An Empirical Analysis of the Balance of Payments as a Monetary Phenomenon: Nigeria’s Experience

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Abstract
This study offers another perspective to using the econometric study to analyze the Nigeria’s experience of balance of payments as a monetary phenomenon. The argument was to determine whether excess money supply has played a significant role in the disequilibrium of balance of payment during the period 1986-2010. Johansen Cointegration, Vector Error Correction Mechanism and the Impulse Response Function and Variance Decomposition were the method used in analyzing the annual data. The results of VECM and impulse responses confirm that balance of payment in Nigeria is not a purely monetary phenomenon in line with similar studies in other countries. The monetary authority in the country should seriously monitor budget deficit because this also cause domestic credit increase.

Keywords: Balance of payment, Cointegration, Vector Error Correction Mechanism, Impulse Response Function, Variance Decomposition and Nigeria.
1. Introduction

Nigeria like many countries in the world today is currently experiencing an overall balance of payments deficit, which has provoked many questions on potential causes of this imbalance. This is a cause of concern because Nigeria, like any other country, aims to maintain a stable equilibrium in the balance of payments as one of the core objectives of macroeconomic policy. Organizations such as the International Monetary Fund (IMF) have been giving a great deal of attention to stable balance of payments situations (Fleermuys 2005).

The monetary approach to balance of payment regards money as a stock, and argues that money stock can be changed through international reserve flows. It states that a fixed exchange rate system could work without having to resort to devaluation, provided a country has a sound monetary policy; thus, devaluation will only occur as a result of a failure of monetary policy (Umer, et al., 2010). This argument stems from the fact that disequilibrium in the balance of payments is a temporary situation that will be corrected if the “money market is in equilibrium” (Du Plessis et al., 1998:255).

Although the monetary approach has been commended for explaining the balance of payments well, it has prompted criticism from other scholars as an approach that ignores other parts of international trade in determining the balance of payments. The MABP has been blamed for disregarding the fiscal and real factors that influence changes in the balance of payments, whilst concentrating only on monetary factors (Umer, et al., 2010). Contrary to these views, it can be stated that the monetary approach does not ignore these factors. Valinezhad (1992:265) contends that “the MABP only asserts that the effect on the balance of payments of a higher rate of economic growth should be analysed with the tools of monetary theory”.

The main aim of this paper is to examine the monetary approach to the balance of payments (MABP), which argues that the balance of payments is a “monetary phenomenon”. Whereas the absorption and elasticities approaches concentrate on the current account balance, the MABP emphasises the overall balance of payments – including the capital account (Coppin, 1994:77). By employing the MABP, the paper intends to offer a basis for understanding the relationship between monetary policy and balance of payments problems in Nigeria. The research could also serve as a recommendation to monetary authorities in handling disequilibrium in the balance of payments. This study wishes to achieve an empirically robust and theoretically consistent model of the MABP in Nigeria by employing Phillips Perron test, multivariate cointegration and error-correction mechanism, accumulated impulse response and the variance
decomposition during the period 1986–2010, using annual observations. This study is different from other works because the impulse response and variance decomposition was used to analysis the MABP in Nigeria. A specific objective is to determine whether excess money supply has played a significant role in the disequilibrium of balance of payments in Nigeria. In addition, the study also sets out to establish whether there is a significant relationship between domestic credit and international reserves. This paper is divided into five sections, one consist of the introduction while section two the literature review. The methodology is in section three. The empirical results and discussion was taken care of in section four and finally the paper was concluded in section five.

2. Theoretical literature

Literature on the fundamental basis of the MABP in a country has been generated by scholars such as Dornbusch (1971), Frenkel (1971), Johnson (1972), Laffer (1969), and Mundell (1968, 1971). Mundell (ibid.) emphasised that monetary factors, not real factors, exert the most influence on the balance of payments through their effects on the currency and capital accounts of a country. This approach contends that disequilibrium in a country’s balance of payments shows an equivalent discrepancy between that economy’s money demand and supply (Alawode, 1997:13).

The balance of payments account records a country’s international economic performance, with the two most significant accounts being the current account and capital account. Whereas the current account records all transactions of goods and services and unrequited transfers in a country, the capital account records all exchanges and money capital for various kinds of real or financial assets. The latter account is important as it relates domestic transactions to international transactions (Fleermuys 2005).

