

SHORT-TERM CAPITAL MOVEMENTS AND MONETARY POLICY EFFECTIVENESS: THE NIGERIAN EXPERIENCE

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1. Introduction

Since her independence in 1960, Nigeria has remained unusually open to international trade and finance. Beyond the immediate gains from international specialisation relatively free trade has meant that Nigeria's internal price structure has been fairly closely related to world prices: free entry of foreign capital, foreign entrepreneurships and foreign technical skills have thus been of central importance to Nigeria's industrial development. However a small open economy, Nigeria is forced to operate in a constrained policy environment given foreign capital inflows. The purpose of this paper is to ascertain to what extent domestic monetary policy measures are constrained by the inflow of foreign private capital.

All the models of balance of payments adjustment for the small open economy — whether of the Keynesian, Monetary or Portfolio Balance approach — point to the long-run ineffectiveness of monetary policy under conditions of fixed exchange rates. Moreover, taking account of the increasing world capital market integration, monetary policy is also found to be ineffective in the short-run ¹.

The « ineffectiveness » conclusions for the short-run are embodied in the so-called « offsetting capital movements » hypothesis ². The hypothesis asserts that policy actions have no power over the total stock of money. Central bankers also generally claim that the interdependence of national money and credit markets permits capital flows that ultimately offset any of their actions designed to exert contractive or expansionary effects upon the economy. The models on which these conclusions are derived are based on two simplifying assumptions of either perfect capital mobility or perfect capital immobility. In the former case, the domestic interest rate is identical

1 See for example: Mundell R.A. « Capital Mobility and Stabilization Policy under fixed and flexible Exchange Rates » *Canadian Journal of Economics and Political Science* (Nov. 1963) pp. 475-485. See also Mc Kinnon R.I. & W.E. Qates « The Implications of International Economic Integration for Monetary Fiscal and Exchange - Rate Policy » *Princeton Studies in International Finance*, No. 16 (1966) pp. 1-31, and Swoboda, A.K. « Equilibrium, Quasi-Equilibrium and Macro-economic Policy under fixed Exchange Rates » *Quarterly Journal of Economics* (February 1972) pp. 162-171.

2 Porter M.G. « Capital Flows as an offset to Monetary Policy: The German Case » *IMF Staff Papers* 19 (July 1972) pp. 395-424.

that prevailing abroad (and hence parametrically fixed in a small country case), and in the latter, all deficiencies in the balance of trade are settled from official foreign exchange reserve.

Neither of these assumptions can realistically be applied to a developing open economy like Nigeria. In terms of financial institutional requirements in any financial system namely — the central bank, the commercial banking system, the national treasury, the private business sector, securities brokers and dealers and foreign exchange brokers and dealers³ — the difference with those of the developed countries is the degree of sophistication and the stage of development as well as the existence of a risk premium in the Nigeria case⁴. Nonetheless it is an open fact that even among the developed economies, the institutional developments differ. To assume perfect capital mobility and a developed capital market would be too presumptions, on the other hand, the assumption of capital immobility is overly pessimistic and does not reflect observed experience.

Our task in this paper is to reformulate the existing models of internal and external balance in the appropriate context of imperfect capital mobility. In this special case it is our contention that the capital flow offset of monetary policy could be less than complete and monetary authorities will retain some measure of control over interest rates.

The starting point of our analysis is based on the (*reduced form*) model of financial markets derived by Kouri and Porter (1974)⁵. The Kouri and Porter Model is generally regarded as a new advanced approach to the theory of offsetting capital flows under fixed exchange rates. Our Model is based on this new approach but attempts to correct some of the assumptions of that model (particularly that of perfect capital mobility) that are not appropriate for a developing open economy with inefficient but growing capital market. Also certain omissions relevant for effective policy formulation will be discussed and introduced into our model. The model is empirically tested using Nigerian data.

3 For a fuller analysis see - Black S.W. « International Money Markets and Flexible Exchange Rates », *Princeton Studies in International Finance* No. 32 (1973).

4 The Asset markets must however be broad enough with a sufficient number of participants to approximate the concept of an efficient market in which current prices always fully reflect all available information (Fama - 1970).

5 Kouri P.J. and M.G. Porter « International Capital Flows and Portfolio Equilibrium » *Journal of Political Economy* Vol. 82 (1974) pp. 443-467.

2. The Model

A. The Perfect Capital Mobility Case

The Kouri-Porter Model is based upon an analysis of the financial markets and includes three kind of financial assets: — money, domestic government securities and foreign government securities. Income and trade balance are exogenously given.

