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The purpose of this paper is to review in a non-technical way some of the more important new insights on the conduct and the efficiency of monetary policy in an internationally changing environment. The last decade has seen a thorough-going reworking of monetary theory for open economies incorporating in particular portfolio balance analysis in macro-economic policy models¹. However, no attempt to write a comprehensive survey of the relevant literature is made. The paper instead focusses on a few key issues that have retained widespread attention by policy makers as well as in academic circles².

To put the discussion in sufficient perspective the standard macroeconomic model of the sixties, developed by Mundell and Fleming, is briefly presented in section I. Section II deals with the problem of capital mobility, off-setting capital flows and sterilization policies under fixed exchange rates. Section III discusses to what extent flexible exchange rates contribute to the solution of some of the older problems under fixed exchange rates and to what extent they induce new problems. In a final section the problem of short-run exchange rate volatility and possible rationalizations are analysed.

I. Early theory for an open economy : the Mundell-Fleming model

The long-run constraint on monetary policy imposed by fixed exchange rates has a well established and generally accepted tradition. It results from the theory for an open economy developed during the sixties in the well-known Mundell-Fleming³ model. This model deals with an open economy that is too

¹ For a recent but rather dense survey of some of the more important results see D.W. HENDERSON, Modeling the interdependence of national money and capital markets, American Economic Review, Papers and Proceedings, Vol. 67, 1977, pp. 190-199.

² Assistance by Michel Dombrecht in selecting issues and the relevant literature is gratefully acknowledged. I am indebted to Paul De Grauwe for comments on an earlier draft. Remaining (mis-)interpretations are mine.

³ M. FLEMING, Domestic Financial polities under fixed and under floating exchange rates, I.M.F. Staff Papers, Vol. 9, 1962, pp. 369-379.
R.A. MUNDELL, Capital mobility and stabilization policy under fixed and flexible exchange rates, The Canadian Journal of Economics and Political Science, Vol. 29, 1963, pp. 475-485.

small to influence world interest rates, world prices or world incomes. In other words the country is too small to generate foreign repercussions in reaction to domestic economic developments.

The model uses a simple Keynesian IS-IM scheme which adapted to standard notation is as follows¹

$$Y = E(Y,i) + CA(Y,e) + G \quad \text{output market} \quad (1)$$

$$L(Y,i) = M = H + R \quad \text{money market} \quad (2)$$

$$CA(Y,e) + K(i) = B = dR \quad \text{balance of payments} \quad (3)$$

Here Y is national income (assumed equal to output), E is domestic absorption, CA is net exports (assumed equal to the current account balance), G is government expenditures on goods and services, L is the demand for monetary base, M is the supply of monetary base. The total monetary base consists of a policy-controlled component H , equal to central bank holdings of domestic assets, and R which is central bank holdings of international reserves. K is international capital movements, B is balance of payments, i is the domestic rate of interest on government securities, e is the exchange rate (domestic currency price of a unit of foreign currency). All variables (except i) are measured in domestic currency with prices of domestic output assumed to be fixed.

The structural parameters of the model, represented by the partial derivatives of the respective arguments in the demand functions, are non-negative except E_i and L_i which are negative; m , the marginal propensity to import, stands for $-CA_y$. The three-equation system solves for Y , i and e under flexible exchange rates and for Y , i , and $B = dR$ under fixed rates. Solved for the policy multipliers $(dY/dG)_j$ and $(dY/dM)_j$, where j indicates the exchange rate regime, the well-known conclusions from this analysis are three

¹ This presentation is slightly adapted from R.N. COOPER, Monetary theory and policy in an open economy, The Scandinavian Journal of Economics, Vol. 78, 1976, p. 148.

$$(i) \quad (dY/dM)_{\text{flexible}} > (dY/dM)_{\text{fixed}}$$

$$(ii) \quad (dY/dG)_{\text{flexible}} \geq (dY/dG)_{\text{fixed}} \quad \text{as } K_i \leq -mL_i/L_y$$

$$(iii) \quad [(dY/dG)/(dY/dM)]_{\text{flexible}} < [(dY/dG)/(dY/dM)]_{\text{fixed}} \quad \text{for } K_i > 0$$

