IS BALANCE OF PAYMENTS A MONETARY PHENOMENON? A REVIEW OF EMPIRICAL EVIDENCE

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Abstract

The empirical proofs in this study evidently support the argument that the balance of payments is a monetary phenomenon, and that any disparity in the balance of payments is always necessitated by disturbances in the monetary variables in the countries concerned. Consequently, any observed disequilibrium in a country's balance of payment can, *ceteris paribus,* be adroitly corrected via adjustment of domestic credits demand, and hence the size of the foreign trade balance. The monetary authorities can do this by adopting stringent monetary disciplines to limit the growth of domestic credit, so that economic agents will cut back their expenditure relative to their income, so as to rebuild their cash balances.

Introduction

The question of whether balance of payments is a monetary phenomenon has been a long-standing issue in the literature of monetary and international economics. Perspectives on the question have been influenced, in part, by developments in monetary theory, and in part by interpretations of monetary history. Although there are alternative theories of balance of payment adjustments, namely; the elasticities and absorption approaches (associated with Keynesian theory), this study is delimited to empirical studies on the monetary approach to the balance of payments.

This study is organised in the following way: First, an overview of the theoretical underpinnings of the monetary approach to balance of payment adjustments is carried out. Next, the empirical works on the monetary approach on randomly selected countries are reviewed. At the end of the empirical review, an appraisal of the methodologies is undertaken, with concluding remarks.

An Overview of the Monetary Approach to Balance of Payments

The monetary approach is essentially a product of work conducted in the late 1950s, the 1960s and early 1970s, by the International Monetary Fund's research department under Jacques J. Polak, and by Harry G. Johnson, Robert A. Mundell, and their students at the University of Chicago. The main thesis of the monetary approach to balance of payments is that a country's balance of payments is essentially a monetary phenomenon, and that any observed disequilibrium in the balance of payments can be eliminated through an adroit manipulation of monetary variables especially domestic credit, under fixed exchange rate, absence of sterilisation by the monetary authorities, and stable demand for money function (Akpansung, 1998).

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The theory does not imply, however, that changes in the money supply are the only factors which affect the balance of payments (Kemp, 1975). The monetary approach concerns itself with the deficit on monetary account, which in principle, consists of the items that affect the domestic monetary base (Ardalan, 2003). The approach emphasises the monetary aspects of the balance of payments, and looks beyond merchandise trade and incorporates the important role of financial assets (Melvin, 1992). It treats the supply of money as endogenous by assuming a feedback from the balance of payments through changes in international reserves to changes in the monetary liabilities of the central bank. Under this approach, money market disequilibrium is seen as a crucial factor provoking balance of payments disequilibrium. Balance of payments imbalances will restore equality between the demand for and supply of money in the absence of official intervention. This implies, however, that external disequilibrium is transitory and will self-equilibriate in the long-run (Johnson, 1976c; Duasa, 2005; Végh, 2011).

The monetary approach to the balance of payments rests on two basic empirical propositions, viz:

(i) the demand for money is a stable function of a few macroeconomic variables; and
(ii) the price of traded goods is assumed to be largely exogenous, as is the level of economic output.

These assumptions, taken together, imply that in an open economy, the authorities cannot control the quantity of money held by domestic residents. If the quantity of money is below the desired stock, given the level of output and other determining factors, economic agents will seek to acquire additional money balances. Akpansung (1998) notes that individuals can do this through restrictions in their expenditure relative to income, while the economy as a whole will restore equilibrium by running a balance of payments surplus, and attracting money from abroad. Any discrepancy between the volume of money balances demanded, and the stock of money created by the monetary authorities will be removed by a reserve movement created by a balance of payments surplus or deficit.

However, following Johnson (1978), a key equation representing the relationship in the monetary approach to the balance of payments can be given as:

$$\frac{dR}{R} = \frac{1}{r}\left[e_y \frac{dy}{y} + e_i \frac{di}{i} - \frac{(1-r)}{r}\frac{dD}{D}\right] \quad \ldots\ldots (1)$$

$$\frac{dR}{R} = \frac{1}{r}\left[e_y \frac{dy}{y} - \frac{(1-r)}{r}\frac{dD}{D}\right] \quad \ldots\ldots (2)$$

Where, the parameter e_y and e_i denote income and interest rate elasticities of the nominal money balances, that is, e_y and e_i represent the change in the demand for money with respect to the real income and nominal interest rate, respectively. R and D denote international reserves and domestic credit, respectively; y represents real output, while i denotes interest rate. Thus under the assumed signs of the elasticities, that is, $e_y > 0$ and $e_i < 0$, an increase in the rate of growth in prices and real income will improve the balance of payments, whereas increase in the rates of growth in interest rates and net domestic assets of the central bank will lead to reserve losses (Aghevli & Khan, 1977).