We can summarize their model in terms of the following relationships:

$$M_d = L(i, i_f, y, w) \quad (1.1)$$

$$M^s = DA + FR \quad (1.2)$$

$$M^s = M_d \quad (1.3)$$

$$\Delta FR = (X - M) + K \quad (1.4)$$

$$H^{pd} = H(i, i_f, y, w) \quad (1.5)$$

$$H^{fd} = F(i, i_f, y_f, w_f) \quad (1.6)$$

$$H^{ps} = NDS - DA \quad (1.7)$$

$$H^{pd} = H^{fd} + H^{ps} \quad (1.8)$$

$$F^{psd} = N(i, i_f, y, w) \quad (1.9)$$

$$K = \Delta H^{fd} - \Delta F^{psd} \quad (1.10)$$

$$W = M_d + H^{fd} + F^{psd} \quad (1.11)$$

The above system of equations can be described as follows. The domestic demand for domestic securities (H^{pd}) is assumed to depend positively on the own rate of interest and negatively on the level of domestic income and foreign interest rates, the foreign demand for domestic securities (H^{fd}) is given in equation (1.6) and since domestic bonds are assumed to be substitutes for foreign assets, at least in this limiting case of perfect capital mobility, H^{fd} will depend negatively on foreign interest rate and foreign income, and positively on domestic interest rate. The supply of domestic securities to the private sector (H^{ps}) in equation (1.7) is equal to the total stock of domestic securities issued NDS less the stock of domestic securities held by the monetary authorities. NDS is assumed to be net of matured securities. Equation (1.8) gives the equilibrium condition for the domestic securities market. A similar set of relations is worked out for the foreign securities market, however, since the domestic economy is assumed to be so small that the foreign supply of bonds is infinitely elastic at the foreign interest rate only equation (1.9) is retained. Two important relations are also significant. First equation (1.10) derives from the definition of international

nal capital flow as the difference between changes in foreign demand for domestic securities and changes in domestic demand for foreign securities which is an improvement on earlier specifications. Another major difference between the Kouri-Porter model and Mundellian⁶ IS-LM analysis, is the introduction of the wealth (W) in the behavioural relations and the explicit specification of the wealth constraint (1.11).

As in the traditional models, the money market contains equations (1.1, 1.2, and 1.3). Equation (1.1) is the usual demand for money function. It is assumed that the domestic public holds both domestic and foreign denominated currency. Domestic demand for foreign currency derives from the use of same as an international medium of exchange. Crucial to the model is the money supply equation (1.2) which is equal to the sum of the domestic assets (DA) that are backing the money base stock and of the stock of international reserves (R). The equilibrium condition of the money market is given in equation (1.3); while the link between the international reserve component of the money supply and the balance of payments is given in (1.4), and equation 1.12 defines the balance of payments.

$$K = K(i, if) \text{ with } K_i > 0 \text{ and } K_{if} < 0 \quad (1.12)$$

The model is solved for net capital flows as a function of the exogenous variables which include DA, $(X - M)$, i and Y . Within this framework, Kouri and Porter's objective was to arrive at a manageable model with testable implications for international capital movements. Thus for the limiting case of perfect capital mobility, their formulation reduced to:

$$K = L_{if}\Delta i + LY\Delta Y - \Delta DA - (X - M) + LW\Delta W \quad (1.13)$$

It can be seen that abstracting from the role of wealth, (1.13) restates (1.14) which we derived from Mundell's framework even without specifying the securities market. Thus it can be concluded that the above framework was already present, though implicitly, in earlier models.

B. *Extension of the Model: The Imperfect Capital Mobility Case*

The assumption of perfect capital mobility in the Kouri-Porter model implies that the domestic interest rate « i » is always equal to foreign interest rate « if ». Moreover, if is

6 Much of Mundell's contribution is spread over several articles. These articles are collected in R. Mundell *International Economics* New York, 1968.

exogenous since the small country assumption guarantees that the country in question cannot influence the world interest rate.

This assumption breaks down when we consider the case of imperfect mobility of capital. If foreign and domestic securities are not perfect substitutes an increase in the supply of bonds will not lead to an equivalent capital inflow as argued earlier. This point is illustrated graphically in Figure 1.

R^D and R^S refer to demand and supply of bank reserves and it is interest rate.

Figure 1 depicts the effect of monetay policy on interest rate and bank reserves under imperfect capital mobility.

Consider the effect of an open market sale of bonds in an amount which reduces the supply of bank reserves from R^s to R^{s1} . In the case of a closed economy, a reduction in bank reserves of that size would have raised the interest rate from i^* to i_1 . But in an open economy case, the higher interest rate will attract a capital inflow which will require the authorities selling more reserves in the open market in order to maintain its fixed exchange rate. In this case the offsetting capital inflow and the corresponding increase in bank reserves will equal R_2R_3 . The resultant increase in interest rate to i_2 is less than it would have been in a closed economy case. However, and the most important point is that, the authorities are able to vary the level of interest rate. So long as foreign and domestic bonds are not perfect substitutes, the authorities can still influence bank reserves and the interest rates. For instance, the monetary authorities can compensate for capital flows which partially offset changes in policy action by increasing the magnitude of the policy change.

