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POLICY TOWARD SHORT-TERM CAPITAL MOVEMENTS: SOME IMPLICATIONS OF THE PORTFOLIO APPROACH

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1 INTRODUCTION: CAPITAL FLOWS AND POLICY

THE SOURCES of policymakers' interest in international financial capital movements can be divided into three major categories: the actual or potential effects of such capital movements on (a) the balance of payments; (b) domestic monetary management; and (c) the efficiency of resource allocation. While the same capital movement, or policy toward capital movements, may have effects under all three categories, it is useful to keep the three conceptually distinct.

Concern over the *balance-of-payments effects* of capital movements ranges from the desire to prevent or offset potential capital flows themselves to the active manipulation of capital movements to offset a net surplus or deficit in the rest of a country's balance of payments. Discussions of the *effects on domestic monetary management of financial capital movements* are usually concerned with the reduced ability to follow an independent monetary policy implied by high capital mobility, although it should be noted that some countries manipulate the foreign asset and liability positions of their commercial banks in lieu of open-market operations to influence the domestic money market.[1]

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[1] See, for instance, Katz [13].

Concern over the *resource-allocation effects* of financial capital movements results from the fact that for numerous reasons, including the existence of disequilibrium exchange rates, the private and social costs and returns from international financial capital movements will often not be the same. International differences in interest rates often do not adequately reflect international differences in the productivity of capital; thus, false signals may be given to private investors and borrowers. Furthermore, deficiencies in the adjustment mechanism can cause a transfer problem—"desirable" net movements of financial capital may not generate commensurate movements of real resources.[2]

In many cases, these distortions are the result of poor functioning of the international monetary system. For instance, greater flexibility of exchange rates should substantially reduce the type of large, volatile movements of capital observed recently when parities came under suspicion, and, likewise, should reduce the distortions (pointed out by Lutz [17]) caused by differential inflation premiums in the interest rates of countries connected by temporarily fixed exchange rates. Similarly, the transfer of real resources in response to net capital movements would be facilitated.

In such a situation, the best solution would be reform of the exchange-rate system. But if this is not possible, there is a case for the use of selective measures as a second-best policy. In addition, selective

[2] We use *desirable* deliberately, as a weasel word without full definition. An attempt to give a precise definition would raise enough controversial questions to last a full paper if not a volume. (What, for instance, was the social productivity of the speculative capital flows which preceded the British devaluation in 1967, and how does this compare with the productivity of the movements in earlier crises? Obviously, it would be difficult to secure general agreement on the answers to these questions.)

The productivity gains from international capital movements have often been assumed to occur only when net movements result in the transfer of real resources. There are additional sources of potential economic gain, however. Cross flows of capital which result in no net direct resource transfers may still increase economic efficiency. Specialized knowledge and complementarity between specific economic activities (such as possible benefits from internal financing) explain much of the cross flows between countries. Another possible source of gain from gross flows (unconnected with real resource transfers via the trade balance) is differences in liquidity preference such that a country may, for instance, lend short and borrow long. Such international financial intermediation has been pointed to by Despres, Kindleberger, and Salant [3], and has been the subject of refinement and empirical investigation by other authors, such as Laffer and Salant in this volume. See also the critical commentary by Halm [10] and Triffin [22]. A third type of gain comes from the possibility of reducing aggregate risk through portfolio diversification. See, for instance, Grubel [8].

measures may correct market imperfections not connected directly with the exchange-rate system. For example, while the Interest Equalization Tax was enacted primarily for balance-of-payments reasons (as a second-best policy to exchange-rate adjustments), it has given infant-industry protection to the development of European capital markets. Thus, it probably has had a beneficial long-run effect on the efficiency of resource allocation.

Within any given exchange-rate system, policy measures toward movements of financial capital can be grouped into four major categories:

1. General monetary (interest-rate) policy can be adjusted to induce or prevent capital movements.

2. Selective measures can be used for this purpose. These can range from attempting to twist the structure of interest rates or the use of official forward intervention or swaps, through moral suasion (voluntary controls), to formal requirements or controls and fiscal (tax and/or subsidy) measures designed to influence the relative profitability of investing, or borrowing, at home and abroad. These may be applied in a general or discriminating manner and may be used either to affect particular capital movements directly or to offset them by inducing private capital movements in the opposite direction.

3. Capital movements may be financed by reserve movements or official borrowing and lending.

4. Other components of the balance of payments may be allowed, or forced, to adjust to capital movements.

In addition, as we have briefly indicated above, changes in the exchange-rate system may have important influences on capital movements. For example, moving toward a system in which exchange rates are changed frequently – or even continuously – in small amounts should reduce the frequency of sudden, large capital shifts as the viability of existing rates comes into question under the present system of adjustable pegs. In turn, assurance that exchange rates will remain fairly close to equilibrium should make official financing of transitory flows of capital more acceptable than under the current system.

The feasibility of using official financing to offset undesired capital movements in place of preventing them by the adjustment of interest rates, or by the use of selective measures, will be crucially affected by the size and duration of such movements. Where capital movements are primarily of the nature of stock adjustments, or their size is fairly small relative to activity in domestic money markets, ample reserves or official borrowing facilities would allow countries to maintain a reasonable degree of monetary independence without the need to resort to selective measures. A change in interest rates or other incentives for capital movements would lead primarily to a one-shot adjustment of portfolios. This adjustment would exert a temporary effect on the balance of payments and could probably be handled by the use of reserves. On the other hand, if large quantities of capital would continue to move internationally as long as differential incentives remained, official financing could not provide substantive monetary independence. The magnitudes and stock-flow relationships of internationally mobile funds are thus of critical importance in determining a desirable policy strategy. These factors also influence the relative desirability of using interest-rate policy or selective measures to suppress capital movements. The greater is the interest sensitivity of international capital movements and the greater are continuing flows, the less are the costs of using interest-rate policy.[3]

Thus, in formulating policies toward financial capital movements it is important to have a proper theoretical view of the nature of these movements and some idea of their likely magnitudes. Obtaining reasonable quantitative estimates of these magnitudes depends in turn on the proper specification of the estimating equation, i.e., upon the use of a proper theoretical framework.

In Section 2 we briefly outline the portfolio-balance model of capital movements and discuss some implications of this model for balance-of-payments policy and for research on capital movements. In Section 3 we describe the empirical implementation of the portfolio model to estimate an equation for changes in short-term American claims on foreigners, using quarterly data for 1960–64; in Section 4, the data sample is extended to 1968 and the effects on short-term claims of the capital-controls program of the United States are examined. Finally, in Section 5, as another illustration of the importance of the portfolio approach for the formulation of policy concerning cap-

[3] For further discussion of this point, see, for instance, Willett [26], and Willett and Forte [28].

ital movements, we consider its implications for the existence of the constraint on domestic interest rates which many writers have suggested would occur under an exchange-rate system of sliding parities.

2 THE PORTFOLIO-BALANCE MODEL OF CAPITAL MOVEMENTS

THE portfolio approach to capital flows relates equilibrium holdings of stocks of assets to levels of interest rates. This is a simple application of the portfolio-distribution model developed by Tobin [21] and Markowitz [18]. This approach to international capital movements has been applied by a number of authors in recent years, including ourselves in earlier work, and by still others in several of the papers published in this volume.[4] Hence our present treatment of this concept can be brief.

For any given constellation (or vector) of rates of return, each individual has an equilibrium distribution of various types of assets in his portfolio. If this distribution is not itself dependent on the size of the portfolio, then the fraction of the portfolio held in each type of available asset can be written as a function of the vector of rates of return:

$$\frac{V_t^j}{V_t} = g(I_t). \qquad (1)$$

V^j/V is the fraction of net worth, V, held in asset j, and I is a vector of interest rates $i^1, \ldots, i^n$. As i^j rises, V^j/V will generally rise.[5] We would expect that after some point this relationship would become nonlinear, with successive increments calling forth progressively smaller adjustments in V^j/V.

[4] References to many of these papers may be found in Officer and Willett [19]. In addition to the papers in this volume, see also Levin [16] and Lee [15].