- (i) indicates that a given expansion in the monetary base will stimulate money income more under a regime of flexible rates than under a fixed rate regime. The leakage away to other countries of part of the stimulus under fixed exchange rates through the current account will be prevented under flexible rates through the induced depreciation in the exchange rate.
- (ii) results from the leakage abroad through the current account of some of the fiscal stimulus under fixed exchange rates which is prevented with flexible rates by a depreciation of the currency. At the same time the pure fiscal stimulus will tend to raise interest rates within the country which in turn will tend to appreciate the currency, thereby offsetting the first influence. The inequality shows the conditions under which the second influence will outweigh the first.
- (iii) says that for interest sensitive capital flows monetary policy has a comparative advantage at stimulating money income under a flexible exchange rate regime because of capital induced movements in the exchange rate. Under a regime of fixed exchange rates with capital mobility monetary policy has a comparative advantage over fiscal policy in dealing with the balance of payments.

II. Capital mobility, offsetting capital flows and sterilization under fixed exchange rates

Among the problems for the conduct of monetary policy under fixed exchange rates that have attracted widespread attention the question of capital mobility, offsetting capital flows and sterilization policies is of particular importance. Several aspects ought to be mentioned.

First, a crucial assumption underlying the results of the Mundell-Fleming model is a completely exogenous money supply no matter what is happening to the balance of payments and central bank reserves. The model therefore assumes systematic sterilization of reserve changes by the monetary authorities to offset the balance of payments impact on the monetary base. The feasibility of sterilization operations, however, depends on the degree of capital mobility - that is on the degree to which home country and foreign securities are substitutable in foreign and domestic portfolios.

With perfect capital mobility under fixed exchange rates monetary policy will be unable to influence the domestic interest rate. An open market sale of bonds, for example, would lead to a reduction of the money supply and an upward pressure on the domestic interest rate. Since under these circumstances domestic and foreign bonds are, in effect, indistinguishable, domestic and foreign investors would be unwilling to hold foreign bonds at a lower interest rate. They would thus be induced to substitute home country bonds for foreign bonds. The resulting capital inflow would force the monetary authorities to support the exchange rate thereby increasing in fact the domestic component of the monetary base. The capital inflow will continue until the monetary base is restored to its initial level.

In a world of perfect capital mobility, therefore, monetary policy can no longer affect aggregate demand. In the Mundell-Fleming model this follows already from the fact that the only transmission channel between the output market and the money market is through the domestic interest rate. If the domestic interest rate must equal the exogenously given foreign interest rate, the output market is no longer affected by the money market. Monetary policy, then, has only an effect on the level of reserves. The "offsetting capital

flows" hypothesis implies that monetary policy actions have no power over the total volume of the monetary base and can only affect the composition of its sources.

Second, as Kouri¹ has pointed out, "offsetting capital flows" and "imported inflation" are two terms that have often been used to characterize the monetary policy in the surplus countries of Europe during the period of fixed exchange rates. The imported inflation hypothesis submits that the US balance of payments deficits in the past have been the main cause of world inflation. These deficits in fact have increased aggregate demand directly through the multiplier effects and indirectly through the effects of payments surpluses on the money supply. Any independent tightening of monetary conditions in European countries will produce capital inflows which effectively offset the restrictive effect of the initial policy measures given highly integrated capital markets. If the central bank, so the argument runs, attempts to sterilize the liquidity effect of capital inflows the result will only be further induced inflows prompting eventually massive speculative capital flows.

But an impotent monetary policy in non-reserve currency countries with fixed exchange rates and free capital movements did not prevent the US from maintaining full control over monetary conditions. The status of the dollar as a reserve currency ensured indeed an automatic sterilization of the effects of private capital flows on the US monetary base. The liquidity effects of conversion of dollar balances by foreign central banks in primary reserves could easily be offset by the Federal Reserve System by adjusting the domestic component of the monetary base.

For the main surplus countries like Japan and Germany the use of monetary policy as a countercyclical device was thus undermined. In consequence the central banks of these countries often faced the famous dilemma situation of a balance of payments surplus with domestic excess demand.²

¹ P.J. KOURI, The hypothesis of offsetting capital flows. A case study of Germany, Journal of Monetary Economics, Vol. 1, 1975, pp. 21-39.

