth and inflation.

Levine and Zervos (1993) concluded that marginal changes in moderate inflation rates may not be negatively associated with growth. However, very high inflation rates may be associated with a breakdown in normal economic relationships and lower economic growth. The authors, however, contradicted their view by later asserting that very high inflation for very long periods may make people accustomed to inflation and hence lead them to develop various mechanisms for coping with inflation. This, they argued, makes growth unrelated to very high inflation.

Jarrett and Selody (1982) examine the link between output and inflation in Canada over the 1963-1979 periods. They conclude from their estimate that a 1 percentage point decrease in inflation would cause a 0.3 percentage point increase in the growth rate of labour productivity and hence GDP. By using Canadian data for the period 1955-1989, Selody (1990) estimates that a 1-percentage point decline in inflation should increase labour productivity growth by 0.2 percentage points.

Clark (1993) uses American data for the period 1947-1981 and his results show that a 1 percentage point decline in inflation would result in 0.4 percentage point increase in productivity growth and hence GDP growth. In Grimes' (1992) study of 21 countries for the period 1961-1987 it was reported that a 1-percentage point reduction in inflation increases output growth by 0.1 percentage points. Barro (1995) studied about 100 countries from 1960-1990 to assess the effect of inflation on economic performance. He concludes that if a number of country characteristics are held constant, then the results suggest that an increase in average inflation of 10 percent per annum reduces the growth rate of real GDP by 0.2-0.3 percent per annum and lowers the ratio of investment to GDP by 0.4-0.6 percent.

III Methodological Issues

The preferred methodology or a study such as the present one is the Vector Auto-Regressive (VAR). The VAR avoids the imposition of potentially spurious *a prior* constraints that are employed in the specification of structural models. Also, since few restrictions are placed on the way in which the system variables interact, VARs are well suited to an examination of the channels through which a variable operates. Thus this paper adopts VAR in the analysis of the relationships among the variable of interest.

As indicated earlier, an interesting development in modelling in recent times is the emphasis on the use of vector autoregressive models (VARs). This is based on its ability to provide comprehensive information about the dynamics of the interactions without losing the desired long run attributes. Also since shocks are common phenomena of the

operations of the macroeconomic variables, earlier models like the PDLs and Lucas procedure have not been able to threat this very explicitly. Shocks, through the instrumentality of innovations have been imbedded into the VAR framework. The relevance of the framework has informed its wide applications (Landerietcha, Morande and Schmidt-Hebbel, 2000).

A framework that minimises these limitations of the foregoing approaches is the vector error correction mechanism; it combines the dynamic attributes with the long run characteristics. It also accounts for possibility of shocks. This study thus adopts this framework of analysis. Following a standard vector autoregressive model framework where is an n x 1 vector of the variables of interest observed at time t, whose joint behaviour we intend to examine. The dynamic behaviour of is governed by the following structural model:

(4) The dimensionality of is three namely: real income (y), inflation (p) and fiscal deficit (fd). The variables are in logarithmic transformation. Theare a sequence of nxn matrix of coefficients while is an nx1 vector of disturbances to the system and it is assumed to be serially uncorrelated. $E(\mu_t \mu_t')=\Sigma$, a diagonal matrix. A is an nxn matrix of coefficients relating the disturbances to the Z vector. The estimation of the standard VARs takes the reduced form of equation (1) as expressed in equation (2) below:

(5) Whereby $= (I-\beta_0)^{-1}\beta_i$; $=E\mu_t$ and $E= (I-\beta_0)^{-1}A$.

The absence of any cointegrating relationships among the variables of interest suggests the need to use the standard VARs. The existence of cointegration vector(s), however, connotes the use of a vector error correction (VEC) model following Johansen (1991). Since equation (2) is a reduced form, and as often argued in the literature (see Rasche, 1993), it provides limited information about the impacts of shocks or any other relevant policy shocks that are of interest to economists. To provide this information, the VARs are supplemented with some identifying restrictions that are derived from some economic model. Such restrictions define the economic structure that provides the needed information on the impacts of fiscal deficit shocks on inflation and real output as proposed by the theory.