[5] It is, of course, theoretically possible for wealth effects to offset substitution effects so that V^j/V would fall, but we consider such dominance to be unlikely empirically. However, wealth effects may make the absolute level of interest, as well as interest differentials, an important factor in portfolio allocation. See Willett [25]. For a recent, more general treatment of wealth effects, see Stiglitz [20].

Interpreting this equation in the case of American holdings of foreign securities, V^f, we have

$$\frac{V_t^f}{V_t} = g(i_t^f, i_t^d; Z_t), \tag{2}$$

where i^f is "the" foreign interest rate, i^d is "the" domestic rate, and Z includes variables such as evaluation of risk and exchange-rate expectations, which are held constant while we look more closely at the relationship between asset holdings and interest rates.

Multiplying (2) by the "scale variable" V gives a relation determining the equilibrium holdings of foreign assets[6]

$$V^f = Vg(i^f, i^d; Z). \tag{3}$$

(Time subscripts will be included from here on only where they are needed to avoid confusion.)

We should note that for empirical estimation this function will have to be modified to account for any special information we have about the determinants of holdings of the particular series we choose for V^f. For example, in estimating equations for short-term claims on foreigners, we would want to add exports to the explanatory variables in (3) to account for the role of short-term lending in financing foreign trade. Since this is not particularly related to the size of the portfolio, we would add terms in exports to the right-hand side of (3), rather than including exports in Z, which pertains only to the distribution of the portfolio. For the present we shall stick to the formulation in (3) to focus on relationships between the interest rates and capital flows. Complications will be added and discussed when we come to an example of empirical estimation.

What, now, is the effect of a change in interest rates on holdings of foreign assets, V^f? At a *given level* of portfolio size, V_0, the effect of a rise in "the" foreign rate is given by

$$\frac{dV^f}{di^f} = V_0 \frac{\partial g}{\partial i^f}. \tag{4}$$

[6] Equations (1)–(3) give the usual specification of an asset demand-equation in the literature on financial models. See, for instance, equations (1)–(4) of the prototype model of Brainard and Tobin [1, p. 101].

The increase in the foreign rate causes a stock shift in the equilibrium distribution of the portfolio toward foreign assets. With a given portfolio size, and ignoring transactions costs for the moment, this *stock-shift* effect is a once-for-all change in portfolio distribution.

But portfolios grow over time, and the higher foreign rate should raise the fraction of portfolio growth that goes to accumulation of foreign assets.[7] With a given vector of interest rates, the growth in foreign assets is given by

$$\frac{dV^f}{dt} \equiv \dot{V}^f = \dot{V}g(i^f, i^d; Z). \tag{5}$$

An increase in the foreign interest rate will increase $\dot{V}^f$—the equilibrium flow into foreign assets from portfolio growth—by

$$\frac{d\dot{V}^f}{di^f} = \dot{V}\frac{\partial g}{\partial i^f}. \tag{6}$$

The most interesting point here is not that there is a *continuing flow* effect, but that the fairly general model of portfolio distribution given by (1) implies a very rigid relationship between the continuing flow and the stock-shift effects. Dividing (6) by (4) we obtain

$$\frac{\text{Flow effect}}{\text{Stock effect}} = \frac{d\dot{V}_t^f/di}{dV_t^f/di} = \frac{\dot{V}_t}{V_t}. \tag{7}$$

The ratio of the flow effect to the stock effect is equal to the rate of growth of the "scale variable."[8] Assume that portfolios are growing at, say, 10 per cent per year; then if an increase in the foreign rate of 1 per cent gives a stock shift of, say, $500 million, the initial effect on the continuing annual outflow would be $50 million per year. This effect itself would, of course, also grow at 10 per cent annually.

However, the presence of this continuing flow effect does not imply that an increase in foreign interest rates will necessarily lead to worsening in the balance of payments. This is because the continuing outflow

[7] The model developed by Grubel [8] is essentially the same as ours, but in his conclusions he failed to recognize this continuing flow effect. See Willett and Forte [28, p. 249]. An earlier application of portfolio theory to aspects of international short-term capital movements is given in Grubel [7].

[8] Equation (7) is simply a mathematical equivalent of the assumptions behind equation (3). This equation contains no new information beyond that in (3).

due to the increase in i^f may be offset by the increase in interest earnings both on the existing stock of claims on foreigners, V_0^f, and on the increase on that stock, dV^f. Earnings on the existing stock would rise by $V^f di^f$. In addition, the stock that is shifted abroad, $dV^f = V_0^f \frac{\partial g}{\partial i^f} di^f$, will earn interest at the rate i^f, so that the total annual interest earnings would be approximately

$$V_0^f di^f \left(1 + i^f \frac{\partial g}{\partial i^f}\right).$$

This amount would act as an offset to the continuing flow effect, $d\dot{V}^f = \dot{V}^f \frac{\partial g}{\partial i^f} di^f$. Thus the continuing-flow effect would outweigh the increment to interest earnings if

$$\left(\frac{\dot{V}^f}{V^f} - i^f\right) \frac{\partial g}{\partial i^f} > 1. \tag{8}$$

Thus the growth rate of V must be sufficiently greater than the foreign interest rate, i^f, that condition (8) is met if the continuing flow effect is to outweigh the effect on interest earnings. If this is not the case, an increase in foreign rates may, on balance, improve the sum of the capital account plus investment income once the stock-shift is completed.

While presented in terms of the effects of interest rates on the portfolio allocation of assets, the same point has general applicability to other types of expected return, such as expected movements in exchange rates; and to decisions concerning borrowing, spot, and forward speculation, and the movement of funds by leading and lagging commercial payments.[9, 10]

[9] Spot speculation and uncovered interest arbitrage are, of course, the same thing. On the application of portfolio theory to forward exchange speculation, see Feldstein [5]. A stock-adjustment approach to trade financing, which can be used to consider the effects of speculative changes in leads and lags, is presented in Willett [24]. On capital movements via changes in leads and lags, see Einzig [4], Hansen [11], Katz [12], and White [23].

[10] For discussions of the balance-of-payments costs of such policies in terms of increased interest payments, speculative profits of foreigners, and a worsened trade balance see, for instance, Grubel [7, chap. 16], Hansen [11, chap. 9], and Willett and Forte [28]. In the last-named paper it is estimated that for the United States, the long-run balance-of-payments effects of an increase in domestic short-term interest rates will probably be negative, with increased interest payments exceeding induced capital in-

The stock/flow relationship implicit in the theory of portfolio distribution has a number of interesting implications for balance-of-payments policy and research. First, since the flow effect is small relative to the stock-shift, interest-rate policy for external purposes is more a policy influencing levels of reserves than balance-of-payments flows. It is *changing* interest rates that produce large continuing flows in the balance of payments; *high* rates primarily affect reserve positions. As was previously indicated, this relationship also means that the balance-of-payments costs of high interest rates, or forward intervention, may exceed the continuing balance-of-payments gains, once the stock adjustment has been substantially completed.

The second point is that continuing flow effects in the data on capital movements will probably be very hard to see if the portfolio theory is correct. With interest rates continually changing, the stock-shift effects would tend to swamp the continuing flow effects. Thus, the existence of continuing flow effects will be hard to confirm empirically, and will probably have to be built into econometric models by assumption.

Finally, if the portfolio model is correct, the concept of an elasticity of capital flows with respect to interest-rate changes is a bit fuzzy. There is an elasticity of equilibrium stock with respect to interest rates, and an elasticity of continuing flow with respect to interest-rate changes. The two are related by the rate of growth in portfolios.