When there is disequilibrium in a country’s balance of payments, authorities often battle with how to correct it. Whether authorities can actually do something to remedy such a situation for example, through policy actions or whether there are self-correcting mechanisms in place is often a point of debate. Throughout the years different adjustment mechanisms to such disequilibria in a country’s balance of payments have been identified (see e.g. Du Plessis et al., 1998:235). Three of these mechanisms are the monetary approach, the elasticities approach, and the absorption approach.
2.1. The monetary approach to the balance of payments

The MABP emanates from the David Hume price-specie-flow mechanism, which was launched as a counter-argument to the mercantile belief that a country can achieve a relentless balance of payments surplus by import-substituting and export-promoting policies. The MABP, which regards the balance of payments as a “monetary phenomenon”, expresses the relationship between a country’s balance of payments and its money supply (Chacholiades, 1990:463). Furthermore, it argues that there is disequilibrium in the money market if there are surpluses and deficits in the balance of payments. Deficits are caused by money supply exceeding money demand, while surpluses are caused by money demand exceeding money supply (Howard & Mamingi, 2002:214). The MABP, therefore, largely emphasizes the monetary implications of balance of payments disequilibria. In terms of prices, the MABP regards the general price level as the determinant of the real value of nominal assets, money and international debt. Relative prices seem to play a secondary role as they are considered to have only a transitory effect on the balance of payments (Umer, et al., 2010).

The MABP specifies a money supply identity, money demand identity, and an equilibrium condition. The model consists of the following equations:

\[ M_s = (R+D) \quad \ldots \quad \ldots \quad \ldots \quad (1) \]
\[ M_d = F(Y, P, I) \quad \ldots \quad \ldots \quad \ldots \quad (2) \]
\[ M_s = M_d \quad \ldots \quad \ldots \quad \ldots \quad (3) \]

Where:
- \( M_s \) = Money supply
- \( R \) = International Reserve
- \( D \) = Domestic credit
- \( M_d \) = Money demand
- \( Y \) = Level of real domestic income
- \( P \) = Price level
- \( I \) = Rate of interest

The monetary theory holds that there is a positive relationship between money demand and income \((\partial M_d / \partial Y>0)\), and between money demand and the price level \((\partial M_d / \partial P>0)\). However, there is a negative relationship between money demand and the interest rate \((\partial M_d / \partial I<0)\). If interest rates are increased, people will demand less money as the opportunity cost of

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holding cash balances is increased, thus creating incentives for investing in interest-bearing securities.

Then the reserve flow equation is written as –

\[
\Delta R = \Delta [F(Y, P, I)] - \Delta D \quad \cdots \quad \cdots \quad \cdots 
\]

(4)

Where equations 1, 2 and 3 are combined, placing the variables in percentage changes and isolating reserves as the dependent variable.

Equation (4) is the basic equation of the MABP, stating that the balance of payments is the result of divergence between the growth of money demand and the growth of domestic credit, whilst the monetary consequences of the balance of payments bring the money market into equilibrium. With money demand being stable, an increase in domestic credit will cause an equal and opposite change in international reserves. The coefficient of \( \Delta D \) is, therefore, known as an offset coefficient: it shows the extent to which changes in domestic credit are offset by changes in international reserves. The MABP envisages a value of minus unity for this coefficient in the reserve flow equation (Dhliwayo, 1996).

The MABP claims that balance of payments deficits result in decreases in the money supply as a consequence of a loss in international reserves. This loss in reserves will only be temporary, however, provided that monetary authorities do not completely sterilise them. Many small economies experience persistent deficits in their balance of payments because authorities use “credit policies and expenditure policies to maintain levels of output and employment” (Howard & Mamingi, 2002:218).

The MABP regards money demand as a demand for a stock; therefore, the inflows or outflows of money are regarded as the disequilibrium between desired and actual stocks, which can be adjusted through an excess of income over expenditure or vice versa. The differences between income and expenditure will be corrected when the flow of money brings the desired and actual money stock back into equilibrium (Fleermuys 2005).

Monetary authorities only have an influence on the flow supply of money. They do not have control over the stock of money supply. Therefore, it is assumed that, in the case of countries with fixed exchange rates, money supply is endogenous. Monetary policy only has an influence on the balance of payments through its control over credit creation. In the modern, demand-determined world, where money supply is credit-driven and loans make deposits, this argument has gained ground, especially as the banking systems of countries develop (Fleermuys 2005).
2.2. Alternative approaches to balance of payments

There are two alternative approaches to balance of payments: the elasticities approach, and the absorption approach.

2.2.1. The elasticities approach

The elasticities approach, which has been associated with Robinson (1937), places its emphasis on the effects of exchange rate changes on the exports and imports of a country and, hence, on the trade account balance, whilst ignoring all other variables such as income. This approach as an aspect of equilibrium also excludes the capital account on the basis that an excess or deficiency of exports in relation to imports will result in a balance of payments surplus or deficit; thus, its main focus is on the current account to the balance of payments. Furthermore, this approach assumes that the price elasticity of supply (domestically and internationally) is equal to infinity (Fleermuys 2005). The elasticities approach applies the Marshall-Lerner condition, which states that the sum of the elasticities of demand for imports and exports must be more than 1 in absolute terms for a devaluation to improve the balance of payments (Du Plessis et al., 1998).