Given the undeveloped nature of the Nigerian capital market, it is more reasonable to expect that domestic bonds cannot be regarded as perfect substitutes of foreign bonds. Hence to make the Kouri-Poter model, analysed above, appropriate and relevant for policy prescriptions in the Nigerian case, we need to reformulate it basically for the special case of non-perfect capital mobility.

The system of equations in the Kouri-Porter model may be reduced to the following equations:

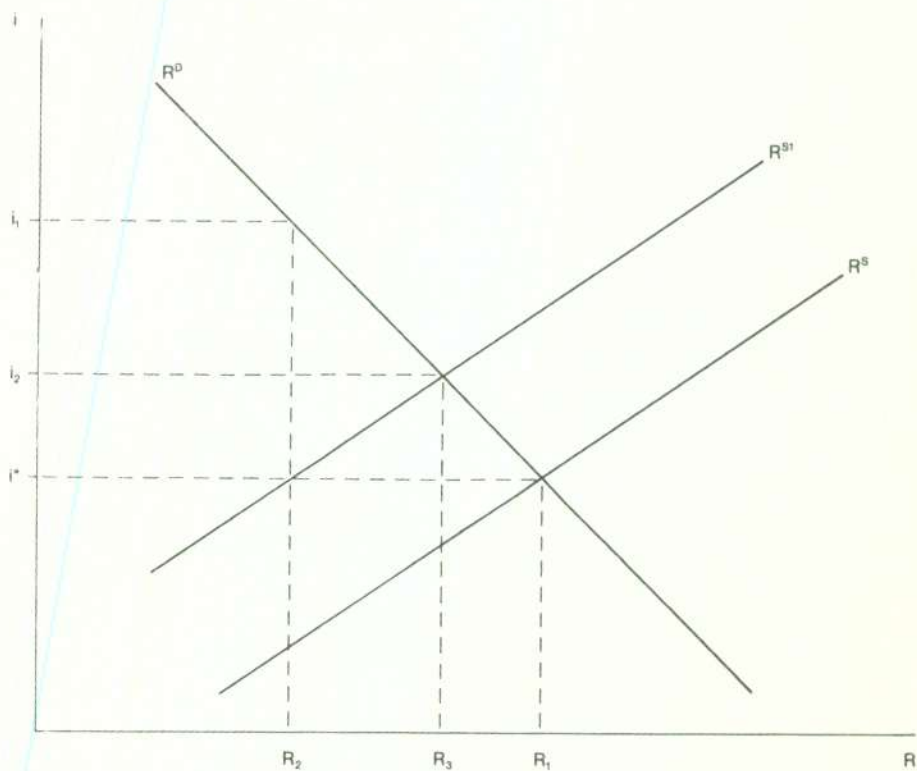
$$L(i, Y, W) = \Delta DA + (X - M) + K \quad (1.15)$$

$$\Delta F(i, Y_f, W_f) = \Delta N(i, Y, W) \quad (1.16)$$

We can then solve for net capital flows and the domestic interest rate as functions of the exogenous variables.

FIGURE 1

CAPITAL MOBILITY AND THE EFFECTIVENESS OF MONETARY POLICY



For the solution of domestic interest rate, we substitute (1.16) into (1.15) and expand to obtain ⁸.

$$\Delta i = -1/(H_i + F_i) [(H_{if} + F_{if}) \Delta i + H_Y \Delta Y + (H_W - 1) \Delta W + DA + (X - M) + F_Y \Delta Y_f + F_W \Delta W_f] \quad (1.17)$$

To solve for net capital flows, we expand (1.16) as follows:

$$K = F_i \Delta i + F_{if} \Delta i_f + F_Y \Delta Y_f + F_W \Delta W_f - N_i \Delta i - N_{if} \Delta i_f - N_Y \Delta Y - N_W \Delta W \quad (1.18)$$

7 It should be emphasized that under the assumption of perfect capital mobility, the interest sensitivity of K is believed to tend towards infinity, hence the multiplier of monetary policy becomes zero and monetary policy is ineffective on the output market.

$$\Delta Y / \Delta DA = 0 \text{ as } K \rightarrow \infty$$

On the other hand, the impact of government fiscal policy is given by

$$\Delta Y / \Delta G = 1/1 - A_Y + M_Y$$

where $Y = A + G + (X - M)$

and $A = A(i, Y)$

(A = total absorption i.e private consumption plus investment expenditure from equation 1.1 to 1.3) and that the domestic interest rate must always equal the exogenously given foreign rate of interest, by implication, it follows that $L(i_f, Y) = DA + FR$ and taking differences becomes:

$$L_{if} \Delta i_f + L_Y \Delta Y = \Delta DA + \Delta FR$$

which by substituting (1.4) yields

$$L_{if} \Delta i_f + L_Y \Delta Y = \Delta DA + (X - M) + K.$$

The above expression can be re-stated so that all offsetting takes place through the capital account of the balance of payments.

$$K = L_{if} \Delta i_f + L_Y \Delta Y - \Delta DA - (X - M) \quad (1.14)$$

derived directly from the Mundellian IS — LM Model.