Similarly, equation (2) above implies that reserve growth and the balance of payments are positively related to domestic economic growth and the income elasticity of demand for money, and negatively related to the rate of domestic credit expansion (Johnson, 1978). However, if we further that there is no economic growth ($dy/y = 0$), then,

$$\frac{dR}{R} = -\frac{(1-r)}{r}\frac{dD}{D} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

This implies that international reserve growth and the balance of payments are inversely related to the rate of domestic credit expansion.

Basically, an important and interesting prediction of the above model is that economic growth will, all else being equal, improve the overall balance of payments, since it tends to increase the demand for money *vis-a-vis* the domestically created supply of money. The model also shows the relationship existing between growth in money supply, prices, and real income.

Beare (1978) observes that the monetary approach provides an explanation for the balance of payments surplus and the necessity for occasional revaluation that were characteristic of the West Germany economy in the 1960s, which had a high real growth rate and a low rate of domestic credit creation; and for the balance of payments deficit and the necessity for the 1967 devaluation for Britain which had a low growth rate and a high rate of domestic credit creation.

Since policy makers are mainly interested in the resolution of balance of payments deficits as opposed to surpluses, the targeted expansion of domestic credit is set as a ceiling. However, Polak & Argy (1971) contend that if the balance of payments has over-riding priority, a credit ceiling would appear to be the better policy and that even if strong priority is attached to minimising fluctuations in output, a credit ceiling may still be the more efficient policy where external disturbances tend to be relatively less important than domestic disturbances (and particularly so when increases in expenditures tend to worsen the balance of payments).

Although the monetary approach may be claimed to be compatible with absorption approach on the proviso that the former stresses the need for equality in the demand for and supply of money, while the latter stresses the need for equilibrium in the market for domestic output, they differ however, on grounds that the monetary approach is a more general theory, since it explains the overall balance of payments (including the capital account), whereas the absorption approach is concerned mainly with explaining the current account (Akpansung, 1998).

All said and done, in spite of this mini-encyclopedic exposition of the monetary approach, it is worthy of mention that the only valid criticism that may be leveled against the approach is that, like absorption approach, it is a long-run equilibrium analysis, and may be of limited usefulness in analysing the short and medium term developments of primary interests to policy makers. But the intellectual architects of the monetary approach (Johnson & Frenkel, 1978) are strongly of the opinion that the demand for money is a stable function of a few macro-economic variables should incidentally dispose of any criticism that has been brought against it.

Review of Empirical Studies

This section is devoted to the review of empirical studies on monetary approach to balance of payments in some randomly selected countries.

Australia

Zecher (1978) was interested in finding the major determinants of Australian reserve flows (Balance of Payments) and the effects of monetary policy on the reserve flows, using the monetary market models of open economies earlier developed by Mundell (1968, 1971), Johnson (1972), and Frenkel (1971), etc. He estimated two equations of the form:

(a) the reserve-flow equation:

$$\frac{R}{H}\cdot\frac{dR}{dt} = \alpha_1\frac{dY}{dt} - \alpha_2\frac{di}{dt} + \beta_1\frac{dP}{dt} - \beta_2\frac{da}{dt} + \beta_3\left[\frac{D}{H}\cdot\frac{dD}{dt}\right] + e$$

(b) the demand for money function:

$$\frac{dM}{dt} = \acute{a}_1\frac{dY}{dt} - \acute{a}_2\frac{di}{dt} + u$$

Where R = International reserves, H = stock of high powered money, M = Stock of Domestic Money (M2), a = Money multiplier, P = Price level, Y = Income, i = interest rate, D = domestic credit, t = time, u, e = Stochastic disturbance terms.