2.2.2. The absorption approach

The absorption approach, which has been linked to Alexander (1952), was developed to highlight the importance of income changes in the adjustment process (Du Plessis et al., 1998:251). The absorption approach intends to show how devaluation might change the relationship between expenditures or between absorption and income – in both nominal and real terms. It is worth noting that great emphasis is laid on the current account balance. This approach contends that the devaluation of a currency would lead to an increase in inflationary prices, which would in turn revoke the initial effect of an increase in prices. This resulting process can only be prevented if inflation itself deflates the aggregate demand for goods through an income redistribution effect or through a reduction in the real value of existing money balances (Fleermuys 2005). The absorption approach is based on the national income identity:

\[ Y = C + I + G + X - M \cdots \cdots \cdots (5) \]

Where

- \( Y \) = national income
- \( C \) = private consumption of goods and services purchased at home and abroad
- \( I \) = total investment, by firms as well as by government

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$G = \text{government expenditure on goods and services}$

$X = \text{exports of goods and services, and}$

$M = \text{imports of goods and services}$.

Then $C + I + G$ are combined into a single term, $A$, which represents domestic absorption (i.e. total domestic expenditure):

$$A = C + I + G \quad \cdots \quad \cdots \quad \cdots \quad (6)$$

Then

$$Y = A + X - M \quad \cdots \quad \cdots \quad \cdots \quad (7)$$

Stating that national income equals absorption plus the trade balance, rewritten as –

$$X - M = Y - A \quad \cdots \quad \cdots \quad \cdots \quad (8)$$

This states that the trade balance is equal to the difference between domestic income and total absorption. Equation (8) is the fundamental equation of the absorption approach. It implies that, if total absorption (expenditure) exceeds income (production), then imports will exceed exports, resulting in a balance of payments deficit. If the opposite occurs, i.e. where income exceeds absorption, then the balance of payments will be in surplus. A balance of payments deficit can, therefore, only be corrected if the level of absorption changes relative to the level of income (Du Plessis et al., 1998:251).

One aspect that these two alternative approaches have in common is that they assume balance of payments disequilibria are permanent. Furthermore, both approaches have been criticized mainly for not taking into account the capital account of the balance of payments. These mechanisms concentrate only on the current account and, thus, ignore the particular impacts of capital movements on the balance of payments (Coppin, 1994:77).

2.3. Criticisms of the MABP

The MABP has largely been criticised for emphasising monetary factors without taking into account that real factors also play a role, as it argues that balance of payments is in effect a monetary phenomenon (Howard & Mamingi, 2002:216). Nevertheless, the fact that the MABP is said to be a monetary phenomenon does not mean that it claims all other factors are unimportant. Rather, the approach explains that, since disequilibria in the balance of payments are caused by monetary imbalances, it would be more appropriate to use policy solutions that rely on monetary policy. Moosa (1992:265) contends that “MABP only asserts that the effect on the balance of payments of a higher rate of economic growth should be analysed with tools of monetary theory”.

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The MABP was also criticised for neglecting the errors that can occur in balance of payments data (Lanciaux, 1990:436). The balance of payments account includes an item called “Net errors and omissions” in order to make provision for balancing the account and noting any errors that might occur in the data. This provision is, however, ignored by the MABP in its equation. Lanciaux (ibid.) pointed out that the MABP, in determining the monetary base, includes the central bank’s holdings of international reserves, but then excludes net errors and omissions, whilst “the magnitude of the central bank’s holdings of reserves is very small relative to the other items on the central bank’s balance sheet, sometimes smaller than net errors and omissions”. In response to this criticism, Valinezhad (1992:264) points out that the item “Errors and omissions” is more a balancing item to fill the gap in the double-entry book system that the balance of payments follows. He (ibid.) contends that “this item is not under direct control of the policymakers”. The latter item is also not able to effect an automatic improvement in the official reserves account of a country that is experiencing a persistent loss of reserves. Evidently, “when a country is faced with persistent balance of payment deficit and loss of foreign exchange reserves, no external adjustment measure, such as devaluation, would be necessary because of this item” (ibid.). Thus, Valinezhad (ibid.) contends that the condemnation of the MABP based on the exclusion of this item is unfounded (Umer, et al., 2010).