8 Substitution of (1.16) into (1.15) and by re-arranging yields
 $(L_i - F_i + N_i) \Delta i = (F_{if} - L_{if} - N_{if}) \Delta i_f + (-L_Y - N_Y) \Delta Y + (-L_W - N_W) \Delta W + \Delta DA + (X - M) + F_Y \Delta Y_f + F_W \Delta W_f$
 But from previous specification, we know that:

$$L_i + N_i = -H_i$$

$$L_{if} + N_{if} = -H_{if}$$

$$L_Y + N_Y = -H_Y$$

$$L_W + N_W = -H_W$$

substitution of these and
re-writing yields (1.17)

collecting terms we get

$$K = (F_i - N_i) \Delta i + (F_{if} - N_{if}) \Delta if + F_{Yf} \Delta Y + F_{Wf} \Delta W - N_Y \Delta Y - N_W \Delta W \quad (1.19)$$

We then substitute the solution for the domestic interest rate (1.17) into (1.19) to obtain

$$K = (F_i - N_i) / (H_i + F_i) [(H_{if} + F_{if}) \Delta if + H_Y \Delta Y + (H_W - 1) \Delta W + \Delta DA + (X - M) + F_{Yf} \Delta Y + F_{Wf} \Delta W] + (F_{if} - N_{if}) \Delta if + F_{Yf} \Delta Y + F_{Wf} \Delta W - N_Y \Delta Y - N_W \Delta W \quad (1.20)$$

Then by re-arranging terms and substituting earlier conclusions we obtain the net capital flow equation as follows⁹.

$$K = 1/H_i + F_i \{ [(N_i - F_i) L_{if} + (F_{if} - N_{if}) L_i] \Delta if + [(N_i - F_i) L_i - L_i N_Y] \Delta Y + (F_i - N_i) \Delta DA + (F_i - N_i) (X - M) + [(N_i - F_i) L_W - L_i N_W] \Delta W + L_i F_{Yf} \Delta Y + L_i F_{Wf} \Delta W \} \quad (1.21)$$

Equation (1.21) presents the general formulation of capital flows for the imperfect capital mobility case. It is evident from (1.21) that the offset coefficients should be different from minus one thus making sterilization policies possible. The magnitude of the sterilization coefficient is however an empirical question the answer to which we shall attend to in the next section.

C. Empirical Estimation of the Model

Ideally in order to test the model, we need to estimate simultaneously the complete set of structural equations. With the use of the a priori constraints, all of the structural parameters could be identified. This approach, however, contains serious difficulties, the most significant of which being the unavailability of adequate and reliable data on the various stocks of assets and interest rates needed for simultaneous estimation. (Although we have in the earlier study obtained a number of structural estimates). To be able to do this, we require a considerable institutional detail in order to adapt the theoretical framework to the peculiarities of the Nigerian monetary sector. Without

⁹ We know as before that:

$$N_i + H_i = -L_i$$

$$N_{if} + H_{if} = -L_{if}$$

$$N_Y + H_Y = -L_Y$$

$$N_W + H_W = -L_W \text{ so that by applying the above relationships, (1.21) is derived.}$$

such details (such as money supply process, structure of interest rates and commercial bank portfolio, etc), which are hard to come by, a comprehensive model of the monetary sector is impossible and any attempt at simultaneous estimation will be fruitless.

The above considerations suggest the alternative approach of estimating the reduced form equation¹⁰ of the previous section directly. This approach provides the critical information on most of the questions that we are primarily concerned with, especially the effect of income changes and monetary policy on the capital account and the relationship between capital flows and current account balance.

The estimating equation thus becomes:

$$K_t = a_0 + a_1\Delta Y + a_2\Delta if + a_3\Delta NDC + a_4CAB + a_5\Delta WD + a_6\Delta Wf + ut \quad (1.22)$$

where the variables are as previously defined. The variables are all obtainable from published statistical materials of the Central Bank of Nigeria and International Monetary Fund (IMF) except for the wealth variables, the construction of which is described in the appendix. From the model we expect that if the degree of capital mobility is high, the coefficient of foreign wealth a_6 will tend to be very small approaching zero in the limiting case of perfect capital mobility. The reverse is the case if perfect capital immobility obtains. With respect to other coefficients, it is expected from the structure of the model, that $a_1 > 0$, $a_2 < 0$, $-1 \leq a_3 \leq 0$, $-1 \leq a_4 \leq 0$. We can on the basis of the above conduct one-tailed tests of the significance of these coefficients. More importantly, we expect that $a_3 = a_4$ and that both tend towards minus one as capital mobility becomes perfect.