These models were estimated using data based on yearly, quarterly and semi-quarterly observations between 1950 - 1971. However, based on his study, observations and findings, Zecher concluded that:

(i) australian reserve flows over the decades under study were consistent with the pattern implied by the monetary approach to the balance of payments;

(ii) when demand for money grows faster than the money supply would have grown due to domestic sources alone, international reserve tend to accumulate and to bring actual growth in the money stock closer to desired growth and the converse;

(iii) the hypothesis implied that growth in output and the price level associated with balance of payments surplus, while growth in the domestically determined portion of the money stock tended to be associated with deficits and reserve outflows; and

(iv) effects of the interest rate on reserve flows tended to be weak, but generally conformed to the negative relation implied by the hypothesis.

Developing Countries as a Group

Aghevli & Khan (1977) provided estimates for the determination of the monetary approach to the balance of payments using a cross-sectional data from 39 developing countries. Two models - the money demand function and the reserve-flow equations were estimated. Particularly, the nominal money demand function was of the form:

$$\dot{M} = \beta_0 + \beta_1\frac{\dot{p}}{p} + \beta_2\frac{\dot{Y}}{Y} + \beta_3\frac{\dot{r}}{r} + \beta_4\frac{\dot{\pi}}{\pi} + v$$

While the unrestricted reduced form reserve-flow equation was:

$$\frac{R}{H}\frac{\dot{R}}{R} = \gamma_0 + \gamma_1\frac{\dot{P}}{P} + \gamma_2\frac{\dot{Y}}{Y} + \gamma_3\frac{\dot{Y}^*}{Y^*} + \gamma_4\frac{\dot{\pi}^*}{\pi^*} + \gamma_5\frac{\dot{m}}{m} + \gamma_6\frac{D}{H}\frac{\dot{D}}{D} + e$$

$$(\gamma_1 = 1,\ \gamma_2 > 0,\ \gamma_3 < 0,\ \gamma_4 < 0,\ \gamma_5 = \gamma_6 = -1)$$

Where the dot over a variable denotes a time derivative, $\frac{d}{dt}$ = rate of inflation = $\frac{dP}{dt}\cdot\frac{1}{P}$, while other variables denote their usual notations.

The following results were obtained:

(1) All estimated coefficients in the reserve flow equation had the expected signs, and, apart from the coefficient of the rate of growth in the money multiplier, all were significantly different from zero, at least, at the 5 per cent level.

(2) The coefficient of inflation was substantially less than unity, indicating a high degree of money illusion in the demand for nominal money balances.

(3) The income coefficient was much closer to the *a priori* value, as its value was not significantly different from unity. The positive signs of the first two coefficients confirm two key monetary propositions, namely that, *ceteris paribus,* an increase in inflation or the rate of growth in income will lead to an improvement in the balance of payments - a variance to the Keynesian view that an increase in these variables would result in an increase in imports and would necessarily worsen the balance of payments.

(4) The estimated coefficient of the rate of growth in domestic assets was significantly different from unity.

(5) The fit of the equation was much better than was obtained in the money demand equation, with more than 60 per cent of the variations of the dependent variable being captured by the specification.

(6) It appeared better to estimate the reduced form equation for the growth in international reserves directly than to follow the two-step procedure of first estimating a demand function for money equation (in real or nominal terms) and then substituting the estimates into the identity determining the growth in reserves.

However, on the basis of their findings, Aghevli & Khan (1977) concluded that their results gave strong indication of the usefulness of the monetary approach in explaining the rate of growth in international reserves of developing countries. They also conceded that an increase in the domestic component of the high-powered money will not all leak out in the balance of payments and that a much larger change in net domestic assets would be called for to achieve a given balance of payments target.

Japan

Bean (1978) undertook a study of the international reserve-flows and money market equation in Japan for the period 1959 - 1970. After equating the money demand function of the form:

M^d = P.L. (y, i), and the supply of money function
M^S = a(R + D), he arrived at an estimatable function thus:

$$\left(\frac{R}{R+D}\right)\text{dlogR} = b_1\text{dlogP} + b_2\text{dlogY} + b_3\text{dlogi} + b_4\text{dloga} + b_5\left[\left(\frac{R}{R+D}\right)\text{dlogD}\right] -$$

Where all the variables retain their usual notations.

The model was estimated using quarterly Consumer Price Index (CPI), Wholesale Price Index and their adjusted values together with United States treasury bills and discount rates. Over-all, the model was statistically more significant, yielding higher R-squared, better D-W statistics, and larger t-values when CPI and Treasury bill were used. Particularly, all of the estimated coefficients of the model had predicted signs. However, the use of the Japanese discount rate and consumer price index resulted in larger interest rate elasticity than when the United States Treasury bill rate was used, though the difference was not statistically significant. The money multiplier was not appreciably different from the predicted value of unity. The income elasticity (b_2) was consistently smaller than unity. Estimates of the elasticity of the domestic component of the base were smaller than the expected magnitude.