Monetary approach to balance of payment is further criticised for concentrating on the change in international reserves in order to determine a country’s external position (Lanciaux, 1990:436). The approach’s characteristic of excluding other important factors – such as the current account balance, trade deficit/surplus, and the extent of a country’s international borrowing – is regarded as being short-sighted with respect to the real factors which determine a country’s balance of payments. In response to this it is argued that devaluation, tariffs and import quotas can only have an effect on the balance of payments by influencing the stock of money. The MABP was explicitly also expected to include the government budget constraint in its identity; however, as Howard and Mamingi (2002:217) pointed out, “there is an interaction between government’s fiscal policy and credit creation, so that the government’s budget constraint is not really excluded”.

The MABP has been criticised for being a ‘long-run’ model. Policies need to be made on a short-term basis; therefore a model that only works in the long run was not regarded as particularly useful (Alawode, 1997). The long run might cause economies tremendous adjustment
costs, as the basic argument is that no policy actions are necessary because balance of payments disequilibria are self-correcting.

In addition, the MABP has been criticized for its assumption of a stable demand for money, which might not always hold for some countries, as money demand can shift from a state of stability due to changes in a country's financial environment. In addition, the demand for money in small open economies is also subjected to external shocks in foreign trade. Currency substitution (holding foreign currency instead of domestic currency) is another factor influencing the trade balance; hence, the demand for money. Alawode (1997:17) contends, therefore, that “the greater the degree of substitution between the domestic and foreign currencies, the less stable are both the exchange rate and the money demand function”.

2.4. Policy implications of the MABP

It is evident from the MABP that disequilibrium in the balance of payments under a fixed exchange rate structure does not need a balance of payments policy, but is rather a self-correcting mechanism over the long term. In cases where the disequilibrium cannot be self-correcting due to a failure in international reserves, monetary contraction can be used to speed up the process. Another alternative is to use devaluation or import-substituting and export-promoting policies, but this should be effected by deflating real money stock through raising the price level rather than deflating nominal money stock through open market operations (Johnson, 1977).

Small open economies with fixed exchange rates are not in a position to control money stock levels over a long period. In cases where monetary authorities need to keep the balance of payments at desirable levels for fixed exchange rates, they need to opt for a growth rate in domestic credit, and the money multiplier should be either at a rate equal to or somewhat less than the internal demand for money (Wilford & Wilford, 1978). In addition, in fixed exchange rate systems, inflation depends on international markets; thus, domestic monetary policies will not have much of an effect on those rates. Inflation in this case can be imported even from the country to which the currency is fixed; therefore, it is only in the case of floating exchange rates where domestic policies actually have a substantial impact on the rate of inflation. Another important policy implication for the MABP is that excessive increases in credit creation might lead to an excessive loss of reserves. Notably, a country’s balance of payments can be corrected by rapid economic growth through escalating money demand (Johnson, 1977).
2.5. Empirical literature

An enormous number of studies have emerged throughout the years testing the validity of the MABP empirically. There is credible evidence that the MABP in fact applies to small open economies with fixed exchange rates. Most parts of the empirical literature were based on the ‘reserve-flow equation’, where a country’s international reserves, or the rates of change in reserves, are regarded as the dependent variable. On the other hand, the independent variables vary in the different studies. They can include domestic income, prices, the interest rate, government expenditure, money multiplier, money stock, the exchange rate, and demand for nominal and real money balances (Umer, et al., 2010).

Aghevli and Khan (1977) performed an empirical test on the MABP for 39 developing countries and found highly significant results, maintaining that the mechanisms underlying this approach held strongly for these countries.

Leon (1988), who examined Jamaican data, found that the MABP’s predictions were not rejected. He used the reserve-flow and sterilisation equations in single and simultaneous equations and found strong evidence that the reserve-flow equation was working; however, he also observed that monetary authorities were in fact sterilising reserves in Jamaica.

Watson (1990), in a study where he modelled Trinidad and Tobago’s balance of payments for the period 1965–1985, found that, although all the other variables were significant and had the correct signs, modelling the change in international reserves as the dependent variable found a coefficient which was less than 1; thus, it was not in accord with what the MABP predicted.

A study by Jimoh (1990) also found strong evidence of the MABP in Nigeria. His suggestion (ibid.74) was that “monetary authorities in Nigeria must pay adequate attention to domestic credit creation in any of their attempts to control balance of payments in Nigeria”.

Dhliwayo (1996) in his paper “the monetary approach to Zimbabwe's balance of payments during the period 1980 to 1991”. It examines whether excess money supply played a role as a disturbance using multivariate cointegration and error-correction modelling. The empirical results suggest that money played a significant role in determining the balance of payments. The one-to-one negative relationship and strong link between domestic credit and the flow of international reserves is established.