From equations (4) and (5), the obvious identifying restrictions are on β_0, C_0 and Σ. The identifying restrictions here are that Σ should be diagonal; C_0 should be an identity while β_0 should be lowers triangular when variables are arranged according to causal priority. The triangular authogonalization has become a standard way of interpreting econometric models. The refinement of Bernanke (1986), Blanchard and Quah (1989), among others, have shown that the orthogonalisation does not necessarily need to be

triangular; the non-zero elements could be interspersed outside the lower triangular matrix – steady state macroeconomic models. Thus in line with Litterman and Weiss (1985), most of the dynamic relationships among macroeconomic variables can best be explained as arising from an economic structure.

III.1 Estimation and Analysis

111.1.1 Data

The four-variable model uses the quarterly series of real income (y), prices (p), exchange rate (ex) and fiscal deficit growth rate (fd) over the period 1988:1 to 2004:4. While data for prices and money are available on quarterly basis, GDP is only available annually. Following Bernanke (1986) and Akinlo and Odusola (2003), quarterly GDP was interpolated through the index of industrial production. The four variables were obtained from the various issues of the Central Bank of Nigeria's Statistical Bulletin. All the variables except the exchange rate are in logarithmic form.

III.1.2 Analysis of the Results and Policy Implications

The four variables – real income, prices, exchange rate and fiscal deficit- are integrated of order one and hence satisfy the condition for their inclusion in vector error correction methodology (VECM). Evidence from Table 1 shows the existence of cointegrating vectors in output, prices and exchange rate. The use of VECM allows the long run attributes of the variables to converge to their cointegrating relationships while permitting a wide range of short run dynamics that characterise the operations of any financial system. While the error terms of the four models as well as the coefficient of determination are plausibly good, the F-statistics of exchange rate is rather low.

III.1.3 Analysis of Impulse Responses

Evidence from Tables 1.1 and 1.3, and Figure 1.1 shows the responses of income, prices exchange rate and fiscal deficit to innovations and forecast error variance in any of the four variables. Changes in fiscal deficit have a positive monotonically decreasing relationship with prices. For instance 10 per cent changes in innovation in fiscal deficit results in inflationary response that ranges from 6.4 per cent in the 1st quarter and 2.9 per cent in the 9th quarter. This result is very instructive as it is at variance with the popular view in the literature that seems to suggest that fiscal deficit is necessarily inflationary.

Perhaps what could account for the weak compliance with the earlier studies in the more developed countries are the structural rigidities of the Nigerian economy which

is almost entirely dependent on oil, which both quantity and prices are determined exogenously. Again the composition of the consumer price index basket in Nigeria has about 63.2 per cent food component, thus suggesting that for most of the time inflation in Nigeria is more of a structural problem relating to other variables including weather conditions, and the state of general infrastructure, than just fiscal deficit that lead to monetary expansion. However, this finding does not in any way invalidate the fiscal dominance argument that the Central Banking of Nigeria has always advanced as the main cause of missing the monetary growth targets and by extension inflationary pressure..

The response of real output to 10.0 percentage change in innovation in fiscal deficit shows an inverse relationship in the short run but the relationship becomes positive in the medium to long run. For example in the 9th quarter the relation improved from 0.99 in the 6th quarter to 1.6 per cent. The plausible explanation of this type of the relationship could again be found in the nature of the Nigerian economy. The oil that seems to drive every other activities in the economy has very limited domestic content in the production process most of the equipment and machineries are sourced from foreign markets leaving the domestic market to respond to the activities in the sector, which has been rightly describes as an enclave in recent times, to only track the real economy with considerable lags.