As suggested above, application of the portfolio model to the data requires numerous modifications. First, the existence of complications like transactions costs and tax laws implies that adjustment to changes in interest rates will be lagged and incomplete. Since additions to portfolios impose costs, whether acquisitions are made at home or

flows. H. Peter Gray [6] has recently pointed out that there may be an upward bias in the Willett and Forte calculations of interest costs because of an implicit assumption in their calculations that net interest costs on official dollar holdings were not reduced as a result of the induced stock adjustment of private funds. However, the Willett and Forte calculations also erred in the opposite direction by treating as non-interest-bearing demand deposits a large quantity of liabilities of American commercial banks to foreign branches which are, in fact, predominantly financed at Eurodollar rates. Since Eurodollar rates tend to follow American short-term interest rates upward very quickly (see, for instance, Branson [2, p. 102]), the original calculations understated interest costs on this score. As it happens, these two biases are roughly equal in magnitude, so that the original estimates can stand.

abroad, redistribution of a portfolio by reallocating additions—leaving the existing stock unchanged—can spread the stock-shift effect over several months. If empirical work does not take this lag into account, it may appear that one is observing a relation between interest-rate *levels* and capital *flows*.[11]

Next, if we use balance-of-payments data on capital flows in empirical work, we must recognize that observable variables other than interest rates also affect the measured flows. In the example to be given below, exports clearly affect short-term claims on foreigners through trade finance, and moreover, we must allow for the effect of the balance-of-payments programs of the United States. In addition, there are variables that are more difficult to observe (which we have included in the Z variable of equation (3)), such as the effects of speculative expectations and of the availability of credit. The best we can get, at least in the current state of the economist's art, are estimates of the differential effects of changes in interest rates and foreign trade on short-term claims, for instance—not a complete explanation of what moves short-term claims.

There are also problems concerning the relevant measure of portfolio size, V, and possible effects from changes in the composition of V (such as might be brought about by an open-market operation, for instance), and problems involving the interaction between capital flows and interest rates at home and abroad. The equations for capital flows are part of a world characterized by simultaneity, in which capital flows affect interest rates, as well as vice versa. Furthermore, an increase in domestic rates of interest will, at least in theory, be associated with a fall in portfolio size as bond prices fall. If a rise in domestic rates is due to the domestic authorities' tightening action, the reduction in portfolio size will add to the effect of higher rates in reducing capital outflows. But if the rise in domestic rates is due to a capital outflow caused by a rise in rates abroad, the drop in portfolio size will reduce the increase in outflow.

[11] This may have led several authors to reject the stock-adjustment theory on the basis of empirical results which were, actually, not inconsistent with a better specification of the portfolio model. For discussions of the specification problems involved in the early published studies of financial capital flows from the United States, see Willett [27, chap. 5] and the papers in this volume by Stern and Leamer and by Bryant and Hendershott.

Even with all of these empirical difficulties, we can find fairly regular relationships between interest rates and capital flows in the data for the United States.[12] Here we will give an example of the application of the portfolio theory to the determination of changes in American short-term claims on nongovernmental foreign contacts. This will give us an idea of the expected magnitude of the stock and flow effects of changes in interest rates.

3 ESTIMATION OF AN EQUATION FOR SHORT-TERM CLAIMS, UNITED STATES, 1960–64

AS WE suggested above, several modifications and assumptions concerning the form of equation (3) must be made before we can get on to estimating its coefficients. First, we will modify the equation by adding current and lagged terms in exports to the set of explanatory variables. Next, we assume that the function $g(i^f, i^d; Z)$ is linear, and that all variables include both current and lagged values. Finally, we will estimate the equation in first-difference form so that it is an equation for *changes* in short-term claims on foreigners—a capital *flow* equation.

With these modifications, the basic form of the estimating equation is

$$\Delta V_t^f = \alpha_0 + \alpha_1 \Delta V_t + \sum_{j=0}^{J} \beta_j \Delta (V i^d)_{t-j} + \sum_{k=0}^{K} \delta_k \Delta (V i^f)_{t-k} + \sum_{n=0}^{N} \tau_n \Delta X_{t-n} + \epsilon_t. \quad (9)$$

This form of (3) assumes that $g(\cdot)$ includes a constant term, accounting for the presence of ΔV_t alone in (9). Definitions and units of variables are given in Table 1.[13] Various rates of interest were experimented

[12] This is not at all to say that further research attempting to take into account the types of difficulties mentioned above is not needed. For an in-depth study of one bilateral flow that examines such problems, see Bryant and Hendershott in this volume.

[13] A listing of the data used in Sections 3 and 4 can be obtained from William Branson, Department of Economics, Princeton University.

TABLE 1

Definitions and Units of Variables in Equation (9)

Variable	Definition	Units
ΔV^f	Changes in American short-term claims on private foreigners	\$ million, quarterly rates
ΔX	Changes in merchandise exports from the United States	\$ million, quarterly rates
V	Net worth of American households	\$ trillion
i	3-month Treasury bill rates	Percentage points

with; the only ones with significant explanatory power that we discovered were the American 3-month bill rate, i^{US}, the British 3-month bill rate, i^{UK}, and the Canadian 3-month bill rate, i^{C}.[14]

We also experimented with forms of (9) that use changes in exports, ΔX, as the scale variable, and that insert the export term into the equation in a way interrelated with ΔV. But as a single scale-variable ΔV performed much better than ΔX, while scarcity of observations prevented the use of more complex forms of the equation that interrelate ΔX and ΔV but also add variables to the right-hand side. As more data become available, this defect can be remedied, and presumably more interest rates will be identified as significant in estimation.

Equation (9) was first estimated on quarterly data from 1960 through 1964. This was done for two reasons. First, these data fall in time between the formal reestablishment of European convertibility in 1958 and the emergence of the Eurodollar market in 1959, on the one side; and the beginning of the American program of controls over capital flows in 1965, on the other. Second, the estimated equation can be compared with earlier work by Branson [2] that did not recognize the role of the scale variable and the "continuing flow" effect of changes in interest rates. The comparison will tell us if the explanation of capital flows is improved by this refinement.

[14] We should note that the contemporaneous value of the rate in the United States was not significant in any of our estimates. This has been a persistent result of our study of capital flows. See [2, p. 150].

TABLE 2

Coefficients of Equation (9) Estimated on Quarterly Data, 1960–64

Variable	Coefficient (Standard Error)	Variable	Coefficient (Standard Error)
Constant	116.30 (73.30)	$\Delta(Vi^{US})_{t-2}$	−149.8 (44.1)
ΔV_t	4131.7 (2212.9)	$\Delta(Vi^{C})_t$	54.2 (44.1)
ΔX_t	0.584 (.139)	$\Delta(Vi^{C})_{t-1}$	69.4 (43.8)
ΔX_{t-1}	0.403 (.158)	$\Delta(Vi^{UK})_t$	81.4 (41.5)
$\Delta(Vi^{US})_{t-1}$	−181.2 (95.0)		

$R^2 = .73$.
Durbin-Watson statistic = 1.93.
Standard error of estimate = 180.4.

Table 2 gives the coefficients and statistics of equation (9), estimated on quarterly data, 1960–64. Several features of the estimated equation are of interest:

1. The equation fits much better than it did before the scale-variable V was introduced. The earlier equation [2, p. 150] had $R^2 = 0.58$.

2. The American and British rates on short-term bills are quite significant in explaining short-term flows from, or into, the United States, while the Canadian rate is only marginally significant.

3. The sum of the coefficients in the American bill rate, −331.0, is larger than that of the foreign rates, 205.0. This suggests that an increase of the same magnitude in all rates will *reduce* capital outflows from the United States.

4. The total coefficient on ΔX, 0.98, corresponds fairly closely to the earlier estimate [2, p. 150], of 0.94.

With a total coefficient of −331.0 for the American interest rate, and V_t at $2.20 trillion in the fourth quarter of 1964, a 1 percentage point increase in i^{US} (with foreign rates unchanged) in 1964-IV would give a stock-shift toward the United States of

$$\Delta V^f = (331.0)(2.20)(1.0) = \$730 \text{ million.}$$

This shift would be completed three quarters after the change in the interest rate.

The continuing flow effect of an increase in i^{US} of 1.0 in 1964-IV, with V growing at 7 per cent per year, would be

$$\Delta \dot{V}^f = (331.0)(2.20)(.07)(1.0) = \$51 \text{ million.}$$

Thus, the annual flow effect would be 7 per cent of the stock shift, as shown by the earlier arithmetic.

If foreign rates adjusted fully to changes in American rates, the net coefficient of −126.0 would substitute for −331.0 in the example, giving a stock-shift toward the United States of

$$\Delta V^f = (126.0)(2.20)(1.0) = \$277 \text{ million,}$$

and a continuing flow effect of $19 million per year.