Fleermuys (2005) examines the monetary approach to the Namibian balance of payments for the period 1993–2003. The empirical results showed that monetary variables do not play an
overwhelming role in determining Namibia’s balance of payments. The results evidently showed that, although some variables suggested by the monetary approach play significant roles, the balance of payments is not a purely monetary phenomenon. Balance of payments disequilibrium can, therefore, not be corrected only through monetary actions by the authorities.

Umer, et al., (2010) in their paper which examines the monetary approach to Pakistan’s balance of payments for the period 1980-2008. Through the reserve flow equation, it tests whether excess money supply played a significant role as a disturbance by using Co-integration test and error correction modeling. The empirical results showed that monetary variable does not play an overwhelming role in determining Pakistan’s balance of payments. The results evidently showed that, although some variables suggested by the monetary approach play significant roles, the balance of payments is not a purely monetary phenomenon. Balance of payments disequilibrium can, therefore, not be corrected only through monetary actions by the authorities.

Most of the empirical studies carried out have focused on using the vector error correction mechanism and other method of analysis without using the impulse response function and variance decomposition to analyze the MABP in Pakistan, Namibia and Bangladesh. Effort was made to use the VECM impulse response function and the variance decomposition to analyze MABP in Nigeria in this study. This study intends to fill this gap. Therefore, it would be interesting to empirically verify using the impulse response function and the variance decomposition to determine whether excess money supply has played a significant role in the disequilibrium of balance of payment in Nigeria during the period of study.

3. Methodology

3.1. Source of Data

This study would simply employ time series data on annual basis from 1986-2010. The data for this study depend mainly on secondary source gotten from Central Bank of Nigeria (CBN) annual reports. However, the variables used were net foreign assets, gross domestic product, inflation rate, interest rate and domestic credit.

Net foreign assets (NFA) equal the sum of international reserves and gold. The log of domestic credit (LDC) is the sum of net claims on government and claims on the private sector by the monetary sector. The log of gross domestic product growth rate (LGDP) is used for the level of domestic income. The inflation represents the price level (INF). The prime rate is used for interest rate (INT).
3.2. Model Specification

The theoretical link between monetary variables and balance of payment is quite complex and can only be best estimated by the use of a dynamic model. The Vector Autoregressive model is adopted for this work because it is commonly used for forecasting systems of interrelated time series and for analyzing the dynamic impact of random disturbances on the system variance. The VAR model sidesteps the need for structural modeling by treating every endogenous variable in the system as a function of the lagged values of all endogenous variables in the system.

The structural form is:

\[
\text{LNFA}_t = \beta_0 + \beta_1 \text{LGDP}_{t-1} + \beta_2 \text{INF}_{t-1} - \beta_3 \text{INT}_{t-1} - \beta_4 \text{LDC}_{t-1} + \mu_t \quad \cdots \quad \cdots \quad \cdots \quad (9)
\]

Where:

- \(\text{LNFA}\) = log of Net foreign asset
- \(\text{LGDP}\) = log of GDP
- \(\text{INF}\) = rate of inflation
- \(\text{INT}\) = interest rate
- \(\text{LDC}\) = log of domestic credit

Vector Autoregression (VAR) models are useful for policy analysis. Consider the vector autoregressive model for example, VAR (1) \(X_t = B + A X_{t-1} + \varepsilon_t\) which describes the dynamics of the vector \(X_t\) (a vector of net foreign asset (LNFA), log of gross domestic product (LGDP), Rate of Inflation (INF), Interest Rate (INT) and log Domestic Credit (LDC)). Each variable is expressed as a linear combination of lagged values of itself and lagged values of all other variables in the group. In this multivariate setting, the forecast of net foreign asset will be a function of a larger information set that combines not only the history of net foreign asset but also the histories of many other variables, such as GDP, INF, INT and DC.

A VAR is the generalization of the univariate autoregressive model to a vector of economic variables. The pth order vector autoregressive model or VAR model can be written as:

\[
X_t = B + A_1 X_{t-1} + A_2 X_{t-2} + \cdots + A_p X_{t-p} + \varepsilon_t \quad \cdots \quad \cdots \quad (10)
\]

Where \(X_t\) is an \(n \times 1\) vector of variables at time \(t\), \(B\) is vector of intercepts and \(\varepsilon_t\) is the vector of stochastic error term called impulses or innovations or shocks in the language of VAR. In ‘pure’ VAR models no a priori economic restrictions are imposed on coefficient matrix \((B)\). Since every equation in the VAR has the same number of variables on the right-hand side, the coefficients of the overall system are easily estimated by applying Ordinary Least Squares (OLS) to each
equation individually. Also, since the OLS estimator has standard asymptotic properties, it is possible to test any linear restriction, either in one equation or across equations, with the standard t and F statistics.