² For a clear account by an insider of this problem for German monetary policy, see O. EMMINGER, The D-Mark in the conflict between internal and external equilibrium, 1948-75, Princeton Essays in International Finance, N° 122, June 1977.

A third issue in the literature is the empirical question to what extent capital flows have indeed offset monetary policy actions. Empirical answers to this question have been obtained through the estimation of the so-called offset coefficient. The contributions of Kouri and Porter¹ and Kouri² offer powerful evidence supporting the offsetting capital flows hypothesis. In a study for Germany, Australia, Netherlands and Italy they found that between 43 to 80 per cent of a change in the domestic component of the monetary base is offset through capital flows, with the lowest offset coefficient for Italy and the highest for Germany. The results for Germany are confirmed by a simulation experiment by Herring and Marston³ over a sixteen quarters period starting in the first quarter of 1964. If the Bundesbank would abandon its sterilization policy, they come up with a net offset of an expansionary change in the domestic component of the German monetary base through capital outflows of nearly 78 percent. Kouri and Porter⁴ conclude :

"Our results indicate that while monetary policy has a strong effect on the capital account there is still some room for independent monetary policy, if only in the short-run, if the Central Bank is willing to tolerate the large reserve movements which that policy entails".

A difficulty, however, with the interpretation of the above results arises from a conceptually clear distinction between offsetting capital flows and sterilization operations by monetary authorities. Herring and Marston⁵ have pointed out that sterilization operations reflect the reaction by policy makers in response to changes in the foreign component of the monetary base, whereas offsetting capital flows are initiated by private investors in response to policy induced changes in domestic monetary policy. Both possibilities, however, give rise to a negative correlation between the domestic and the foreign component

¹ P.J. KOURI and M.G. PORTER, International capital flows and portfolio equilibrium, Journal of Political Economy, Vol. 82, 1974, pp. 443-467.

² P.J. KOURI, The hypothesis ..., op.cit.

³ R.J. HERRING and R.C. MARSTON, National Monetary Policies and International Financial Markets, Amsterdam, North Holland Publishing Company, 1977, pp. 188-191.

⁴ P.J. KOURI and M.G. PORTER, op.cit., p. 464.

⁵ R.J. HERRING and R.C. MARSTON, op.cit., pp. 158-159.

of the monetary base. Sterilization behavior and offsetting capital flows are, therefore, difficult to distinguish empirically. The inherent simultaneity between both phenomena has led to confusion in the empirical literature.

This is illustrated by the controversy that has arisen in response to an analysis of the German control over the money supply by Willms¹. He argued that German monetary policy has been successful in substantially neutralizing the effects on the monetary base of changes in the foreign source component.

The evidence offered was a strong negative correlation between the change of foreign exchange reserves and the change in the domestic component of the monetary base (adjusted for changes in reserve requirements). The difficulty as Porter² noted, is that the Willms results are equally consistent with the "offsetting capital flows" hypothesis. Porter presented evidence that capital flows responded strongly to changes in reserve requirements from which he concludes that the offset interpretation of Willms' result was more plausible. But a satisfactory resolution of the controversy necessitates the use of simultaneous equation methods when estimating a sterilization equation. Argy and Kouri³ developed a simultaneous system in which both the change in net domestic assets and the change in the net foreign assets of the central bank are determined. They come up with results that confirm the earlier Kouri and Porter findings about the substantial and significant offset of the effects of monetary policy on the monetary base through capital flows. They also indicate that sterilization policies have been pursued but not to the full amount of payments surpluses or deficits. In the case of Germany the sterilization coefficient was substantially lower than the one which Willms reported.

Herring and Marston have questioned the Argy and Kouri results on the basis of a misspecification of the reaction function of the monetary authorities.

¹ M. WILLMS, Controlling money supply in an open economy : the German case, Federal Reserve Bank of St.Louis Monthly Review, Vol. 53, 1971, pp. 10-24.

² M.G. PORTER, Capital flows as an offset to monetary policy : the German experience, I.M.F. Staff Papers, Vol. 19, 1972, pp. 395-424.