Furthermore, the weak manufacturing sector of the Nigerian economy also underscores this relationship. Since the other growth driving sector of the economy, agriculture takes time to respond to money supply, occasioned by fiscal deficit and by extension price innovations, because of the expected gestation period for most of the agricultural products, a shock in money supply in the short run results in price changes but since output is seemingly constant in the short-run the inverse relationship is expected. However in the medium to long term, when agricultural sector could respond to the monetary stimuli there is a positive and increasing impact. On the policy front one way of harnessing the full impact of fiscal deficit which influences monetary innovations positively to the benefit of the economy would be to encourage the manufacturing sector through several incentives including provision of infrastructure that could reduce the cost of production and thereby making the product more competitive with those from abroad.

The real GDP growth and inflation is inversely related and is theory consistent. For instance 10.0 per cent changes in innovation in real GDP reduce inflation potentials by 8.2 per cent in the short run; however the impact of Real GDP growth on inflation eased marginally in the medium to long term to 6.5 per cent in the 9th quarter. The basic cause of this relationship may be the composition of the real GDP in Nigeria, which still

have agriculture as the dominant sector. If output say in agriculture increases, then the cost of food will decline, all things being equal, since food constitute a substantial percentage of the consumer price index basket, as indicated earlier, price decline.

The response of exchange rate to 10.0 per cent innovation in real GDP is marginal ranging from instantaneous response of 0.0 per cent in the 1st quarter to 0.1 per cent in the 9th quarter. This is consistent with theory that suggests that increased productivity is positively related to exchange rate appreciation. Thus part of what the government should consider in policy formulation is how to grow the economy in real terms so as to achieve a stable exchange rate of the domestic currency, the naira in the medium to long term. The relationship between real GDP and fiscal deficit is positive in the short run but negative in the medium to long run. For instance a 10.0 per cent innovation in changes in real GDP result in 0.03 per cent increase in fiscal deficit in the 3rd quarter but a decline of 0.28 and 0.27 per cent in the 6th and 9th quarters, respectively. This is also consistent with theory and practice, when an economy expands, there is more demand for money, but after a point the general expectations is built into the planning process by the private sector which combine with wealth effect to give rise to accumulation of other forms of wealth other than money balances.

The response of exchange rate to changes in fiscal deficit shows positive and increasing relationship. For instance 10.0 per cent changes in innovation in fiscal deficit results in progressive exchange rate depreciation that ranges from 2.1 per cent in the 1st quarter to 3.7 per cent in the 9th quarter. This finding is consistent with expectation in an open economy with weak manufacturing sector like Nigeria. The plausible explanation for the observed relationship is in the structure of the Nigerian economy that is basically imports dependent. Thus increase in money supply through the fiscal expansion of government fuel the demand for goods and services and since most of the goods are produced abroad, pressure is brought to bear on the foreign exchange market, since the supply of foreign exchange is limited, the naira depreciation, there requiring more unit of the local currency to purchase a unit of the foreign currency. This is indeed revealing as the argument of stimulating economic growth through expansionary fiscal operations of government has been shown by this result not to have had the desired impact of enhancing growth, but rather of depreciating the value of the local currency with the attendant problems of increasing the cost of production for the fragile manufacturing sector that depends almost exclusively on foreign inputs.

Again another plausible explanation of the observed result is that in the era of high inflation that was mostly double digit during this study period, most people preferred

to hold their liquid wealth in a stable international currency, usually the US dollar, hence leading to currency substitution, which is substituting the local currency for a convertible currency that has stable value in order to hedge against inflation. Furthermore, the sharp practices by the commercial banks in the segmented foreign exchange market in Nigeria through the exploitation of the premium that existed between the official and the parallel markets exchange rate through round tripping activities for profits could serve as another explanation for this result. The anticipation of devaluation of the naira that followed the foreign exchange market liberalization in 1986 and the political turmoil that characterized the early 1990s contributed to sustaining the anticipation further depreciation, especially when the external reserves of the country was dwindling due to high debt service requirement, adverse developments in the international oil markets and corruption.