These estimates may be closer to actuality than the "no-reaction" estimates, so that we might conclude that a 1 percentage point increase in the U.S. Treasury bill rate near the end of the 1960–64 period would yield a reduction in the outstanding stock of short-term claims on foreigners of about $300–$400 million in three quarters, and reduce the subsequent outflow by about $20–$30 million per year.

4 THE IMPACT OF THE CAPITAL CONTROLS PROGRAM: AN EXTENSION OF THE EQUATION TO THE 1965–68 PERIOD

IN FEBRUARY of 1965, the Administration imposed voluntary restraints on short-term lending to foreigners; these restraints were made mandatory in January, 1968. In general, the program initially required banks to limit their *increase* in short-term claims to 5 per cent in 1965, and 4 per cent in 1966, leaving the ceiling at the end of 1966 at 109 per cent of claims outstanding at the end of 1964. During this period, short-term outflows were reduced substantially (with negative outflows in some quarters), so that outstanding claims were well below the ceiling at the end of 1966.

With this leeway in mind, the Administration held the ceiling on outstanding claims constant at 109 per cent of the 1964 level in 1967, and reduced it to 103 per cent in 1968, with controls becoming mandatory. We can get a rough picture of the effects of the program by using our estimate of equation (9) on the 1960–64 data to predict what outflows there would have been from 1965 through 1968, and then comparing these predicted values with the actual flows. This comparison is shown in Chart 1, where the dotted line shows predicted values, and the solid line shows actual values.

CHART 1

Actual and Predicted Changes in Short-Term Claims on Nongovernmental Foreigners from the 1960–64 Equation

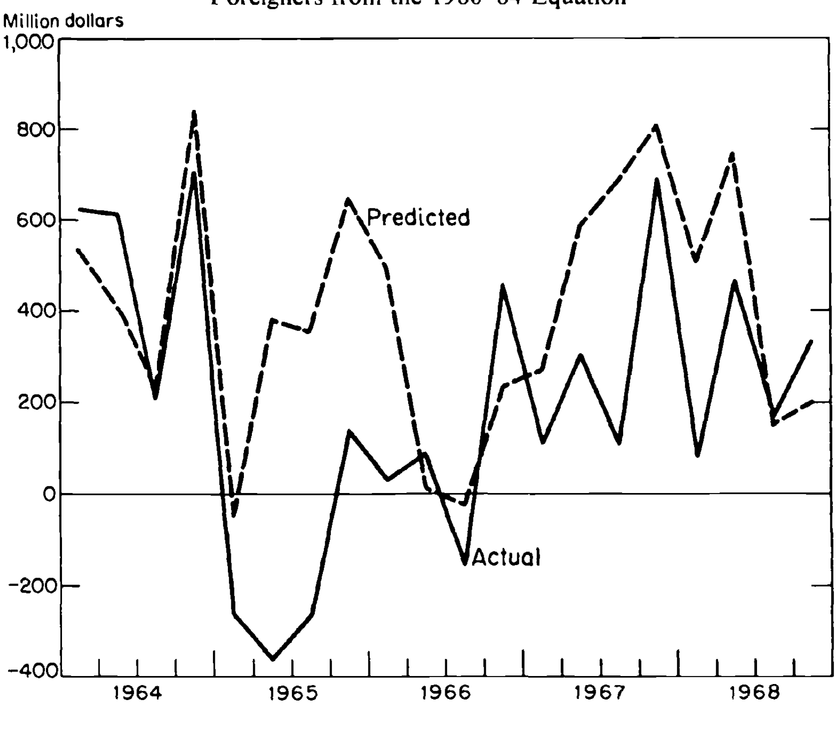

Chart 1 shows that a large gap opened between actual and predicted outflows in 1965, with actual figures below predicted ones. The gap narrowed somewhat in late 1965, and from then on, movements in capital flows (quarterly changes in flows) were fairly similar in the two series, with actual figures below predicted ones until late in 1968.

Our interpretation of these results is that during 1965 the banks reduced outflows enough to get their transactions well below the ceiling, producing the leeway that so bothered the Administration in 1967 and 1968. Once the stock of claims was sufficiently below the ceiling, the banks could then react "normally" to *changes* in capital *flow* determinants, rather than having to worry continually about bumping up against the ceiling. Capital flows were then kept at an average level below normal, but continued to react to changes in interest rates, trade flows, and total assets in the usual way.

With this view of movements in the data from 1965 to 1968 in mind, we can now extend the period of estimation of equation (9) through 1968, adding two dummy variables that reflect the reactions to the programs as interpreted above. The first dummy variable, *D Stock,* is set at unity in 1965-I–1965-III, and zero elsewhere. This should give us an estimate of the initial stock-shift effect as the banks got their transactions below the ceilings. The second dummy, *D Flow,* is set at zero through 1965-III, and unity from 1965-IV through 1968-IV. This should yield an estimate of the continuing effect of the program on the outflow of private American short-term capital.

The results of reestimation of equation (9) on quarterly data, 1960-I–1968-IV, are shown in Table 3.[15] The Canadian interest rate, which was marginally significant in the 1960–64 estimates of Table 2, had coefficients smaller than their standard errors in the 1960–68 estimates, so the variable was dropped from the equation in the 1960–68 estimates of Table 3.

We found several aspects of the reestimates interesting:

1. The sum of the coefficients on changes in exports from the United States – ΔX – is reduced from 0.99 in Table 2, to 0.63 in Table

[15] In reestimation, a large negative residual was noticed in 1964-III, the quarter in which the Interest Equalization Tax was introduced. With no ready explanation of why the IET should have so affected short-term claims of the United States, we eliminated that observation by adding a dummy with the value unity in 1964-III and zero elsewhere.

TABLE 3

Coefficients of Equation (9) Estimated on Quarterly Data, 1960–68

Variable	Coefficient (Standard Error)	Variable	Coefficient (Standard Error)
Constant	195.85	$\Delta(Vi^{US})_{t-2}$	−140.0
	(53.39)		(41.5)
ΔV_t	2890.4	$\Delta(Vi^{UK})_t$	53.2
	(1087.3)		(23.8)
ΔX_t	0.371	*D Stock*	−584.3
	(.095)		(111.9)
ΔX_{t-1}	0.260	*D Flow*	−163.2
	(.096)		(69.6)

$R^2 = .72$.
Durbin-Watson statistic = 2.12.
Standard error of estimate = 172.9.

3. This may reflect the impact of the capital restraint program on trade financing by American banks.

2. The interest-rate coefficients are smaller in the 1960–68 estimate than in the 1960–64 estimate. The United States bill rate lagged one quarter was thoroughly insignificant and was dropped from the estimate.

3. The coefficient of the American rate of interest, −140.0, is still greater (in absolute value) than that of the foreign rate, 53.6, so that an equal increase in all rates still gives a reduced outflow of short-term capital.

4. The stock-shift effect of introducing the program on short-term claims was apparently about $600 million per quarter for three quarters. The effect on continuing quarterly outflows was to reduce them by about $160 million. These are *not*, however, net gains from the program, because there were probably offsets in decreased inflows of foreign capital.[16]

[16] See, for instance, the discussion in Haberler and Willett [9, pp. 14–18] and the econometric work by Laffer [14].

The 1960–68 estimates suggest that the program reduced the sensitivity of short-term capital to changes in interest rates. With the estimates of Table 3, a 1 percentage point increase in i^{US} (with foreign rates unchanged) in 1968-IV, with V_t at $2.91 trillion, would give a *stock shift* toward the United States of

$$\Delta V^f = (140.0)(2.91)(1.0) = \$407 \text{ million},$$

and a continuing flow effect of $28 million per year with net worth growing at 7 per cent per year.

An equal one-point increase in both the American and British rates would give a stock shift toward the United States of

$$\Delta V^f = (86.8)(2.91)(1.0) = \$252 \text{ million}.$$

Thus, the program may well have damped the interest sensitivity of American funds, but the interest-rate variables were still significant.