However, based on his empirical evidence of Japan, Bean (1978) concluded that his study strongly supported the theses of the monetary approach.

Malaysia

Dausa (2005) examines the Malaysian balance of payments (from the first quarter of 1974 to the fourth quarter of 1995), based on both the Keynesian and the monetary theories of balance of payments. Each of the two approaches provides distinct explanations on how the determinants of the balance of payments could lead to equilibrium and disequilibrium of the balance of payments account and both theories also rank differently the importance of real/merchandise account and monetary/official reserve transactions balance account of the balance of payments. Two tests were carried out based on the Almon or Polynomial Distributed Lag (PDL) model, namely the test of signs coefficients and the test of speed adjustment (test whether the real account (TB) or monetary account (ORTB) has preeminence in international accounts). The two tests were applied both on the Malaysian Trade Balance (TB) and Official Reserve Transactions Balance (ORTB) accounts. The results show that signs of regressors of the Trade Balance (TB) equation support the Keynesian view while signs of regressors of the Official Reserve Transactions Balance (ORTB) equation support both Keynesian and Monetary views. It is also found that the ORTB dominates the TB in terms of quickness of adjustment, so the ORTB is an autonomous account and the TB is an accommodating account.

Nigeria

(i) A study to investigate the impact of exchange rate adjustments (devaluation) in Nigeria's balance of payments from 1960-1993, was undertaken by Nyong & Obafemi (1995). They employed a modified monetary approach to devaluation as propounded by Johnson & Frenkel (1978) and elaborated by Connolly & Taylor (1976, 1979). The specific form of their simultaneous equations model is reproduced thus:

$$\frac{\Delta BOP}{M} = \psi_0 + \psi_1\frac{\Delta R}{R} + \psi_2\frac{\Delta DOM}{M} + \psi_3 SAP + \psi_4\frac{\Delta BOP}{M}(-1) + \mu_1 \ldots\ldots\ldots\ldots\ldots (1)$$

$$\frac{\Delta DOM}{M} = \omega_0 + \omega_1\frac{\Delta BOP}{M} + \omega_2\Delta 1ogGDP + \omega_3 SAP + \omega_4 LENDR + \mu_2 \ldots\ldots\ldots\ldots (2)$$

Where,

BOP = balance of payments position at time, t,
M = broad money supply (M_2) at time, t.

$\frac{\Delta BOP}{M}(-1)$ = one period lag of the variable.

R = exchange rate at time, t.
SAP = dummy variable which takes value of 0 from 1962-1985, and 1 from 1986-1993.
Log(GDP) logarithm of GDP at time, t.
LENDR = lending rate at time, t;
μ_1, μ_2= stochastic error terms with the-usual properties of normality and constant variance.

Their empirical results, based on two stage-least squares estimating procedures and effective estimation period from 1962- 1993, showed that:

(a) the devaluation coefficient ($_1$) was statistically insignificant and was also of the wrong sign, the magnitude of the coefficient being far from unity, as *a priori* expected; implying that devaluation may not correct the disequilibrium in Nigeria's balance of payments, all else being equal.

(b) The expansion in domestic credit was an important source leading to the worsening of the Nigeria's balance of payments position.

(c) The coefficient on change in domestic credit ($_2$) was not only close to unity but different from unity as predicted by the monetary approach. That is, the domestic credit coefficient ($_2$) was found to be -0.8746 instead of -1.00 as *a priori* expected. The coefficient was statistically significant at about 5 per cent level.

(d) The sterilisation or neutralisation coefficient ($_1$) was statistically significant at better than one per cent level. This result implies that the Central Bank of Nigeria carried out complete neutralisation of the domestic money supply within the sampled period (i.e. 1960-1993).

(e) Their model failed to track the actual effect of the 65 per cent devaluation in 1986 (where the Naira was devalued by 65 per cent, trading *vis-a-vis* the US dollar at \$1 = ₦4.60 as against the administered rate of \$1 = ₦1.60, during September 26, 1986 SFEM auction).