³ V. ARGY and P.J. KOURI, Sterilization policies and the volatility in international reserves, in R.Z. ALIBER, ed., National Monetary Policies and the International Financial System, University of Chicago Press, 1974, pp. 209-230.

Argy and Kouri did namely not include the possibility of discount borrowing in the reaction function. An intensive empirical study by Michaely¹ for the relatively calm period of mutual adjustment of short run response mechanisms as manifested in national banking policies and movements in monetary aggregates, indicated, however, that, typically, the monetary base was not allowed to contract by the cumulative amount of any international payments deficit. Central banks consistently lent to their commercial banks and to their own treasury authorities in an amount sufficient to partially but not fully sterilize the contraction in the monetary base that would otherwise have occurred. In contrast to the U.S., European commercial banks rely heavily on discount facilities provided by their central banks. In these countries, with the exception of Great Britain, little reliance is placed on open-market operations for changing the monetary base. When European commercial banks experience reserve losses arising from international payments deficits, they typically tend to increase their discounting with their central bank, even if the discount rate has been raised. Instead of a conscious open-market operation by the central bank that compensates for the effect of foreign reserve losses on the domestic monetary base, it is the external deficit that brings the commercial banks to the discount window. The increased cost of obtaining reserves in this manner explains why only partial instead of full sterilization normally occurs².

The above mentioned practice implies a substantial negative correlation between the change in borrowed reserves and the change in foreign exchange reserves. It is thus likely that the specification of a sterilization function that does not allow for discount borrowing will result in a sterilization coefficient biased towards zero, since the change in foreign exchange reserves will tend to assume an additional role as a proxy for discount borrowing.

Taking account of the inherent simultaneity problem in their estimation procedure between changes in monetary policy and changes in foreign exchange reserves and allowing for discount borrowing, Herring and Marston obtain

¹ M. MICHAELY, Th Responsiveness of Demand Policies to Balance of Payments : Postwar Patterns, New York, National Bureau of Economic Research, 1971.

² R.I. McKINNON, Sterilization in three Dimensions : Major trading countries, Eurocurrencies, and the United States, in R.Z. ALIBER, ed., National Monetary Policies ..., op.cit., pp. 236-238.

results that correspond much more closely to those reported by Willms than to the Argy and Kouri results. Their estimates of the reaction function describing the conduct of monetary policy indicate that the Bundesbank sterilized more than 90 percent of the reserve flows. Furthermore, this sterilization policy was apparently the same with respect to both inflows and outflows and for large and small reserve flows. Herring and Marston conclude that :

"... despite a high degree of capital mobility in Germany the monetary authorities retained a substantial amount of control over the interest rate and bank reserves. The capital flow offset to monetary policy was far less than complete : our estimates imply that only 22 % of the change in the Bundesbank's domestic assets was offset by balance of payments flows. Sensitivity experiments indicated that this result was largely attributable to the Bundesbank's sterilization policy; indeed, if the Bundesbank had refrained from sterilization, the offset would have been virtually complete. As expected, the Bundesbank's success in controlling bank reserves was at the cost of losing much of its control over foreign exchange reserves".¹

A high degree of capital mobility, even under a fixed exchange rate system, must not preclude an effective sterilization policy. In consequence, the German monetary authorities were able to exercise a significant amount of monetary independence despite offsetting capital flows. The contrast between the conclusions Herring and Marston come up with and a considerable portion of the contemporary theoretical literature about the international monetary system are striking. However, although the Bundesbank successfully resisted external pressures for domestic monetary adjustment which enabled the German monetary authorities to pursue domestic policies which differed markedly from those of Germany's leading trade partners, these divergencies in national policies led to mounting current account surpluses which, in turn, led to massive inflows of speculative funds. In the end nevertheless, fixed exchange rates had to be given up.

Finally, an important caveat against the empirical evidence of both the offsetting capital hypothesis and the sterilization hypothesis has been raised by P. De Grauwe. De Grauwe² shows that the failure to consider the individual

¹ R.J. HERRING and R.C. MARSTON, op.cit., p. 205.

² P. DE GRAUWE, International capital flows and portfolio equilibrium : comment, Journal of political Economy, Vol. 83, 1975, pp. 1077-1080. See also by the same author Monetary Interdependence and International Monetary Reform, Westmead, Saxon House, 1976.

countries' capital equation in the framework of a multi-country model, will underestimate the true offset coefficient and thus the offsetting capital flows. The explanation is as follows.