In the estimation, total capital flows K are taken as the sum of capital flows of the public, net capital flows commercial banks and errors and omissions. Also all those components of the capital account that can be regarded as autonomous are added to the current account. For purposes of comparison we estimated two variants of the model. In the first variant (K_1) only private capital flows were included in the dependent variable, with official capital flows added to current balance (CAB_2). In the second variant, all capital flows (K_2) private and official (non-reserve items) were used as independent variable. In this alternative, the current account balance is just $(X - M)$ and so excludes any autonomous capital flow. Thirdly we also single out short-term capital flows (K_3) for consideration. In the estimation of K_3 , long-term capital is consi-

10 This approach was adopted by Kouri and Porter for the same reasons.

dered exogenous and added to the current account balance. This is analogous to the basic balance concept which derives from the fact that a current-account deficit may be financed on a continuing basis by the inflow of direct long-term investment from abroad. Speculative movements are considered inapplicable in this case as a result of previous results and discussion with monetary and banking experts. As a measure of monetary policy, two separate instruments were incorporated into the equation; namely changes in net stock of domestic credit of the Central Bank of Nigeria to the economy (ΔNDC) and changes in the statutory reserve requirements imposed on commercial banks (ΔRR).

The model was then estimated by use of annual data for the period 1959-1977. The starting point of our estimation period is largely determined by data availability. Prior to 1959, monetary policy administration in Nigeria was undertaken by the West African Currency Board (WACB) the operations of which are quite different from those of a typical modern central bank. The Central Bank of Nigeria was established by statute in 1958 and became functional in 1959. Monetary data before this date are therefore inadequate and unreliable.

The estimated results are reported in Table (1.1).

Generally the overall explanatory power of the equations is satisfactory. The Durbin-Watson shows the presence of negative serial correlation in two of the cases (equations 2 and 3) and this was corrected by means of the Cochrane-Orcutt iterative technique. The coefficients are statistically significant and have the expected sign. However the coefficient of foreign wealth and sometimes interest rate are not significant, even though they both carry the expected signs.

The income coefficient is significant in all the equations thus indicating that changes in income create changes in money demand which are at least partially satisfied by capital flows. The coefficient of ΔNDC , the offset coefficient which measures the extent to which capital flows offset changes in the domestic monetary base is statistically significant in all cases. The point estimates of -0.44 -0.58 and -0.36 respectively are significantly different from minus one, which suggests that sterilization is possible as we hypothesized, at least in the special case of imperfect capital mobility. Similarly the offset coefficients on the current account balance are statistically significant and most strikingly identical to those on the domestic component of the money base, in each of the equations as was expected. This contrasts with the results of Kouri and Porter where they found the offset coefficients for the current account component of the mo-

ney base to be substantially higher than those for the domestic component of the money base (see Table 1.3).

Table 1.1

ESTIMATES OF THE REDUCED-FORM CAPITAL FLOW EQUATIONS FOR MONETARY POLICY I

Equation No.	Dependant Variable	Constant	ΔY	Δif	ΔNDC	CAB	ΔRR	ΔWWD	ΔWF	R^2	DW	ρ	SE
1	K_1	57.70 (2.31)	0.046 (2.04)	-22.20 (1.73)	-0.44 (3.48)	-0.44 (3.78)	4.68 (2.86)	-0.48 (2.32)	0.30 (2.38)	0.77	2.14	0.09	46.84
2	K_2	88.82 (5.50)	0.068 (3.22)	-15.64 (1.25)	-0.54 (3.28)	-0.55 (3.90)	5.94 (2.61)	-0.78 (2.84)	0.16 (1.41)	0.87	2.15	-0.55	47.77
3	K_3	58.07 (4.87)	0.041 (2.10)	-10.39 (1.97)	-0.36 (2.33)	-0.34 (2.42)	3.98 (2.01)	-0.55 (2.37)	-0.11 (1.39)	0.84	2.36	-0.57	37.48

Note: The sample period = 1960-1977. All values are in N million. In regression 1, CAB includes exogenously determined official capital flows and in equation No3, K_3 , is short-term capital flows alone with long-term capital included in CAB. Other Variables are defined as follows: ΔY = change in income at annual rate, Δif = change in foreign interest rate, ΔNDC = change in net domestic credits of the Central Bank, CAB = current account Balance including official/long-term capital flows as defined, ΔRR = policy determined change in required reserves, ΔWWD = change in domestic wealth, and ΔWF = change in foreign wealth, R^2 and S.E. are adjusted for degrees of freedom and D.W. is Durbin-Watson Statistics, ρ = autoregressive coefficient. Figures in parenthesis = t statistics.

No good explanation could be given for their observed differences; even though, the model requires that the offset coefficient on all predetermined sources of base money creation should be equal ¹¹.