The lag length p is also chosen by statistical testing or by minimizing some information criteria. The VAR model is estimated under the null and under the alternative hypotheses, and testing is carried out by constructing either the F-statistic (based on the comparison of the sum of squared residuals for the restricted and unrestricted specifications) or an asymptotic likelihood test (based on the comparison of the value of the likelihood function for the restricted and unrestricted specifications).

Hence, the general framework of the model to be estimated can be specified as follows:

For simplicity, assume a VAR (1) model of the form:

\[
X_t = B + A_1 X_{t-1} + \epsilon_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots
\]

Where the vector \( X_t = (NFA, GDP, INF, INT \text{ and } DC) \).

The relationship can be represented as follows:

\[
\begin{pmatrix}
LNFA_t \\
LGDP_t \\
INF_t \\
INT_t \\
LDC_t
\end{pmatrix} =
\begin{pmatrix}
B_1 \\
B_2 \\
B_3 \\
B_4 \\
B_5
\end{pmatrix} +
\begin{pmatrix}
\beta_{11} & \beta_{12} & \beta_{13} & \beta_{14} & \beta_{15} \\
\beta_{21} & \beta_{22} & \beta_{23} & \beta_{24} & \beta_{25} \\
\beta_{31} & \beta_{32} & \beta_{33} & \beta_{34} & \beta_{35} \\
\beta_{41} & \beta_{42} & \beta_{43} & \beta_{44} & \beta_{45} \\
\beta_{51} & \beta_{52} & \beta_{53} & \beta_{54} & \beta_{55}
\end{pmatrix}
\begin{pmatrix}
NFA_{t-1} \\
GDP_{t-1} \\
INF_{t-1} \\
INT_{t-1} \\
LDC_{t-1}
\end{pmatrix} +
\begin{pmatrix}
\epsilon_t \\
\epsilon_{2t} \\
\epsilon_{3t} \\
\epsilon_{4t} \\
\epsilon_{5t}
\end{pmatrix} \quad \ldots \quad \ldots \quad 12
\]

Thus, in all VARs, each variable is expressed as a linear combination of lagged values of itself and lagged values of all other variables in the group.

Therefore, to estimate the VAR, we need to first check the time series properties of the data in order to help us decide whether the VAR will be estimated in levels, first or second difference. Here we shall use a variant of the unit root tests such as the Augmented Dickey Fuller (ADF) or Phillip Perron (PP). Depending on the nature of the time series, a variant of this test that account for structural changes may be more appropriate.
As for cointegration test, which defined as a linear combination of two or more none stationary time series. That is $Y_t$ and $X_t$ variables are cointegrated if both series are I(1) or I(2) and the residuals from cointegrating equation $\varepsilon_t$ is I(0). Cointegrating equation is estimated to test for long run relationship between variables; where net foreign asset are endogenous, gross domestic product (LGDP), inflation rate (INF), interest rate (INT) and domestic credits (LDC) are exogenous variables. Because residuals are estimated “not observed” adjusted ADF critical values used instead of standard values (i.e. Mackinnon (1991) critical values).

An impulse response function describe the response over time of each variable in the VAR to a one time shock in any given variable while keeping all other variable constant. While the variance decomposition is used to determine how much variation in a given variable can be attributed to each variable over the sample period.

4. Empirical Results and Discussions

4.1. Unit root test

A necessary but not sufficient condition for cointegration and VECM is that all series should share the same integrational properties in a univariate sense. Prior to testing for cointegration, we investigated the integrational properties of each of the variables by applying unit-root testing procedure. This study makes use of Phillips Perron (PP) tests. The result shows that all variables are not stationary in levels. After first difference, the PP test of unit root indicates that all variables employed are stationary and their use would not lead to spurious regression. Therefore, all the series are stationary or integrated of the same order one, that is, $I(1)$ as expected.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Level</th>
<th>First difference</th>
<th>With drift</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNFA</td>
<td>Level</td>
<td>-1.3434</td>
<td>-4.5785**</td>
<td>I(1)</td>
</tr>
<tr>
<td></td>
<td>First difference</td>
<td>-0.8868</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LGDP</td>
<td>Level</td>
<td>-3.2571**</td>
<td>-2.1935</td>
<td>I(1)</td>
</tr>
<tr>
<td></td>
<td>First difference</td>
<td>-3.2571**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INF</td>
<td>Level</td>
<td>-2.1935</td>
<td></td>
<td>I(1)</td>
</tr>
<tr>
<td></td>
<td>First difference</td>
<td>-3.2571**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 4.2. Cointegration Test

Having established that the variables are integrated of the same order, we proceed to testing for cointegration. The Johansen-Juselius maximum likelihood procedure was applied in determining the cointegrating rank of the system and the number of common stochastic trends driving the entire system. We reported the trace and maximum eigen-value statistics and its critical values at five per cent (5%) in the table below. The result of multivariate cointegration test based on Johansen and Juselius cointegration technique reveal that there is three cointegrating equations at 5% level of significant as indicated by the trace statistic while the max-eigien statistic only indicated two cointegrating equation at 5% significant level. These results suggest that the appropriate model to use is the vector error correction mechanism specification with more than one cointegrating vector in the model.