In a multi-country framework the net capital flow of a single country will not only depend upon the changes in the domestic component of the monetary base. Any capital outflow from (inflow into) a country must appear as inflows (outflows) in some or all other countries. A single country capital flow therefore depends upon changes in the domestic component of the monetary base of all the countries in the system. The Kouri-Porter estimations of the single country capital flow equations have omitted these changes in the net domestic assets of the other country's central banks. To the extent that the omitted variables are correlated with the included variable the estimated offset coefficient will be biased. Since the change in the domestic component of the monetary base of a foreign central bank will have an opposite effect on a country's capital flow from a change in the same direction of the domestic component of the monetary base of its own central bank, it can be shown that the offset coefficient is biased toward zero. During the sample period covered by the empirical studies the industrialized countries have, on average, followed expansionary monetary policies. As a result, the ceteris paribus assumption underlying the Kouri-Porter single-country equation does not hold.

In an analogous fashion De Grauwe shows that in case of the use of sterilization policies the necessary conditions for stability of the country's capital flows depend not only on the country's own use of sterilization policies but also on the extent of sterilization used by all the countries of the system. It turns out that the use of sterilization policy by one country reduces the possibility of the other country's using sterilization without destabilizing capital flows.

"In other words, sterilisation by one country results in an adjustment of the monetary base in all the other countries to whatever level is determined by the monetary policy of the sterilising country. However, if other countries refuse to let their monetary base adjust to changes in monetary policies of the first country, i.e. if they too engage in sterilisation operations, policy conflicts will emerge. Instability in reserve flows will then occur, if the burden of adjustment cannot

by shifted, in a significant way, to other non-sterilizing countries".¹

Assuming that the Herring-Marston results of an effective sterilization policy by the German monetary authorities conform with the facts, this is achieved, according to the results obtained by De Grauwe, at the expense of either the use of sterilization policies by the other countries in the system in particular the smaller ones, or the stability of the system itself. In the former case the degree of independence of German monetary policy is attained at the expense of an independent monetary policy of the other, particularly European countries. In the latter case the system of fixed exchange rates becomes unstable and is eventually replaced by a more flexible system.

Before turning our attention to some of the problems of monetary policy in open economies under a more flexible system, reference can still be made at attempts to reconcile the capital mobility problem and an effective monetary policy in individual countries. Dornbusch² in particular has developed a new approach to this problem by showing that the existence of a nontraded asset can restore effectiveness of monetary policy in a small, open economy. The use of instruments of monetary policy, other than open-market policy on which the theoretical analyses usually concentrate, can thus be explained as devices to establish non-tradability of domestic assets and to conduct monetary policy in the absence of open market operations and sterilization. It is in this context that policies take often the form of credit-rationing, capital controls, regulation of the financial industry or attempts at changing the relative yields of relatively non-tradable securities over which domestic authorities may exert more leverage than over their tradable counterparts.

¹ P. DE GRAUWE, Monetary interdependence among major European countries, in R.Z. ALIBER, ed., The Political Economy of Monetary Reform, London, MacMillan, 1977, p. 194.

² R. DORNBUSCH, Capital Mobility and portfolio balance, in R.Z. ALIBER, The Political Economy ..., op.cit., pp. 106-125.

III. Macroeconomic disturbances under flexible exchange rates

The switch since 1973 from a fixed exchange rate system to flexible exchange rates is usually explained by the need (i) to restore the (short-run) effectiveness of monetary policy for stabilization purposes and (ii) to mitigate the impact of disturbances originating in the rest of the world on the national economy. The first point is generally accepted and results in fact from the foreign source component of the monetary base being endogenous with capital mobility under a system of fixed rates, when governments are committed to buy or sell foreign exchange to maintain the exchange rate of their national money. Under a freely flexible rate system, instead, the foreign source component is fixed. Changes in the total monetary base will then depend only on changes in the domestic source component which is under full control of the national monetary authorities. Flexible exchange rates therefore guarantee national control over the money supply. To the extent that the money supply is the target variable for monetary policy, floating rates allow the national monetary authorities to pursue an independent monetary policy.