These arouse the fear that the artificial exchange rate that was sustained through massive drawdown on the lean international reserves was not sustainable in the medium term; therefore the likelihood of further depreciation became the main driving force for foreign exchange demand. Perhaps the lesson that could be gleaned from this result is to further liberalize the foreign exchange market in Nigeria by the government allowing only the banks and other authorized dealers in the market to freely trade among themselves and the price of the currency freely determine by the market forces with only occasional intervention by the central bank of Nigeria. The current practice of centralising the supply of foreign exchange to the market in the central bank is not sustainable. Thus there is need for the development of the inter-bank foreign exchange market through the abolition of the surrender policy that is being implemented which requires the exporters to surrender up to 70.0 per cent of their export proceeds to the central bank. The exporters should be allowed the freedom to source for their foreign exchange in the banks and to keep and use their foreign exchange earnings for their use without any encumbrances. The existence of a consistently high premium of about 12.3 per cent between the official and parallel market exchange rate of the naira against the acceptable average of 5.0 per cent for developing countries was a major incentives for round tripping by banks.

It follows therefore that the policy to stabilize the exchange rate of the naira would need to be undertaken in a holistic manner, taking into account the monetary and fiscal developments. This calls for an integrated macro-economic policy that will be formulated and implemented within a medium –term framework with specific targets which are internally consistent with the overall objective of growing the economy in the medium to long term.

Table 1: Summary of the Vector Error Correction Model (VECM) Estimates, 1988:1-2004:4

	Output	Prices	Exchange Rate	Fiscal deficit
Co integrating equation	-0.137	-0.095	-10.754	0.316
	(-1.945)	(-2.619)	(-2.304)	(1.523)
Goodness of fit statistics				
Adjusted R^2	0.405	0.365	0.148	0.320
Standard error of equation	0.121			
F-statistic	3.885	3.286	0.991	2.689

Note: The cointegrating equation presents the cointegrating vectors from the four-variable model with the t-statistic in parenthesis.

Expectation plays a significant role in the price formation process as evident in Table 1.2. Current inflation is incorporated into the future price formation process. This behaviour is even stronger as time horizon becomes longer. After the 9th quarter, for instance, about 10 percent of the price level increase is accounted for by the cumulative effects of past inflation's expectation. The relationship between real income and inflation is hyperbolic. Increase in real income, in the short run, dampens inflation but due to wealth effect and the associated increased purchasing power and enhanced demand, the impact eased marginally in the 6th quarter but tend to stabilize towards its long run value. This finding is consistent with Milton Friedman validation of the empirical relevance of the crude quantity theory in the 1970s and 1980s.

Again the Nigerian economic structure plays a critical role in explaining this result. Although there exists excess capacity in the economy, especially in the labour market, with unemployment rate hovering around 8.9 per cent on the average for most 1990s, output especially in agriculture did not increase in response to price stimulus. Other structural rigidities including the land tenor system and lack of adequate incentives for young educated youths to be involved in agriculture resulted in the existence of both high unemployment and high inflation in Nigeria, contrary to the trade-off between the two as advocated in the Phillip's Curve conclusions. The appropriate response to this development is for government to pursue agricultural policy that will reduce drudgery from agriculture. In this direction mechanization of agriculture through the adaptation of appropriate technology is required.

The response of exchange rate to 10.0 per cent innovation in prices is contemporaneously nil, but become largely negative as the horizon increases, ranging from -0.8 per cent in the 3rd quarter to -2.8 per cent in the 9th quarter. This is consistent with the earlier findings of Egwaikhide, Chete, and Falokun (1994), and Ajakaiye and Ojowu (1994). It also conforms to the findings of Ndung'u (1997) for Kenya.