As we said earlier, these estimates of equation (9) clearly do not provide a complete explanation of flows of private American short-term capital. For that, a much more painstaking and detailed empirical study, such as that reported by Bryant and Hendershott in this volume, will probably be necessary. But these estimates do give a rough idea of the *differential* effect of changes in interest rates on short-term capital, and also give us an idea of the quantitative effect of the restraint program of the United States.

The results also show that a proper specification of an equation such as (3), incorporating both the stock and flow effects, gives reasonable econometric results. This adds one more shred to the mounting evidence that capital flows are a tractable subject for econometric research.

5 THE CONSTRAINT ON INTEREST RATES UNDER A SLIDING-PARITY SYSTEM OF EXCHANGE RATES

ONE familiar argument against a sliding-parity system of exchange rates is that relative interest rates would have to adjust to the rate of change of parity to prevent large outflows of capital from the devaluing country. This argument thus says that there is no (or little) gain from a sliding-parity system in terms of freeing monetary policy to meet domestic targets; monetary policy must still compensate for movements in parity.

In this section we extend the model developed in Section 2 to consider exchange-rate expectations, and show that on a portfolio-adjustment view of capital movements, this "interest-rate constraint" is much weaker than would be implied by a flow theory. Essentially, the capital outflow that results from a change in the expected rate of change of parity from zero to, say, the maximum negative rate of change allowed in the system, is a one-shot affair. Furthermore, it will be reversed if and when the expected rate of change returns to zero as the exchange rate reaches a new equilibrium.

Expected changes in the exchange rate should enter decisions on portfolio allocation analogously to interest rates. The expected return from uncovered capital movements depends on (a) differences between interest rates at home and abroad, and (b) expectations concerning the spot exchange rate at the time of maturity of the financial instrument in question. The relative importance of these two components depends on the length of time to maturity (or the anticipated time to repatriation). The shorter the time period in question, the more important are expected movements in the spot rate. On a one-month loan, the movement of the spot rate from the bottom to the top of a 3/4 per cent band in each direction around parity would be the equivalent of an 18 percentage point difference in interest rates expressed in annual rates. On a three-month loan such a movement would be the equivalent of a 6 percentage point difference in interest rates. And on a ten-year loan, such an exchange-rate movement would be the equivalent of a difference in interest rates of only 15 basis points (0.15 percentage points).

This relationship between the time to maturity and the relative importance of interest-rate differentials and exchange-rate movements illustrates the importance of the smoothness of a parity movement in situations in which the spot rate is confidently expected to move in line with changes in parity. Suppose that adjustments in parities are made only quarterly. Then for one-month loans, each 1/2 per cent jump, *when it occurred,* would be the equivalent of a 6 percentage point difference in interest rates. A discrete 2 per cent jump under a

New Look Bretton Woods system would be the equivalent of an 8 percentage point difference in interest rates on three-month loans during the quarter in which it occurred.[17]

In the case of fairly smooth, continuous movements in exchange rates, as should occur under a system of sliding parities, we can extend the model of Section 2 to include exchange-rate expectations specifically by adding the expected rate of change of the price of domestic currency, $\dot{r}_e$, to the explanatory variables in the portfolio-distribution function (2). We can then rewrite (2) as

$$\frac{V^f}{V} = g(i^d, i^f, \dot{r}_e; Z'). \tag{10}$$

With any given i^d and i^f values, and exchange rates expected to remain constant so that $\dot{r}_e = 0$, a given proportion of portfolios will be held abroad. As portfolio size, V, grows, claims on foreigners, V^f, will grow, giving "normal" capital flows with given interest rates.

If, in this situation, the domestic currency begins to fall and the rate of decrease is expected to continue, $\dot{r}_e$ becomes negative and the desired proportion of portfolios held abroad, V^f/V, will rise, generating a stock-shift outflow of capital. To prevent this outflow, the domestic interest rate would have to rise relative to the foreign rate. This is the interest-rate constraint, in the framework of the stock-adjustment model.

But once this initial stock-shift is completed – over perhaps three quarters, on the evidence of Sections 3 and 4 – the continuing capital outflow due to the continuing crawl of the parity will be only a fraction of the initial shift. Furthermore, if the crawl slows, a reflow of capital will begin, and when the exchange rate reaches a new equilibrium, so that $\dot{r}_e$ returns to zero, this return flow should, ceteris paribus, be equal to the initial stock-shift plus the accumulated continuing flow effect of the temporary downward crawl of the parity.

This result simply says: if I hold a given proportion of my assets abroad with a given set of interest rates and a constant exchange rate, when the price of the domestic currency begins to fall I will transfer

[17] For further discussion of the comparative speculative incentives for short-term capital movements under alternative exchange-rate systems, see our contribution to Willett, Katz, and Branson [29].

more of my assets abroad to increase my return, and I will also transfer abroad a larger fraction of any additions to my portfolio. When the exchange rate stabilizes again, if interest rates have not changed and my portfolio was in equilibrium to begin with, I will transfer back both the initial asset-shift and the assets accumulated abroad due to the drop in the exchange rate.[18]

The estimates of Section 3 suggest, for example, that the initiation of an upward crawl in the dollar price of foreign currencies of 1 per cent a year would lead to a stock-shift outflow of American short-term capital of about $0.7 billion, since this would be comparable to a one-point drop in the American interest rate relative to foreign rates. This would be followed by a continuing outflow of perhaps $50 million a year as long as the crawl continues. If the rate reached a new equilibrium after two years, the return flow would include both the original flow and the accumulation of the continuing flow *that was due to the crawl.*[19]

The constraint on interest rates should be compelling, therefore, only if the country's reserves were dangerously threatened by the temporary stock-shift outflow due to initiation of the crawl. When the rate reaches a new equilibrium, capital that left the country *due to expected exchange-rate movements* would return.

One way to ensure that countries retain freedom of monetary policy—freedom from the "interest-rate constraint"—would be to arrange for official recycling of funds that flow in response to changes in r_e under a sliding parity. Our estimates in Section 3 indicate that such movements would not be so large that they could not usually be handled in this manner. The prospect that the loans under a recycling agreement would be repaid when the rate reaches a new equilibrium should reduce opposition to recycling, and a recycling agreement should reduce opposition to a sliding-parity system, thus improving both the short-run and long-run stability of the system.[20]

[18] A numerical example of this process is given in Willett, Katz, and Branson [29, p. 9].

[19] We should note that the appropriate measure of the interest-rate constraint is how much interest rates would have to be raised above the level desired for domestic purposes in order to keep capital from flowing in response to a change in $\dot{r}_e$. Often the factor leading to a change in $\dot{r}_e$ would also move the desired level of domestic interest rates in the direction dictated by the change in $\dot{r}_e$. See Willett, Katz, and Branson [29, pp. 5–6].

[20] This is discussed at greater length in Willett, Katz, and Branson [29, pp. 31–34].

REFERENCES

1. Brainard, William C., and Tobin, James, "Pitfalls in Financial Model Building." *American Economic Review,* Vol. LVIII, No. 2 (May, 1968).
2. Branson, William H., *Financial Flows in the U.S. Balance of Payments.* Amsterdam, North-Holland Publishing Co., 1968.
3. Despres, Emile, Kindleberger, Charles R., and Salant, Walter S., "The Dollar and World Liquidity: A Minority View." *The Economist* (London), February 5, 1966, reprinted with additional material by The Brookings Institution as Reprint 115, April, 1966.
4. Einzig, Paul, *Leads and Lags.* New York, St. Martin's Press, 1968.
5. Feldstein, Martin S., "Uncertainty and Forward Exchange Speculation." *Review of Economics and Statistics,* Vol. L, No. 2 (May, 1968).
6. Gray, H. Peter, "Fiscal-Monetary Mix and Full Employment External Balance: Two Addenda." Unpublished manuscript.
7. Grubel, Herbert Gunter, *Forward Exchange, Speculation and the International Flow of Capital.* Stanford, Stanford University Press, 1966.
8. ——— "Internationally Diversified Portfolios: Welfare Gains and Capital Flows." *American Economic Review,* Vol. LVIII, No. 5 (December, 1968).
9. Haberler, Gottfried, and Willett, Thomas D., *U.S. Balance-of-Payments Policies and International Monetary Reform.* Washington, D.C., American Enterprise Institute for Public Policy Research, 1968.
10. Halm, George N., "International Financial Intermediation: Deficits Benign and Malignant." *Princeton Essays in International Finance,* No. 68 (June, 1968). Princeton, Princeton University Press, 1968.
11. Hansen, Bent, *Foreign Trade Credits and Exchange Reserves.* Amsterdam, North-Holland Publishing Co., 1961.
12. Katz, Samuel I., "Leads and Lags in Sterling Payments." *Review of Economics and Statistics,* Vol. XXXV, No. 1 (February, 1953).