But, in a world with capital mobility covered interest arbitrage will still ensure that interest rates remain linked internationally. Interest-rate differentials and interest-sensitive capital movements do now affect the exchange rate rather than international reserves. At the same time this implies that a desire to avoid unwanted distortions of the exchange rate by temporary interest-rate differentials does on occasion become one of the factors that will determine interest-rate policy. Also, exchange rate expectations introduce the possibility that the domestic interest rate may diverge from the world rate. What matters to investors above all is the expected net return on alternative assets. Therefore, in the case of perfect capital mobility, the domestic interest rate can be defined as being equal to the world interest rate augmented with the expected rate of depreciation of the domestic currency.

As to the second point, it is argued that flexible exchange rates have failed to insulate national economies from foreign disturbances. To the extent that this is true flexible exchange rates do not permit total independence of national stabilization policies. A regime of flexible exchange rates is not the same as autarky but it does reduce both the impact of disturbances abroad on

domestic income and the leakage of domestic disturbances abroad.

R. Cooper¹ has raised the question of how much insulation a floating exchange rate does provide. He argues that it depends on the nature of the disturbance : (i) some disturbances to domestic aggregate demand can be completely neutralized under flexible exchange rates as compared to a fixed exchange rate system; (ii) in other cases the impact can be reduced but not eliminated; (iii) and again in certain situations a flexible rate may even aggravate the impact of a disturbance as compared with a fixed exchange rate.

Examples for disturbances originating in the rest of world for each of the three possibilities would be as follows : (i) a general rise in the world price level will be compensated at the border through an appreciation of the currency proportionate to the increase in foreign prices; (ii) an increase in the world demand for the country's exports will still raise income and stimulate domestic demand, but the resulting appreciation will partly damp the sale of exports and encourage an increase in the volume of imports, thereby relieving pressure on the domestic economy although the impact of the foreign disturbance will not be completely neutralized; (iii) an example of aggravation is provided by an inflow of capital which leads to an appreciation of the currency. The currency appreciation will reduce aggregate demand and induce a reallocation of resources away from tradable goods to non-tradable goods, possibly with transitional unemployment. In other words an appreciation induced by capital inflows could damage the profitability of foreign trade transactions. Although the latter case is very popular among anti-floaters, it should be pointed out that the aggravating disturbance arises from portfolio shifts. And as S. Black² has pointed out in his comment on Cooper, the first lesson to be learned from portfolio theory is that portfolio shifts must be temporary or one-shot adjustments. The currency appreciation is therefore bound to be a temporary phenomenon. For that same reason stabilizing speculation will tend to offset its effects and prevent or in any case attenuate the destabilizing effects on real variables.

¹ R.N. COOPER, op.cit., pp. 159-160.

² S. BLACK, Comment on R.N. COOPER, "Monetary theory and policy in an open economy, Scandinavian Journal of Economics, Vol. 78, 1976, p. 168.

All three categories have their counterparts in dealing with disturbances of domestic origin : (i) currency depreciation will fully offset a general domestic monetary inflation, "bottling it up" as it were in the originating country. Flexible exchange rates do compel countries to "swallow their own inflation"; (ii) a domestic shift in demand towards imports will be mitigated through currency depreciation; and (iii) a shift in preference from domestic to foreign securities might, in the absence of stabilizing currency speculation, aggravate domestic instability and induce reallocation of resources.

Floating rates thus provide incomplete insulation from "real" external disturbances. An open economy is open, no matter what its exchange rate regime. But flexible exchange rates do, however, permit different long-term rates of inflation.

Mussa¹ has drawn further attention to the fact that since exchange rate changes have real effects, at least in the short run, this makes such changes a concern of government policy. It even implies that governments can use exchange rates as policy instruments. The possibility has been recognized for some time as the experience of the thirties has demonstrated. But as is well known policy conflicts are bound to arise if everyone wants to devalue vis-à-vis everyone else. The potential for policy conflicts, therefore, remains under a managed flexible exchange rate system and consequently also the need for policy coordination.