(i) Based on their empirical results and analysis, Nyong & Obafemi (1995) concluded that devaluation as a policy response to redress the disequilibrium in Nigeria's external sector was an inappropriate policy response to the fundamental

disequilibrium plaguing the Nigerian economy. They went further to identify various factors responsible for the inapplicability of the monetary approach to devaluation in the Nigerian context to include the structure of Nigeria's production, imports and exports coupled with instability in the macro-economy, political instability and unpropitious institutional environment. However, their study indicated the crucial role of domestic credit in macro-economic adjustment.

(ii) In assessing the balance of payments crisis in ten (10) sampled African countries from 1960 -1990, using Bayesian Posterior Odds Ratio, Taiwo (1992) concluded that about 50 per cent of the countries sampled were experiencing fundamental disequilibrium in their current and capital accounts. Among others, his results indicated that Nigeria was not yet experiencing this severe problem but that it would take her approximately four years to attain equilibrium in the current account, if nothing else disturbed the system. He noted, however, that the economic crisis facing most African countries (including Nigeria) is multi-dimensional, and should not be equated with the balance of payments crisis confronting these countries. He, therefore, suggested that countries having fundamental disequilibrium in their balance of payments should adopt drastic measures derivable from any of the relevant theory of balance of payments, such as the monetary approach. He also foresaw the imminent self-correcting tendency of the countries without serious balance of payments deficits.

(iii) Still for Nigeria, Akpansung (1998) attempted to establish the applicability of the monetary approach to the balance of payments in Nigeria (1960 -1995), using a two stage least squares (2SLS) estimation technique with relevant monetary variables. The simultaneous equations model estimated were the reserve-flow equation and the sterilisation equation, thus:

$$\frac{\Delta R}{H} = \pi_0 + \pi_1 \frac{\Delta P}{P} + \pi_2 \frac{\Delta Y}{Y} + \pi_3 \frac{\Delta r}{r} - \pi_4 \frac{\Delta m}{m} - \pi_5 \frac{\Delta D}{H} + u_1 \quad \ldots\ldots\ldots\ldots\ldots (1)$$

$$\frac{\Delta D}{H} = \lambda_0 + \lambda_1 \frac{\Delta R}{H} + \lambda_2 \frac{\Delta GDOS}{GDOS} + u_2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where H is the high-powered money, defined as the sum of the international reserves (R) and total cash in circulation (C), m is the money multiplier, P is the price level, Y denotes income, D equals domestic credit, r is the interest rate, and GDOS stands for government debt outstanding.

The sterilisation or offsetting or government reaction function (equation 2) assumes that open market operations by the central bank are determined by the change in international reserves (the offsetting hypothesis) and the change in government external debt outstanding (since the central bank is a large source of finance for the government).

However, the empirical result showed that Nigeria's balance of payments has been dominated by monetary variables. The result confirms the postulate that reserve accumulation is negatively related to the rate of growth of domestic output.

(iv) Recently, Jimoh (2004) used both the Nigerian monthly and annual data between 1987 and 2001 to determine the relevance of the monetary approach to floating exchange rate regime operable in Nigeria since 1987. Fitting some of the most commonly used models for testing the relevance of monetary approach to floating rates analysis on Nigerian data, Jimoh found that those monetary models provided an adequate representation of the Nigerian data.

Panama

Borts & Hanson (1979) developed an extended version of the monetary model of the balance of payments in which home goods provide some monetary independence in a fixed exchange rate economy. Some econometric tests using data from Panama showed that even in an economy as open as Panama foreign and local prices do not move proportionately, and that domestic credit does influence the local price level. The results suggest that their extended model, involving the simultaneous determination of reserve loss, and the price level, is more appropriate. This model was then estimated using two-stage least squares and yielded satisfactory results, while the straightforward estimate of the reserve loss as a function of domestic credit expansion, performed poorly.

The linearised form of the estimated model was of the form:

$$r = a_0 + \underset{(+)}{a_1 P_{y+}} \quad \underset{(+)}{a_2 P_x} + \underset{(-)}{a_3 M} + \underset{(-)}{a_4 d} + u_1$$

$$r = b_0 + \underset{(-)}{b_1 P_y} + \underset{(+)}{b_2 P_x} + + \underset{(-)}{b_3 M} + u_2$$

where the expected signs of the coefficients are shown in parentheses. P_x and P_y denote prices of export goods and home goods, respectively; r is the international financial assets (reserves), a proxy for balance of payments equation, m is the money supply, and d equals government deficit. These structural equations are just identified but were estimated with two stage least squares to facilitate hypothesis testing.