13. ——— *External Surpluses, Capital Flows, and Credit Policy in the European Economic Community, 1958 to 1967.* Princeton Study in International Finance, No. 22, 1969.
14. Laffer, Arthur B., "Short-term Capital Movements and the Voluntary Foreign Credit Restraint Program." Unpublished manuscript.
15. Lee, Chan H. "A Stock-Adjustment Analysis of Capital Movements: The United States–Canadian Case." *Journal of Political Economy,* Vol. 77, No. 4 (July-August 1969).
16. Levin, Jay H., *Forward Exchange and Internal-External Studies Equilibrium.* Ann Arbor, Michigan International Business Studies, No. 12, 1970.
17. Lutz, Friedrich, "Monetary Rates of Interest, Real Rates of Interest and Capital Movements," in Fellner *et al., Maintaining and Restoring Balance in International Payments.* Princeton, Princeton University Press, 1966.
18. Markowitz, Harry M., *Portfolio Selection: Efficient Diversification of Investments.* New York, John Wiley, 1959.
19. Officer, Lawrence H., and Willett, Thomas D., "The Covered Arbitrage Schedule: A Critical Survey of Recent Developments." *The Journal of Money, Credit, and Banking* (May, 1970).
20. Stiglitz, Joseph E., "The Effects of Income, Wealth, and Capital Gains Taxation on Risk-Taking." *Quarterly Journal of Economics,* Vol. LXXXIII, No. 2 (May, 1969).
21. Tobin, James, "Liquidity Preference as Behavior Towards Risk." *Review of Economic Studies* (February, 1958).
22. Triffin, Robert, "The Balance of Payments and the Foreign Investment Position of the United States," *Princeton Essays in International Finance,* No. 55 (September, 1966). Princeton, Princeton University Press, 1966.
23. White, William H., "Interest Rate Differences, Forward Exchange Mechanism, and Scope for Short-Term Capital Movements." *International Monetary Fund Staff Papers,* Vol. X, No. 3 (November, 1963).
24. Willett, Thomas D., "The Influence of the Trade Balance and Export Financing on International Short-Term Capital Movements: A Theoretical Analysis," *Kyklos,* Vol. XXII, fasc. 2, 1969.
25. ——— "Interest Arbitrage and the Absolute Level of Interest

Rates." *Revista Internazionale de Scienze e Commerciali,* No. 2, 1968.

26. ——— "Official Versus Market Financing of International Deficits." *Kyklos,* Vol. XXI, fasc. 2, 1968.
27. ——— *A Portfolio Theory of International Short-Term Capital Movements, With a Critique of Recent U.S. Empirical Studies.* Unpublished Ph.D. dissertation, University of Virginia, 1967.
28. ——— and Forte, F., "Interest-Rate Policy and External Balance." *Quarterly Journal of Economics,* Vol. LXXXIII, No. 2 (May, 1969).
29. ——— Katz, Samuel I., and Branson, William H., "Exchange-Rate Systems, Interest Rates, and Capital Flows." *Princeton Essays in International Finance,* No. 78, January, 1970.

COMMENTS

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Studies such as these are welcome additions to the literature on optimum policies for an open economy. In the conventional neo-Keynesian theory, the monetary authorities in a closed economy can control either the money supply or the rate of interest. In the models of an open economy built by Mundell and others—and represented at this conference by Floyd's paper, for example—the monetary authorities can influence either the exchange rate or the balance of payments. They have, however, no power to affect (let alone determine) domestic monetary magnitudes. The reason for this, of course, is the assumption that international capital movements are infinitely elastic with respect to interest-rate differentials.

In the real world of the 1970's there are probably few countries which are either completely "closed" or "small" in the Mundellian sense. Thus, for example, the Federal Reserve Board has been understandably chagrined but not-so-understandably surprised that a tightening at home has induced an inflow of short-term capital from abroad. While the Federal Reserve Board decries the weakening of its control over domestic monetary conditions, neither the Board nor anyone else has denied that its influence remains substantial. We have, therefore, neither of the two extremes of the models described above: the elasticity of demand for foreign assets is clearly neither zero nor infinity. Qualitative solutions to the model are therefore nonexistent and we must seek quantitative solutions. Now the precise size of the elasticities is important. Note, however, that in both papers only part of the international capital flow is being measured, namely the response of movements of American capital to differentials in interest rates here and abroad. Foreign claims on the United States are excluded. There is no reason to assume that the elasticities are the same in both directions, so that predictions as to the balance-of-payments impact of changes in interest rates could be misleading.

Both studies incorporate the notions of portfolio theory into an analysis of international capital movements and attempt to settle finally the stock versus flow argument which has persisted in this area. It turns out, after all, that everybody has been partly right. To the question, "Is the response of short-term capital to international differences in interest rates a stock adjustment or a flow?" the answer is, "Both." There is a stock adjustment as asset-holders find themselves out of equilibrium when the structure of world interest rates changes. There is a flow as the total portfolio of the asset-owners grows and a constant share of the increase is allocated to foreign assets. When interest rates change at home or abroad, this share of the increase changes. The flow thus generated is, however, small relative to the size of the initial stock adjustment. Changes in the flow are smaller yet in importance. In order to increase the international "flow" of capital (in the conventional sense), it is necessary to change interest rates repeatedly and thus to elicit continual stock adjustments. A more general model would, of course, have to allow for the impact of these changes in interest rates on the "scale variable" through a change in bond prices (which Branson and Willett recognize but do not treat) and perhaps, also, on its rate of increase if borrowing and investing decisions are influenced by the rate of interest.

Finally, in this general vein, we note that although the discussions here (and elsewhere) are in terms of responses to interest-rate *differentials*, neither of these studies specifies this formally. In both, desired holdings of foreign assets are functions of both foreign and domestic interest rates, but not necessarily of the difference between them. According to Branson and Willett, the coefficient of changes in foreign interest rates is smaller than that of domestic interest rates (in absolute value). The policy implication of this is that a rise in domestic interest rates would lead to a backflow of American capital even if foreign interest rates rose by the same number of percentage points; that is, even if the United States were a "large" (indicating the opposite of "small") country. It does not follow from this, of course, that the United States should continually boost its own, and therefore the world's, interest rates in order to eliminate or ameliorate its balance-of-payments problem. First, such a policy has numerous implications for growth rates, income distribution, and economic welfare in general. Second, these results of Branson and Willett are not entirely consonant with those of Miller and Whitman. In the latter paper, the coefficient of foreign interest rates (the average of rates in four recipient countries), when significant, is somewhat greater than the absolute value of the coefficient of domestic interest rates. Whether the differences are significantly nonzero is not clear. In any case, the Branson and Willett result is not repeated here.

The similarities and differences between the empirical results of the two studies raise interesting questions. I shall state some of them (it being clearly understood that they are indeed questions). As far as I can tell, the major dependent variable is the same in both estimations: the stock of short-term claims on nongovernmental foreigners held by Americans at the ends of quarters. The denominator (Miller and Whitman) or scale variables (Branson and Willett) differ, however. Miller and Whitman have two alternatives. The first, A', is short-term U.S. government securities plus "bank loans, n.e.c." and "other loans," as reported in the Federal Reserve flow-of-funds tables. The second, A, is A' plus long-term U.S. government securities, state and local securities, mortgages, and corporate and foreign bonds. The former seems to perform somewhat better, but the difference is not dramatic. Branson and Willett, on the other hand, get good results using a much broader category, namely "net worth of households." One explanation of the similarity of results, despite the apparent differences in variables, is that the two variables used as normalizers are highly correlated with one another.