To avoid policy conflicts and competitive depreciation it is often suggested that international surveillance of exchange rate policies is necessary and that as a rule governments should agree not to intervene against their own currencies in the foreign exchange markets. But recent models of exchange rate determination based on the assumption of continuous asset market equilibrium point to the fundamental inadequacy of international exchange rate surveillance and non-intervention rules. What matters for the exchange rate is the total supply of money in relation to its demand and not the artificial distinction between money that is created by the monetary authorities through buying domestic or foreign assets. A currency depreciation can result almost as well from the central bank buying domestic bonds as by having it buy foreign currency. Policy coordination and stability of exchange rates are thus in the first place matters of coordination of money supply policies, and not of exchange rate surveillance and interventions rules.

¹ M. MUSSA, The exchange rate, the balance of payments and monetary and fiscal policy under a regime of controlled floating, Scandinavian Journal of Economics, Vol. 78, 1976.

IV. Short-run instability of exchange rates and "overshooting"

In the recent past exchange rates have exhibited wider swings than many economists had expected to occur. Considerable attention has been devoted to a better understanding of the causes of this short-run volatility. Dynamic models have also offered insights on the conditions under which short-run responses of exchange rates to policy changes or other exogenous events overshoot the adjustments required for long run equilibrium to be restored¹. The Dornbusch model is suggestive of the observed large fluctuations in exchange rates while at the same time establishing the consistency of such exchange rate movements with rational expectations formation. A key role in his analysis is the assumption of differential speeds of adjustment in goods and asset markets. In fact, the dynamic aspects of exchange rate determination in his model arise from the assumption that exchange rates in the short run are determined in the asset markets where adjustment is relatively fast as compared to goods markets.

Dornbusch focusses on the impact of and the adjustment process to a monetary expansion whereby he identifies several features that are suggestive of recent currency experience. A monetary expansion will cause a fall in the domestic interest rate to the point at which the private sector is willing to absorb the additional money issued. To the extent that the foreign interest rate is exogenously given (the small country assumption), it is necessary that the forward premium (discount) on domestic currency increases (falls) relative to the situation prior to the monetary expansion.

The argument runs as follows. In order to maintain equal attractiveness of domestic and foreign assets at the margin interest rate parity is required. Thus, the monetary expansion must induce initially a depreciation of the domestic currency in the spot market through a capital outflow which exceeds

¹ See R. DORNBUSCH, Expectations and exchange rate dynamics, Journal of Political Economy, Vol. 84, 1976, pp. 1161-1176; R. DORNBUSCH, The theory of flexible exchange rate regimes and macroeconomic policy, Scandinavian Journal of Economics, Vol. 78, 1976, pp. 255-275.

P.J. KOURI, The exchange rate and the balance of payments in the short-run and in the long run : a monetary approach, Scandinavian Journal of Economics, Vol. 78, 1976, pp. 280-304.

W.H. BRANSON, Assets markets and relative prices in exchange rate determination, Institute for International Economic Studies, Stockholm, 1976.

the depreciation (if any), in the forward market in order to obtain the required increase (fall) in the forward premium (discount) on domestic currency. This is implied by the expectations mechanism in the Dornbusch model¹, since the elasticity of expectations, Π , is less than unity. An elasticity of expectations less than unity implies that a depreciation of the spot rate results in a less than proportionate depreciation of the forward rate set equal to the expected future spot rate. This implies an anticipated appreciation of the spot rate.

"The magnitude of the depreciation in the spot rate that is required depends on both the interest response of money demand and the elasticity of expectations. The smaller the interest responsiveness of money demand, the larger the interest rate change that is brought about by a monetary expansion and, therefore, the larger the expected appreciation that has to be brought about by a depreciation in the spot rate. Furthermore, a given depreciation of the spot rate will give rise to an expected appreciation of the future spot rate that is smaller, the larger the elasticity of expectations. Accordingly, large exchange rate changes will arise in circumstances where interest response of money demand is small and the elasticity of expectations is large".²

But contrary to what is suggested by Dornbusch and others, the overshooting highlighted by dynamic models does not offer a convincing explanation of the exchange rate volatility observed in recent years. Exchange rate overshooting may explain a cyclical development around a long run trend. It is not sufficient to account for some observed short run exchange rate instabilities. Furthermore, the appropriate lesson drawn from Dornbusch's story by Isard³ is that spot exchange rates should be observed to fluctuate more widely than forward rates by amounts that can be large or small, depending on the extent to