Type of Innovation/ Horizons in quaters	Income (v)	Prices (p)	Exchange Rate(ex)	Fiscal deficit (fd)
e_y 1	1.111	0.000	0.000	0.000
3	0.646	-0.821	0.012	0.003
6	0.896	- 0.643	0.007	-0.028
9	0.932	- 0.651	0.006	-0.027
e_{p1}	-0.245	0.518	0.000	0.000
3	-0.361	0.721	-0.081	0.390
6	-0.593	0.969	-0.254	0.739
9	-0.669	0.992	-0.281	0.860
e_{ex}	14.467	3.821	72.147	0.000
3	10.406	-14.267	52.588	20.742
6	0.571	3.304	46.823	32.562
9	-2.518	4.157	45.053	38.754
em 1	-0.273	0.643	0.216	3.198
3	0.065	0.566	0.219	1.008
6	0.09	0.329	0.325	1.019
9	0.156	0.294	0.370	0.945

Notes: Entry (i,j) is the dynamic response of variable j to a one standard deviation shock in variable i. All variables are percent increases of the level of each variable from baseline. Initial condition matters a lot in predicting future real income, the higher the income the higher the future income expectation (Table 1.2). Inflation has a monotonically declining linkage with real income. The impulse generated by innovations in fiscal deficit via money supply is inverse both contemporaneously and in the first three quarters, but marginally positive as the horizon becomes longer. The noise often associated with monetary policy announcement could generate the negative influence in the short run.

III.1.4 Analysis of Variance Decomposition

Table 12 shows the fraction of the forecast error variance for each variable that is attributable to its own innovations and to innovations from other variables in the system. Innovations from own sources predominate the variations in the predictions of all the variables. Prices are explained by past values of own, real income, money and exchange rate (in order of importance). This shows that predicting inflation accurately is more

important than targeting it in Nigeria. Full knowledge of inflation accounts for between 81.75 and 49.99 percent over the quarters of the forecast error variance innovations from inflation. This calls to question the ability of the monetary authorities to predict inflation accurately as opposed to the stress given to its targeting. Real income also plays an important role in predicting prices in Nigeria. Its importance becomes stronger as the horizon increases, it 18.24 per cent in the 1st quarter to 18.94 per cent in the 9th quarters. The importance of exchange rate in predicting inflation was strong and increased as the horizon lengthened. From in :antaneous 0.0 percent, the explanatory power of exchange rate in inflation increased steadily to 2.78 per cent in the 9th quarter. Exchange rate explanation of forecast variance innovation in money supply accounts for less than 1.0 per cent in the short run but the importance increased as horizon increases, reaching 3.95 per cent in the 9th quarter.

Expectedly, the role of fiscal deficit is ranged from 10.10 per cent in the 3rd quarter to 28.28 per cent in the 9th quarter, of the forecast error variance in price formation process, its significance waxed as the horizon becomes longer. Its predictive power, however, is relatively mild in the short run confirming the time inconsistency argument of the role of money in inflation. This is indeed consistent with theory and earlier studies on inflation in Nigeria. This not withstanding, the forecast error variance of money has auxiliary influence in predicting real income. Its importance becomes stronger as we move from short to medium to long terms horizon. It ranges between 0.69 and 0.83 percent between the first 9 quarters; albeit with limited role for inflation (Table 1.3).

As indicted earlier, the predominant sources of variation in all the variables are the "own" shock. Price is an important source of the forecast variance errors in the exchange rate, and real income, particularly in the medium- and long-term horizons. Innovations in the exchange rate account for about 6.81 per cent of the forecast error variance in real income and prices in the 3rd quarter. The results equally reveal that output is an important source of forecast error variance in price and fiscal deficit particularly in the medium- and long-term horizons. Exchange rate and price jointly explain 12.93 variations in money supply in the 9th quarter. Output and fiscal deficit jointly accounted for 43.14 and 47.22 per cent variations in prices in the 6th and 9th quarters, respectively. Real income, prices and fiscal deficit jointly explained 20.55 per cent variations in exchange rate in the 6th quarter, the explanatory variations of these variables on exchange rate increased with horizon to 26.71 per cent in the 9th quarter.

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