A second difference, more puzzling, is that Branson and Willett estimate a demand equation (at any rate, they call it a demand equation), and Miller and Whitman say that they are estimating a reduced form of two equations, demand and supply. Yet the results are similar, and the estimating equations are similar, at any rate in the major independent variables. That is, the coefficient of the domestic interest rate is expected to be negative; the coefficient of the foreign interest rate is expected to be positive. To be sure, there are differences between the estimating equations, but not, it seems, in any important respect that distinguishes between a demand equation and a reduced-form equation. One possible explanation of this is that the supply of foreign assets to Americans is infinite. The analytical model of Miller and Whitman emphasizes "borrowing" on the part of foreigners. The supply of assets matters, because foreigners choose where to borrow, and they worry about the variance of the expected rate they must pay for loans from the United States (including both expected changes in the exchange rate and the cost of being cut off from domestic sources of funds at some point in the future if they become too dependent on American lenders). The reduced-form equation, like Branson and Willett's demand equation (and like my own view of the world), pictures Americans taking the initiative and anonymously purchasing transferable financial assets in the money and capital markets of foreign countries, or simply making deposits in foreign banks. The Miller and Whitman view of the world may be more accurate, but they have been unable to test it, since they substitute rates on treasury bills and call money for the "loan rate" which they were unable to observe, and are, moreover, unable to find a suitable proxy for expected changes in the exchange rate. At the same time, neither Miller and Whitman nor Branson and Willett are able, in their estimations, to assure us that there is, in fact, no simultaneity; that American lending does not affect foreign interest rates (which according to the foreign press, it does) – in short, that the United States is not a "large" country.

Finally, as a general reaction to both studies, it is disturbing that things should apparently work out so well in the absence of any consideration in the estimations of actual or expected exchange rates. First, the interest rates used in the estimations are uncovered rates, and yet differences in recipient countries' forward-rate policies (both between countries and over time) do not appear to have mattered. Perhaps, however, they did. This may be the reason why, in general, foreign interest rates are poorer explanatory variables than domestic rates, and why the studies get different results with respect to the relationship between the coefficients of domestic and foreign rates of interest. Secondly, expectations of changes in exchange rates appear not to have mattered. This may be fortuitous, however. The worst of the flights from sterling, for example, do not coincide with the divergences between actual and predicted values for capital outflow in the 1964–68 period, as computed by Branson and Willett. This may be due to the fact that the United Kingdom is evidently not a major recipient of United States short-term capital. But this, in turn, raises the question of why the United Kingdom Treasury bill rate is the only foreign interest rate to yield satisfactory results in the Branson and Willett study. Possibly this bill rate is a proxy for something else, perhaps the Eurodollar rate. In short, at the risk of appearing ungracious, I would argue that it is incumbent upon the authors to explain why their results are so good.

RUDOLF R. RHOMBERG

INTERNATIONAL MONETARY FUND

The two papers presented in this session are concerned with the sensitivity of the outflow of short-term capital from the United States to factors influencing it, such as changes in interest rates and merchandise exports, or the Government's capital restraint program. Estimation of these influences is the main purpose of the paper by Miller and Whitman. Branson and Willett also estimate equations explaining these short-term capital flows and use them to illustrate certain general conclusions for policy toward capital movements. This comment will be divided into: (1) some remarks on general methodological questions raised by these papers; (2) a review of the econometric techniques and results; and (3) observations on the policy conclusions drawn by Branson and Willett.

GENERAL METHODOLOGICAL PROBLEMS

The first question concerns a fundamental point: Should the determinants of short-term capital flows be assessed in isolation from the movements of other capital-account items and (most) current-account magnitudes? A number of reflections render this approach dubious.

First, movements of short-term capital are directly dependent not only on merchandise exports (trade financing), but also on other items of the balance of payments. For instance, changes in long-term capital flows may induce, or be accompanied by, short-term capital flows in the opposite direction when the proceeds of long-term loans are not immediately transferred.

Second, short-term capital movements and the rest of the balance of payments are indirectly interdependent through the adjustment mechanism. Under freely fluctuating exchange rates, without official intervention in the exchange market, short-term movements, which (especially in the very short run) tend to show a higher responsiveness to the exchange rate than other components of the balance of payments, are determined by the sum of the other components, with the exchange rate moving so as to achieve this balance. The par-value system is characterized by a combination of official intervention (reserve changes) and exchange-rate movements within permitted margins. Compared with a system of floating rates, under this system the balance-of-payments adjustment function of short-term capital movements (through response to changes in exchange rates) is somewhat lessened, but it is not entirely absent. If components of the balance of payments were to be ordered in sequence from the most nearly autonomous (say, private remittances or contractual interest payments) to the most nearly "accommodating," the category of short-term capital movements as a whole would doubtless hold a place near the "accommodating" end of the list. This accommodation is achieved partly through the exchange-rate mechanism and partly in other ways. Even if the equation for the flow of short-term capital adequately reflected these relations, there would still be the problem of consistent estimation of its coefficients within this system of simultaneous equations; a single-equation approach would be found wanting.

Third, the same question could be raised within the framework of the portfolio approach, which is employed in both papers under discussion: Is the over-all portfolio of domestic and foreign assets decomposable in this particular way, and can the portfolio approach be separately applied to long-term and short-term assets without explicit allowance for any interaction between these portfolios? To be sure, the size of each of the two portfolios, short-term and long-term—or for that matter, the size of any other subportfolio—may be known ex post. It may also be possible to explain the distribution of such a subportfolio among component assets by reference to variables expressing rates of return and riskiness. But it will not be possible to explain or forecast changes in one of the components—say, short-term capital movements—because the size of each of these subportfolios cannot be explained or forecast unless the problem of the distribution of the total portfolio among the various subportfolios has been solved.

These reflections suggest that econometric work on short-term capital movements should ultimately be based on a general-equilibrium model covering the entire balance of payments and all domestic and foreign assets, real and financial. This observation is not, however, meant as a criticism of the pioneering work under discussion, even though it may fall short of ideal, as yet unattainable, standards.

I now turn more briefly to three other general questions. What has been said so far acquires additional weight in view of the fact that exchange rates, though in principle part of the models used in the two papers, do not in practice enter the functions expressing short-term capital flows. In the theoretical formulation, both papers include exchange-rate influences (Miller and Whitman explicitly, Branson and Willett in the catchall variable) but are forced to leave them out of the estimating equations for lack of a satisfactory proxy for expected exchange rates. The resulting equations would thus properly reflect short-term capital movements in a single-currency area. If exchange-rate expectations play an important role in the explanation of short-term capital movements (and they could hardly fail to do so), and if they are correlated with changes in interest rates (as is also likely), the estimated sensitivity of short-term capital movements to changes in interest rates is likely to be biased. For instance, a downward bias would result if foreign interest rates were raised when foreign currencies were expected to depreciate vis-à-vis the U.S. dollar. The conceptual and statistical difficulties of finding appropriate exchange-rate variables for inclusion in equations for short-term capital movements are clearly formidable.

In econometric work on capital movements, the question of geographic aggregation, or disaggregation, is particularly troublesome. On the one hand, there is no easy way to express divergent financial conditions in various partner countries through a few summary variables, like the interest rate, or the expected exchange rate, in the rest of the world. On the other hand, a bilateral model estimating capital flows to a particular partner country (as in Bryant and Hendershott's paper in this volume) must be essentially incomplete, since it is implausible to suppose that financial conditions—say, interest rates—in third countries would not influence the bilateral capital movements in question. Branson and Willett use interest rates in two foreign countries, dropping one of them in the course of the investigation. Miller and Whitman use an unweighted average of four foreign interest rates. To make further progress in this regard, it may be necessary to develop an explicit multinational model without, at the same time, running afoul of the constraint imposed on statistical estimation by the available degrees of freedom. Conceivably such a development could follow the lines of the market-shares approach used in trade models, with the shares assumed to be influenced by relative interest rates, expected exchange rates, and similar factors.