¹ For this result to obtain "it is sufficient to assume that the forward rate is set by speculators in a perfectly elastic manner at the level of the expected future spot rate and that expectations about the latter are formed in an adaptive manner. With these assumptions we have :

$$\bar{e} = \Pi e + (1-\Pi)e_{-1} \quad ; \quad 0 < \Pi < 1$$

The impact of a change in the spot rate $[e]$ is therefore to raise the forward rate $[\bar{e}]$ but proportionately less". R. DORNBUSCH, The theory of flexible exchange rate regimes and macro-economic policy, op.cit., pp. 261-262.

² ibidem, p. 262.

³ P. ISARD, The Process of Exchange-Rate Determination : A Survey of Important Models and Major Issues, International Finance Discussion Papers, N° 101, Jan. 1977 (mimeographed).

which monetary authorities allow interest rates to diverge internationally. The facts, however, do not confirm this empirical prediction based on Dornbusch's analysis. Most of the volatility in spot exchange rates in recent years has also been observed in forward rates.

Isard, therefore, suggests on the basis of the belief of many inside market operators that exchange rates move in speculative runs. This view is supported by the fact that it is difficult to find evidence of major private participants in exchange markets (notably banks and multinational corporations or oil-sheiks for that matter) taking large open positions on the basis of long-run exchange rate expectations. The explanation offered for this lack of long-run open positions is that banks and multinationals operate under strict limits on the open positions that their foreign-exchange managers may take. For commercial banks, particularly in Europe, these limits may be imposed by the monetary authorities. In addition, it is also undoubtedly true that banks and multinationals, being among the major operators in the exchange markets, do not have clear long-run exchange rate expectations. Consequently, the risk associated with long-run open positions is perceived as being too high. The question then becomes why expectations are imprecise and how they are formed.

An approach developed by Mussa¹ is suggestive in this respect. He starts from the proposition that expectations of future exchange rates affect the willingness to hold domestic money. These expectations are assumed to be formed in a way that is consistent with the underlying economic structure and that they therefore reflect the asset holders' knowledge of the structure of the economy, in particular, the structure of the stochastic processes generating money demand and money supply. This is the so-called rational expectations hypothesis.

Mussa then develops a simple model which focusses on the potentially-large variability of such expectations which in turn leads to large scale volatility in exchange rates.

In his model today's expectations of tomorrow's exchange rate depend on today's expectations of the entire future time paths of both the money supply and all variables (other than exchange rates) which influence money demand. If the

¹ M. MUSSA, op.cit., pp. 241-247.

expectations about the latter time paths are subjected to sudden shifts both exchange rate expectations and, thus, observed exchange rates will be subject to sudden shifts. The exchange rate which prevails at any moment in time and the expectations held at that time about future exchange rates, depend on the information available to asset holders at that particular instant. But as a practical matter information is always limited in the sense that economic agents never know the future course of all variables relevant to our current decisions. Ex post, it is easy to observe that errors were made and that expectations are consequently revised. This is not inconsistent with the "rationality" of exchange rate expectations and the "efficiency" of the exchange markets.

"Large up and down movements of exchange rates appear irrational and inefficient, after the fact, but do not provide evidence of a capacity to make better predictions or more profitable transactions, before the fact".¹

Although Mussa's model is still highly simplified, his analysis suggests that changes in expectations about policy variables, in particular the characteristics of monetary and fiscal policy, may be an important cause of exchange-rate volatility. Monetary and fiscal policy measures play indeed a crucial role in the expectations formation process. The policy implications of this analysis follow readily : exchange rate volatility could be reduced by (i) adequate dissimulation of information that would allow better predictions of the time path of policy variables by market participants, and/or (ii) avoiding sudden shifts in the time paths of policy variables. Predictability and stability of policy variables becomes, thus, a crucial factor for the predictability and stability of exchange rates. This conclusion is nothing but the currently fashionable monetarist policy prescription that submits as essential in monetary policy pre-announced money supply targets which in the future will only be gradually adjusted.

¹ Ibidem, p. 246.

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