The required reserve coefficients in each of the equations is statistically significant but comparably very high, pointing to a strong offsetting by induced capital movements. This high value may have resulted from the fact we used changes in total amount of reserve obligations with the central bank instead of the ratio of liberated reserves to total required reserves which Kouri and Porter used. The domestic wealth term is significant and opposite in sign to the foreign wealth variable. While the former indicates capital outflow as domestic wealth rises, increases in foreign wealth lead to inflow of foreign capital. Unfortunately the foreign wealth variable is significant only in one occasion i.e. in equation 1 with K_1 as the dependent variable. An equally

11 The inclusion of the current account as well as the change in Domestic Credit in our estimating equation can be justified by the fact that they both affect capital flows since they constitute autonomous sources of change in the monetary base.

poor statistical significance is also observed in the case of foreign interest rate, however in two out of the three equations it was significant at 10 per cent level of confidence. Nevertheless as long as the demand for money is interest-sensitive, one would expect the coefficient on foreign interest rate to be statistically different from zero. The observed low significance of this variable may partly be explained by our use of a weighted average foreign interest rate, which may not in all cases be the representative foreign interest rate. Kouri and Porter however obtained an interest rate coefficient statistically not different from zero even though they used Euro-dollar rate as proxy¹². Another possible cause might be our failure to explicitly incorporate exchange rate expectations in our model. We had earlier tried to represent this by use of changes in Reserve/Trade ratio as a measure of a government reaction function to speculative pressures but the result was not satisfactory. Also dummy variable introduced for those periods when there were definite expectations of parity changes (for example the 1967 devaluation of sterling and the 1971 devaluation of the dollar) did not yield any statistically significant result.

C.1. Distinction between Government Debt and Banks Discount Borrowing

Although the coefficient of domestic monetary base (ΔNDC) has a strong explanatory power and indicates a possibility of sterilization as we expected, it still remains an aggregated variable which is the sum of commercial bank discount borrowing from the Central Bank, and Federal Government debt. We feel however that it will be important to distinguish between government debt and private debt. This is necessary because since open market operations are negligible or even not applicable in Nigerian monetary management, changes in government borrowing from the Central Bank must be seen as resulting from government economic development financing needs (i.e. monetary-fiscal policies).

Moreover, the supply of bank reserves depends not only on their holdings of free reserves, but also on the flow of foreign capital and the reaction function of the monetary authorities. Thus since ΔNDC contains this principal endogenous contribution of gross borrowing by banks from the Central Bank, it may well be that treating (ΔNDC), the change in total stock of net domestic assets of the Central Bank, as exogenous variable, may be subject to a simultaneous equation bias.

12 Kouri P. and M.G. Porter « *op. cit.* » pp. 455-461.

This would follow from the fact that the monetary authorities in setting the domestic source component are guided by inflows and outflows of capital. Since the reaction of the monetary authorities can go into opposite directions the direction of bias is by no means obvious, hence a few observations may therefore be necessary.

- (a) The monetary Authorities may try to change ΔNDC in order to offset liquidity effects of payments deficits and surpluses. Possibly, they may also assign monetary policy to balance of payments target and thus follow the rules of the game. These of the game (e.g increase rather than decrease ΔNDC in response to an inflow of capital) give rise to possible bias in the estimation of the model by CLS. In the case of sterilization, it can be shown that the offset coefficient is biased towards minus one while in the other case it is biased towards zero¹³.
- (b) The actions of the monetary authorities are more likely to be directed to the whole balance of payments rather than to the capital account alone. Consequently, the simultaneous equation bias is likely to be more serious in estimates of offsetting parameters in the total balance of payments than in the capital account. In the latter case also, other factors such as current account balance play a crucial role in the determination of the domestic source component of the monetary base with the result that the simultaneous equation bias is reduced.

Given the above considerations, we shall disaggregate changes in domestic source component of the money base (ΔNDC) into changes in government debt and changes in private debt or discount borrowing (i.e GD and DB). In Nigeria, as we argued previously, changes in the government debt component are not due to the actions of the Central Bank but rather the actions of the Treasury (or The Federal Ministry of Finance) and thus occurs in response to the budgetary process rather than to the balance of payments. There is thus no reason to assume a significant simultaneous equation bias. Rediscounts of the commercial banks with the Central Bank may, however, be dominated by automatic responses to money market conditions in general and capital movements in particular. The results of this distinction are presented in table (1.2).