A final methodological comment relates to the practice of "estimation by proxy." Models are often being constructed to a large extent in terms of unobservables, actual estimation being carried out with the help of a set of proxy variables. Sometimes the relation between the theoretical variable and its proxy is quite tenuous (e.g., Miller and Whitman use deviations from trend of GNP for the riskiness of domestic assets and a time trend for the riskiness of foreign assets). Statistical tests cannot confirm or refute the postulated relation between the unobservable theoretical variables and their proxies. The estimated structure is consistent with any theory that could have been tested with the help of the same set of proxies, and conclusions with respect to the confirmation of the theory presumably being tested must be drawn with caution. It has been found that econometric work must often be preceded by a reconstruction of received theory so as to make it testable in terms of observable phenomena. In the area of capital movements, this reconstruction of theory has not yet been brought to a very satisfactory level of development.

ECONOMETRIC TECHNIQUES AND RESULTS

Branson and Willett follow a portfolio approach, which is simplified by omission of any explicit representation of the riskiness of assets. This formulation of the model, by itself, allows them to draw some interesting conclusions with respect to the distinction between stock-shift and flow effects of changes in interest rates. In the application, however, they deviate from a strict portfolio approach by introducing, in addition to portfolio considerations, separate effects of changes in exports, reflecting trade financing apparently unrelated to rates of return and portfolio size. Although this separation of trade financing from the remainder of the portfolio may be indicated for practical reasons, logically it is not fully satisfactory. For one thing, it is difficult to think of the volume of export financing as being unaffected by the total volume of funds available for placement. Moreover, once exclusions from the portfolio model are allowed, there is no reason to stop at export financing: variables explaining many other types of borrowing that may at first glance appear to be independent of the size of the lender's total portfolio could be introduced as separate additive factors determining capital movements. In order to preserve a consistent portfolio approach, the possibility of allowing the volume of export financing to be determined within the portfolio model may be worth considering. The yield of this type of investment would then have to be represented by a shadow rate of return, reflecting the profit on the exports that are being financed.

The choice of interest-rate variables and their lag structure seems to have been determined largely by statistical criteria. In the equation estimated by Branson and Willett for the period 1960–64 (Table 2), the American interest rate lagged by one and two periods, the Canadian interest rate not lagged and lagged by one period, and the British interest rate not lagged are taken to affect outflows of U.S. short-term capital (although only the American interest rate lagged by two periods seems to be statistically significant at the 95 per cent confidence level). In the corresponding equation estimated for the period 1960–68 (Table 3), only the American interest rate, lagged by two periods, and the British interest rate, not lagged—both significant—are retained as interest-rate variables. Moreover, the effect of the American interest rate, though long delayed, is quite strong, while the effect of the British interest rate, though immediate, is relatively weak. It would be difficult to find a theoretical justification for such a time pattern of interest-rate effects. It may be that an explicit formulation in terms of distributed lags might be preferable. In both equations the effect of the domestic interest rate on movements of American short-term capital is stronger than the effect of foreign interest rates; but in view of the uncertainties with respect to the time pattern of these effects, of the selective use of only one or two foreign interest rates, and of the low level of significance of the estimates, undue importance should not be attached to this finding.

In the equation fitted to data extending to 1968, it would be desirable to take cognizance of the gold and exchange-rate crises that occurred during the last part of the period, which must be presumed to have had effects on flows of American short-term capital. It is true, however, that the equation explains a large proportion of the variation in capital outflows, even without any allowance for the effects of changes in exchange-rate expectations. In this equation the effect of the Government's capital-control program is indicated by two additive dummy variables. Here, again, the question arises as to whether it might not be preferable to test for these effects within the framework of the portfolio approach (which would require a modification of the portfolio ratio, rather than a reduction of the capital outflow by an absolute amount, as a result of the restraint program).

Miller and Whitman develop a very imaginative double-portfolio approach, in which the demand side is represented by the asset-portfolio ratio, which depends on yields of domestic and foreign short-term assets and their respective riskiness, and the supply side by a liabilities-portfolio ratio, which depends on the cost of borrowing in the United States and elsewhere, and on the respective riskiness associated with these borrowing costs. Under the assumption that the ratio of the total American portfolio of short-term assets to the total foreign portfolio of liabilities is constant, a reduced-form equation for the equilibrium ratio in the American short-term portfolio is derived and a pattern of adjustment of actual to optimal portfolio ratios specified.

Be it for reasons of the inherent merit of this sophisticated model or because of a wise choice of proxy variables, the empirical results appear quite promising. It is remarkable that an explanation of up to three-fourths of the total variation in changes in the portfolio ratio is achieved (although the explanatory power of the equation may be aided by the use of seasonally unadjusted data and the inclusion of seasonal dummy variables). The preferred equation for the portfolio ratio implies an explanation of quarterly flows of American short-term capital amounting to over 83 per cent of the total variations in this flow over the observation period.

A comparison of some of the results of the two papers shows that considerable uncertainty still exists regarding the magnitude of some of the estimated effects. For instance, Branson and Willett estimate that the effect of a change of 1 percentage point in the domestic interest rate has a much larger effect on the flow of American capital than does a change of 1 per cent in the foreign interest rate; Miller and Whitman estimate that the opposite is the case. While the results obtained by Miller and Whitman, working with the period 1959–67, for the effect of changes in domestic interest rates are roughly comparable with the equation estimated by Branson and Willett for the period 1960–64, their stock-shift effect is about three times that found by Branson and Willett in the equation applying to the longer period, 1960–68. An even larger discrepancy is found in the estimates of the effect of a change in foreign interest rates. Here the difficulties in connection with geographic disaggregation and the choice of foreign interest rates discussed above may play a major role.

POLICY IMPLICATIONS

Branson and Willett draw some interesting conclusions that follow directly from the portfolio approach to the explanation of movements of short-term capital (rather than from the particular parameter estimates contained in their paper). This approach implies that the continuing (flow) effects of changes in interest rates would tend to be small relative to the once-for-all stock-adjustment effects of such changes. What is true for the effects of interest-rate changes would also apply to the impact of changes in the rate of change of the exchange rate. With this thought in mind, the authors make an interesting contribution to the current discussion on interest-rate policy under the crawling-peg system. In order to offset through interest-rate policy the effect of an expected change in the exchange rate on movements of short-term capital, the difference between domestic and foreign interest rates would have to be adjusted by the expected annual percentage change in the exchange rate. But only a temporary adjustment is required. Once the exchange rate has found its new equilibrium level, the interest differential can, other things being equal, be returned to its former value. Moreover, if the effect of exchange-rate expectations under the crawling-peg system were not to be offset by interest policy, expected changes in exchange rates would only temporarily affect monetary reserves through movements of short-term capital, this effect being reversed as soon as the exchange rate is no longer expected to continue its rise or decline. As a result, monetary authorities would tend to be more favorably disposed, Branson and Willett feel, toward "recycling" the funds that may at times move temporarily in one direction or another in response to expectations regarding the direction and rate of change of crawling movements of par values.

This point is well taken, as far as it goes, and its acceptance would appear to weaken one objection to the crawling-peg system; namely, that it would severely constrain national interest-rate policy. There are, however, two sides to this consideration. Since the mere cessation of a previous trend in the exchange rate will tend to reverse the short-term capital flow that was induced when that trend came to be expected, it is unlikely that the exchange rate will remain close to its new equilibrium level following a period during which it had been rising or falling; instead, it will tend to reverse its course. In view of the uncertainty that exists with respect to the magnitude and timing of the sensitivity of short-term capital movements, one cannot exclude the possibility that a crawling-peg system, under which the par value responds by formula to past exchange rates or reserve movements, may be unstable —at any rate, within the limits imposed by the speed with which the par value would be adjusted and the permitted margins on either side of par. Proponents of the crawling-peg system are attracted by the notion that exchange rates would gradually drift in a direction indicated by longer-run tendencies of the balance of payments. If this consideration were to cause par values to fluctuate around a constant level, or around their longer-run trend, in response to movements of short-term capital induced by the very expectation of these fluctuations, the performance of this system would be impaired, even though the effects of these fluctuations on reserves could be mitigated through the technique of recycling operations among monetary authorities.