**Table 2: Unrestricted Cointegration Rank Test Trace Statistic and Max- Eigen Statistic**

<table>
<thead>
<tr>
<th>Hypothesized No. of CE(s)</th>
<th>Trace Statistic</th>
<th>5 Percent Critical Value</th>
<th>Hypothesized No. of CE(s)</th>
<th>Max-Eigen Statistic</th>
<th>5 Percent Critical Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>None*</td>
<td>96.82</td>
<td>68.52</td>
<td>None*</td>
<td>35.52</td>
<td>33.46</td>
</tr>
<tr>
<td>At most 1*</td>
<td>61.30</td>
<td>47.21</td>
<td>At most 1*</td>
<td>27.50</td>
<td>27.07</td>
</tr>
<tr>
<td>At most 2*</td>
<td>33.80</td>
<td>29.68</td>
<td>At most 2</td>
<td>19.64</td>
<td>20.07</td>
</tr>
<tr>
<td>At most 3</td>
<td>14.16</td>
<td>15.41</td>
<td>At most 3</td>
<td>11.24</td>
<td>14.07</td>
</tr>
<tr>
<td>At most 4</td>
<td>2.93</td>
<td>3.76</td>
<td>At most 4</td>
<td>2.93</td>
<td>3.76</td>
</tr>
</tbody>
</table>

* denotes rejection of the hypothesis at the 5% level

Trace test indicates 3 cointegrating equation(s) at the 5% level

Max-eigien value test indicates 2 cointegrating equation(s) at the 5% level

### 4.3. Vector Error Correction Model

We proceed to estimate the VECM that is designed for use with non-stationary series that are known to be cointegrated. The VECM has cointegration relations built into the specification so that it restricts the long run behaviour of the endogenous variables to converge to their
cointegrating relationship while allowing for short-run adjustment dynamics. The cointegration term is known as the *error correction* term (ECT) since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments. The results are presented in the table (3) below. It shows that only some macroeconomic variables are crucial in influencing the performance of the balance of payment as only few of the test statistics are significant. The results were evaluated using the conventional diagnostic tests. The estimated VECM satisfy the stability condition, that is, the vector error correction term in each of the models should have the required negative sign and lie within the accepted region of less than unity.

**Table 3: Error Correction Results of LOG (NFA)**

<table>
<thead>
<tr>
<th>Regressor</th>
<th>Coefficient</th>
<th>T-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.135</td>
<td>1.219</td>
</tr>
<tr>
<td>D(LOG(NFA(-1)))</td>
<td>0.315</td>
<td>1.587</td>
</tr>
<tr>
<td>D(LOG(GDP(-1)))</td>
<td>4.918</td>
<td>2.618</td>
</tr>
<tr>
<td>D(INF(-1))</td>
<td>0.014</td>
<td>2.995</td>
</tr>
<tr>
<td>D(INT(-1))</td>
<td>0.002</td>
<td>0.143</td>
</tr>
<tr>
<td>D(LOG(DC(-1)))</td>
<td>-0.257</td>
<td>-1.561</td>
</tr>
<tr>
<td>ECM(-1)</td>
<td>-0.423</td>
<td>-3.787</td>
</tr>
</tbody>
</table>

R-Square = 0.578

S.E = 0.307

F-Stat = 3.654

The error correction term appears with a statistically significant coefficient with the appropriate negative sign as is required for dynamic stability. This is in harmony with the validity of an equilibrium relationship among the variables in the cointegrating equation. The estimated coefficient indicates that about 42 percent of the errors in the short run are corrected in the long run. The result also indicated that the past change in gross domestic product, inflation rate and interest rate in Nigerian economy are positive and statistically significant, except interest rate even though positive but is insignificant as the result from it t-statistic is less than 2. Further more, the result from the domestic credit is negative and statistically insignificant. This is because in the short run, it seems that there might be other variables beside the monetary variable mentioned in the equation that are not included. The fact that gross domestic product and inflation are statistically significant can, however, not provide evidence that MABP work in Nigeria.
4.4. The Impulse Response Function Analysis

An impulse-response function describes the response over time of each variable in the VAR to a one-time shock in any given variable while keeping all others constant. Closely associated with the impulse-response function is the variance decomposition.