Spain

In his empirical study of the Spanish economy, from 1955- 1971, Guitan (1978) attempted a test of the theoretical proposition that the balance of payments is a monetary phenomenon. Besides, his study also aimed at investigating the relationship between the balance of payments and the rate of domestic credit expansion, as well as ascertaining the importance of the latter relative to variables like the exchange rate, domestic prices and the gross national product, in determining balance-of-payments outcomes.

Although his models cannot be reproduced here for sake of space, his regression results showed R-squared (adjusted for degrees of freedom) ranging from 0.556 to 0.932 for the balance of payments and from 0.65 to 0.898 for the current account. Moreso, the t-ratios of the slope coefficients were consistently significant at the 99 per cent confidence interval. These results strongly pointed at the monetary character of balance-of-payments

disequilibrium, as well as indicating a significant relationship between the balance of payments (and the current account) and the two major concepts of domestic credit: the rate of expansion of central bank's domestic credit (however defined), and the rate of expansion of net banking system's credit.

Concerning the demand for money, his results indirectly emphasised variables like high powered money (H), currency and other narrow money definitions. This followed from the strong correlation between the domestic credit variables corresponding to such concepts and the balance of payments. Based on the results of the study, Guitan concluded that his tests appeared to establish domestic credit expansion as the major determinant of the evolution of the balance of payments.

The Spanish experience during the period of the analysis (1955-1970) supported the view that exchange rate changes were not effective unless accompanied by appropriate credit policies. Again, there was no sustainable trade-off between devaluation and restrictive credit policies. The real trade-off was rather between devaluation and the degree of restrictiveness of internal policies. The results of the tests also pointed out the importance of the central bank credit variables in the determination of the balance of payments.

Sweden

In computing a predicted time path for the balance of payments to establish the link between reserve-flows and the domestic money stock in Sweden between 1950-1968, Genberg (1973) applied Johnson's (1972) reserve-flow model of the form:

$$\left(\frac{R}{H}\right) g_R = g_{md} - \left(\frac{R}{H}\right) g_m \; g_D$$

Where, g, stands for the relative growth rate of the variable appearing as a subscript.

From his estimated results, Genberg (1973) pointed out that the high correlations between the actual and predicted reserve-flow series strongly supported the monetary interpretation of balance of payments adjustments.

As for the test of the sterilisation hypothesis that an autonomous reserve-flow will cause the central bank to contract domestic credit by the same amount in order to prevent the balance of payments surplus from affecting the money supply, Genberg incorporated a government policy reaction function into the reserve-flow equation. Particularly, the sterilisation function was of the form:

$$\left(\frac{D}{H}\right) gD = {}_0 + {}_1 \left(\frac{R}{H}\right) gR) + {}_2 g G_{dos} + u_1$$

Where G_{dos} = Government debt outstanding.

Using a two stage least squares estimation procedure, Genberg obtained the parameters for both the reserve-flow and the offsetting functions. Judging from the parameter estimates, however, Genberg indicated that the specification of the central bank reaction function was inadequate as the government financing variable failed to be

significant, perhaps due to the short-run instability of the central bank's policy response due to the existence of money alternative targets.

The parameter estimates of the reserve-flow equation were not significantly different from their *a priori* values of -1 (for domestic credit, money multiplier coefficients) and + 1.0 (for price coefficient); the income and interest rate coefficients were equally not significantly different from the estimates of the demand functions earlier given, even though the point estimates were contrary to expectations.

Based on his study and empirical finding, however, Genberg remarked that the sterilisation hypothesis appeared not to offer a very plausible alternative to the explanation of reserve flows, whereas the monetary approach passed his tests both as far as its underlying view of the world was concerned and its implications with respect to the balance of payments.