All the results of the previous estimates in Table 1.1 are also repeated here and the comments made earlier-on apply. Most significantly however, we find that by disaggregating the domestic source component commercial bank discount borrowing

13 See Kouri P.T. and M.G. Porter = *op. cit.* = pp. 453-454.

Table 1.2

ESTIMATES OF REDUCED-FORM CAPITAL FLOW EQUATIONS FOR MONETARY POLICY II

Equation No.	Dependent Variable	Constant	ΔY	Δi	ΔGD	ΔDB
4	K_1	52.65 (2.38)	0.065 (2.09)*	-28.95 (1.78)	-0.41 (2.72)	-0.69 (2.14)
5	K_2	91.85 (4.87)	0.057 (1.78)	-14.17 (0.92)	-0.52 (2.98)	-0.37 (0.93)
6	K_3	50.17 (4.20)	0.049 (2.08)	-25.67 (2.27)	-0.35 (2.25)	-0.64 (2.43)

Note: ΔGD = change in government debt and ΔDB = change in commercial bank discount borrowing from the Central Bank. All other variables are as previously defined. The results are OLSQ estimate and figures in parenthesis = t statistic.

seem to dominate government debt in equations 4 and 6; equation 5 is an exception, but since its dependent variable is least dependable, it may well be ignored.

It can indeed be argued that the offsetting behaviour of commercial banks, (mostly subsidiaries of foreign multinational banks), via capital inflows is confirmed by estimates of table (1.3). Thus from the evidence we may conclude that the possibilities of offsetting domestic policy action is almost exclusively due to commercial banks flows. It can be seen from the result that the coefficient on government debt which is a sub-component of domestic money base, matches equally offset coefficients of current account component of the money base thus leaving the commercial bank behaviour unaccounted. For policy effectiveness therefore, the role of commercial banks in offsetting domestic monetary policy actions may not be neglected. It might thus be appropriate to introduce changes in the official discount rate as the instrument of monetary policy. We would expect theoretically that an increase in the discount rate will lead to capital inflows. However, in empirical tests of same structural equations by the author¹⁴ the coefficient of changes in the discount rate had negative sign and was often statistically insignificant. This might result from the problem of multicollinearity between the discount rate and foreign interest¹⁵.

14 J.E. Ezike, "A Structural Model of the Nigerian Balance of Payments 1957-1977", unpublished Ph.D Thesis University of Exeter 1981.

15 Brown 1966; has shown that the rate at which Treasury Bill rates were issued by the Central Bank have followed the Treasury Bill rate in London rather closely. Also he observed that the Central Bank may not

CAB	ΔRR	ΔWD	ΔWI	R^2	D.W	9	S.E.
- 0.44 (3.36)	5.36 (2.72)	- 0.54 (2.21)	0.37 (2.54)	0.78	1.99	- 0.089	48.36
- 0.51 (3.38)	4.98 (1.78)	- 0.68 (2.18)	0.14 (1.04)	0.87	2.09	- 0.45	50.37
- 0.36 (2.52)	4.72 (2.27)	- 0.53 (2.03)	0.02 (0.26)	0.86	2.73	- 0.66	37.39

Also the discount rate may not represent a purely independent variable. As earlier observed, the discount rate may be endogenous in that the Central Bank adjusts it according to monetary developments especially on the foreign sector. Hence problems of simultaneity may as well explain the poor results with the discount rate.

D. Summary and Policy Implications

Our objective in this paper was to investigate the possibilities of monetary control in Nigeria under the basic assumption that capital mobility is not perfect.

We found in the first case that the offset coefficient on the domestic component of money supply (ΔNDC) approximates the offset coefficient in the current account component. In each case the coefficients are significantly different from minus one thus indicating that sterilization is possible at least in a quasi-equilibrium situation, if the Central Bank is willing to accumulate or lose reserves. We also found that by using a non-linear money supply approach, and thereby accounting for the role of the commercial banks in the offsetting of domestic policy actions, we obtain better information on offsetting capital flows. In the unique case of Nigeria where most commercial banks are (until very recently) wholly owned or dominated by foreigners, we observed that commercial bank's capital movements are the main source of offsetting behaviour which emasculates short-run monetary policy action of the Central Bank. These findings confirm our hypothesis that in the special case of imperfect capital mobility which is more appropriate to a developing open economy like Nigeria, monetary authorities still will retain some measure of control. It also

successfully control commercial bank credits in Nigeria because a rise in Rediscount rate would cause expatriate banks to seek their finance abroad. See Brown C.V. « The Nigeria Banking System », *University of Glasgow Social and Economic Studies* No. 8, Allien & Unwin Ltd. 1966 pp. 152-153 and pp. 170-180.

shows that such control should be directed towards commercial bank behaviour. To be effective, such monetary instruments less valuable to offsetting capital flows, such as direct controls of bank lending and other means of credit rationing (e.g. selective credit allocation), should necessarily be useful.

Appendix

The Foreign Wealth Variable

The proxy variable for the stock of wealth held by foreigners (WF) was computed as the sum of « permanent income » series for six representative countries that have trade relationship with Nigeria, namely France, Western Germany, Italy, Japan, the United Kingdom and the United States of America. These countries represented « the rest of the world » in our formulation.