The impulse response functions the path of log (GDP), INF, INT and log (DC) when there are innovations in the policy variables. Figure (1) below shows the Accumulated response of log (GDP), INF, INT and log (DC) in the period of study that is, 1986-2010.

Fig 1  Accumulated Impulse Response

From the response figure it indicated that the response of GDP and DC are positive. Looking at the graph of both the GDP and DC from the first period to the 10\textsuperscript{th} period resulted into an upward
movement of the graph indicating that positive relationship exist between both variables and NFA. However, the response of net foreign asset to inflation is slightly positive in the short run. A close look at the graph shows a positive movement from 1st to 3rd period, the next movement which was from period 4th to 10th resulted in to a downward movement of the graph indicating a negative relationship. The response of interest rate also indicated a negative relationship from the first period to the 10th period, as can be seen from the graph.

4.5. Variance Decomposition

This decomposition refers to the contribution of each innovation to the variance of the forecast error associated with the forecast of each variable in the VAR. It can be used, therefore, to determine how much variations in a given variable can be attributed to each variable over the sample period.

The forecast variance decomposition provides information on the dynamic behaviours of the variables in the system. It decomposes the history in the variables and attributes same to the effect of all the variables in the system. The full estimate of the findings of the variance decomposition log (NFA) is reported in table (4) below.

<table>
<thead>
<tr>
<th>Table 4</th>
<th>Variance Decomposition LOG (NFA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
<td>S.E.</td>
</tr>
<tr>
<td>1</td>
<td>0.307327</td>
</tr>
<tr>
<td>2</td>
<td>0.451582</td>
</tr>
<tr>
<td>3</td>
<td>0.550697</td>
</tr>
<tr>
<td>4</td>
<td>0.635431</td>
</tr>
<tr>
<td>5</td>
<td>0.713669</td>
</tr>
<tr>
<td>6</td>
<td>0.780525</td>
</tr>
<tr>
<td>7</td>
<td>0.838600</td>
</tr>
<tr>
<td>8</td>
<td>0.892024</td>
</tr>
<tr>
<td>9</td>
<td>0.942877</td>
</tr>
<tr>
<td>10</td>
<td>0.991692</td>
</tr>
</tbody>
</table>

**Source:** Author’s Estimation using Eviews 4.0

From the above table own shocks constitute a significant source of variation net foreign asset forecast errors declining from 100 percent to 49 percent in 10th period. Domestic credit followed by inflation rate has the highest source of net foreign asset variation after own shocks. Domestic credit by the 10th period explains 22 percent of net foreign asset, while inflation rate by
the 10th period explains 14 percent of net foreign asset. Gross Domestic Product accounts for about 8 percent net foreign asset variation, interest rate influences net foreign asset the least in the long run as they account for 6 percent source of variation net foreign asset.

The accumulated impulse response and the variance decomposition shows that while some variables are positive other are negative, this means other policy measures should also be used to obtain balance of payments stability rather than monetary tools only, as predicted by this theory.

The impulse response and variance decomposition results imply that balance of payment problem in Nigeria could not be regarded as solely a monetary phenomenon since other variables such as increase exchange rate, fiscal deficit etc also play significant role in reducing the country’s revenue. Hence, money supply is not the only correcting mechanism for the disturbance in Nigeria’s balance of payments in line with Jimoh (1990), and in accordance to similar studies carried in other countries.

5. CONCLUSION

In this paper, we estimated the role excess money supply played in the disequilibrium of that balance of payment in Nigeria. The MABP was estimated by means of IRF’s from VEC. Evidence from the analysis covering the period 1986-2010 reveals that money supply is not the only correcting mechanism for the disturbance in Nigeria’s balance of payment. This is in accordance with the findings of Umer et al., (2010) for the Pakistan economy.

When looking for policy instruments to correct the disequilibrium, authorities should also concentrate on other policy measures instead of relying solely on monetary tools to attain stability in the country’s balance of payments account. The empirical results showed that the balance of payments in Nigeria is not a purely monetary phenomenon: only two of the variables from the accumulated impulse response namely gross domestic product and domestic credit – seemed to have a positive relationship with net foreign assets. Although this is in accordance with some of the predictions of the MABP, the results of this study do not entirely comply with the strong assumptions of the latter approach.

Another important policy implication for the Nigeria economy is that increases in credit creation lead to a continuous loss of reserves. Thus, monetary authorities should also pay special attention to domestic credit creation when controlling the country’s balance of payments. It is important that the country achieves sufficient economic growth through money demand to correct the balance of payments deficit. Nigeria should also look at its increased budget deficit, which is
mostly financed through the central bank’s credit. The expansion in the fiscal deficit caused the increases in domestic credit.

References