United Kingdom

In another study, Spanos & Taylor (1984) undertook the modeling and statistical analysis of the reserve-flow equation under fixed exchange rates - as an aspect of the monetary approach to the balance of payments. Their empirical evidence derived from a quarterly data on the United Kingdom (1965-1971).
Their estimatable reserve-flow model was:

$$\frac{\Delta R}{R+D} = b_1 \Delta \log P + b_2 \Delta 1 \log Y + b_3 \Delta 1 \log r + b_4 \Delta 1 \log m + b_5 \left[\frac{\Delta \log D}{R+D}\right] + u$$

Using implicit GDP deflator as a proxy for P, real GDP for Y and gross redemption yield on UK government bonds issued at par with 20 years to maturity as a proxy for interest rate r, the model was estimated on quarterly basis. Their result was very impressive both on statistical and theoretical grounds. For instance, the R-squared was 0.92; R-squared (adjusted) equaled 0.90 with a standard error of 0.01645 and Durbin-Watson statistic of 2.000. All the coefficients had the sign and size expected *a priori* and all but b_3 (the coefficient of interest elasticity) were significantly different from zero. The Durbin-Watson statistic gave no indication of any systematic first-order dynamic effects in the residuals and all the *a priori* restrictions were strongly accepted. Based on their findings, Spanos & Taylor remarked that the estimated model was dominated by the money accounting identity; and that modeling the adjustment equation directly in a disequilibrium context seems to provide a more appropriate procedure for the reserve-flow model.

4. Appraisal of the Empirical Studies

The empirical studies reviewed in the penultimate section confirm the fact that the balance of payments is a monetary phenomenon, and that the disequilibrium noticed in the balance of payments or the reserve-flows are always necessitated by disturbances in the monetary variables in the countries concerned. Almost all the studies adopted the monetary model of the open economies developed by either Johnson (1972), Mundell (1968, 1971), Johnson & Frenkel (1978) or their modified versions. In either case, the results were generally consistent with the pattern (sign and magnitudes) implied by the hypothesis of the monetary approach to the balance of payments. There appears to be a very significant relationship between balance of payments and domestic credit, as well as income and prices:

whereas growth in income and prices were/are associated with balance of payments surpluses, growth in the domestic credit, generally leads to balance of payments deficits and reserve outflows. However, effect of interest rate on reserve-flow seemed to be weak, but conformed to the monetary approach predictions.

Generally, the studies do not savour exchange rate variations (devaluation) as the only policy tool for either the correction of a deficit or the sustainability of equilibrium in the balance of payments. Rather, the studies prognosticate a side-by-side adoption of both devaluation and strict monetary policies by the monetary authorities especially in the absorbing and third world countries, like Nigeria.

However, some of the studies used single equation estimation techniques in their model estimations. Hence, there is, therefore, no feedback mechanism with respect to domestic credit effect in the system as causality is only in one direction. Their studies, therefore, suffer not only from simultaneous equation bias but inefficient estimates, since all the information available in the description of the system of equations are not utilised in their estimation procedure (Pyndyck & Rubinfeld, 1976; Koutsoyiannis, 1977; Pokorny, 1992; Dougherty, 1992; Greene, 2003; Wooldridge, 2003; Gujarati & Sangeetha, 2007). Besides, the problem of identification of the behavioural equations has not been established by some of these studies. Particularly, the use of increases in the rates of growth in inflation and increases in the rate of growth in prices by Aghevli & Khan (1977) seems to be tautologous. Moreso, these rates of growth are bound to be multicollinear.

Nevertheless, some of the observed lapses were overcome by empirical studies undertaken by Genberg (1973), Zecher (1978), Borts & Hanson (1979), Nyong & Obafemi (1995), and Akpansung (1998). These authors employed systems equations in their studies.

Concluding remarks

The main aim of this paper was to review the empirical studies that either support or invalidate the argument that the balance of payments is a monetary phenomenon. The central hypothesis which the monetary approach to balance of payments attempts to test is that the reserve growth and the balance of payments are positively related to domestic economic growth and income elasticity of demand for money, and negatively related to the domestic credit expansion.

Some of the monetary approach empirical studies reviewed in this paper have not only confirmed stable money demand functions but have shown evidence of causal relationships between domestic credit and balance of payments. Whereas growth in income and prices are associated with balance of payments surpluses, growth in the domestic credit generally leads to balance of payments deficits and reserve outflows. However, effect of interest rate on reserve-flow seemed to be weak, but conformed to the monetary approach predictions.

On the bases of these empirical proofs, this study concludes that the balance of payments is evidently a monetary phenomenon. Consequently, any observed disequilibrium in a country's balance of payment can, *ceteris paribus*, be adroitly corrected via adjustment of domestic credits demand, and hence the size of the foreign trade balance. The monetary authorities can do this by adopting stringent monetary disciplines to limit the growth of domestic credit, so that economic agents will cut back their expenditure relative to their income.

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