Specifically, the permanent income hypothesis can be described mathematically as follows:

$$Y_{pt} = BY_t + B(1-B)Y_{t-1} + B(1-B)^2Y_{t-2} + \dots + B(1-B)^nY_{t-n} \quad (1.23)$$

where B_2 is the weight attached to this year's level of measured income or what is the same thing, the coefficient of adjustment in an adaptive expectations model.

Equation (1.23) is rather unwieldy and can be simplified through manipulation and re-arrangement to become

$$Y_{pt} = BY_t + (1-B)Y_{pt-1} \quad (1.24)$$

We must point out however, that in a dynamic world of steady growth, this kind of weighting scheme would lead to a continuous underprediction of current permanent income. In order to account for the possibility of underprediction, we shall in conformity with usual practice, add a secular trend term (T) to the weighted average. With this addition, the final form of the equation for permanent income in time t now becomes

$$Y_{pt} = BY_t + (1-B+\bar{T})Y_{pt-1} \quad (1.25)$$

where \bar{T} is the expected rate of growth in income.

Based on equation (1.25) above, permanent income series were computed for each of the six countries representing « the rest of the world » using data on gross national

product (GNP) as the current income variable. The method of computation and determination of the appropriate adjustment coefficient was as suggested in Herring (1973) ¹⁶ and Marston and Herring (1977) ¹⁷.

LES MOUVEMENTS DE CAPITAL A COURT TERME ET L'EFFICACITÉ DE LA POLITIQUE MONÉTAIRE: LE CAS DU NIGERIA.

RESUME

Les flux de capitale international sont le trait d'union entre les marchés de capitaux nationaux et les taux de rendement dans les différents marchés dont les modèles se basent traditionnellement sur une série d'activités indépendantes et notamment le commerce, l'arbitrage des intérêts et les spéculations sur le marché à terme.

D'après la théorie des flux de capital international à court terme, si les autorités monétaires pouvaient maintenir un différentiel des intérêts à court terme favorable, elles pourraient compter sur les mouvements de capital à court terme pour financer un déficit constant de la balance des paiements en compte courant. Cependant, des modèles successifs d'ajustement de la balance des paiements mis à point pour les petites économies ouvertes démontrent l'inefficacité de la politique monétaire en situation de flux libres de capital international à court terme en régime de taux de change fixes. On estime que dans des conditions pareilles, les mesures de la politique monétaire visant à ajuster les déséquilibres de la balance des paiements seraient effacées ou compensées par les flux de capital international à court terme.

Pour soutenir ce point de vue, Kouri et Porter (1974) ont mis à point un modèle réduit du secteur financier basé sur une analyse des marchés financiers qui est considéré comme une approche nouvelle et très avancée à la théorie de la compensation des flux de capital en régime de taux de change fixes. Le modèle présenté dans cet article se base sur cette nouvelle approche, tout en essayant de corriger les prémisses du

16 Herring, R.J. « International Financial Integration, Capital flows and Interest rate relationship among six industrial Nations » Ph. D Dissertation, Princeton University, Princeton XN. J. 1973; pp. 52-53.

17 Herring, R.J. and R.C. Marston, « National Monetary Policies and International Financial Markets », Amsterdam, North-Holland 1977 pp. 220-221.

modèle Kouri- Porter qui ne s'adaptait pas à une économie ouverte en voie de développement avec un marché des capitaux qui ne fonctionne pas très efficacement, mais qui se développe rapidement. Plus précisément, les auteurs ont formulé ce nouveau modèle sur la prémisse que les flux de capital sont imparfaits. Si on accepte cette prémisse, on doit conclure que la politique monétaire n'est pas complètement bridée par les flux de capital international à long terme, et que les autorités monétaires gardent une certaine capacité de contrôle.

Le modèle a été mis à l'essai en utilisant les données nigérianes de la période 1969/1977. Sur la base d'estimations empiriques, on a observé que le coefficient de compensation sur la composante nationale de l'offre de monnaie se rapproche du coefficient de compensation dans le compte courant. Dans le deux cas, les coefficients sont significativement différent de moins 1 (-1) ce qui démontre que la stérilisation est possible, au moins dans une situation de presque équilibre.

On a observé également que dans le seul cas du Nigéria, où jusqu'à il n'y a pas longtemps c'était encore les étrangers qui possédaient ou de toute façon dominaient les banques commerciales, les mouvements de capital de ces banques étaient la cause principale des effets de compensation qui bridaient les mesures de la politique monétaire à court terme de la Banque Centrale.

Ces données confirment donc l'opinion des auteurs que, dans les cas de mobilité imparfaite du capital, les autorités monétaires gardent une certaine capacité de contrôle, et que dans le cas du Nigéria ce contrôle devrait être exercé sur les activités des Banques commerciales. La recherche future doit donc viser à analyser les opérations de mouvement de capital des banques commerciales et à identifier la façon dont on peut les contrôler.