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The IMF Monetary Model at Forty

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Abstract

A model reflecting the monetary approach to the balance of payments was developed in the International Monetary Fund (IMF) in the 1950s. Its purpose was to integrate monetary, income, and balance of payments analysis, and it became the basis of the conditionality applied to IMF credits. Extremely simple, with primary focus on the balance of payments effects of credit creation by the banking system, the model has retained its usefulness for policy purposes over time, as it was adapted to changes in member countries' priorities and in the international monetary system, in particular the disappearance of the par value system.

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Summary

This paper deals with the vicissitudes over a forty-year period, from 1957 to the present, of a model that was designed from the start with policy considerations uppermost in mind, that has been used consistently for policy purposes by the International Monetary Fund and that has been adapted over time in the light of changes in the world economy and emerging views of policy priorities. The model, originally designed for a par value world, could readily be adapted to situations where exchange rate changes became a normal component of Fund stand-by arrangements, and the incorporation of two instruments, domestic credit creation and the exchange rate, made the model suitable for the pursuit of two objectives, a reserve target and the rate of capacity utilization.

But attempts to marry the model to medium-term growth models have foundered on a fundamental incompatibility between these two types of models. By contrast, the model could be adjusted to situations in which the control over inflation, rather than the achievement of a particular balance-of-payments aim, was the dominant objective. Nevertheless, it was found to be much less useful to analyze some of the "transition countries" in the early 1990s and, at the other end of the range, the CFA countries with their almost completely integrated financial systems.

The IMF Monetary Model at Forty

1. Origin of the Model

From the day in 1947 that the Fund opened its doors for business, member countries came to it to seek credit when they encountered deficits in their balances of payments that they found difficult to finance from their own reserves. To ensure that these countries would correct their payments positions within a reasonable period, the Fund had to have an understanding of the causes of the payments deficits and, both qualitatively and quantitatively, of the policy measures necessary to overcome them. Only then could it come to a judgment whether the actual or proposed policies of the member would be sufficient to restore balance and, if not, to insist on a strengthened policy package as a condition for its credit. The model that the Fund introduced in the 1950s to meet this need appeared to be still very much alive 30 or 40 years later. About one-half of a 1987 Occasional Paper (no. 55), attributed to no fewer than eight senior staff members of the Research Department and entitled *Theoretical Aspects of the Design of Fund-Supported Adjustment Programs* (IMF 1987, hereinafter referred to as OP55), was devoted to an exposition of the model and its implications for policy. In 1996, a workbook prepared as a training manual in the Fund's Institute (*Financial Programming and Policy: The Case of Sri Lanka*; IMF 1996, hereinafter referred to as Sri Lanka) focuses, as its title indicates, on the technique of financial programming, and its monetary chapter is built around the same monetary model. Fund stand-by and other financial support arrangements continue to be designed around monetary targets serving as "performance criteria" for the release of successive tranches or as "benchmarks" that play a major role in the reviews of such arrangements.

The case for a simple model

One key characteristic of the model is its simplicity. For this, there were two good reasons.[1] At the analytical level, this simplicity was inevitable in view of the paucity of data (e.g. the absence of national income or GNP figures) for many of the Fund's member countries, the total absence of econometric models to describe their economies and indeed of any hope to remedy this situation for decades ahead. In these circumstances a ready-made model that needed as inputs only two sets of statistics that were generally available, banking and trade data, went a considerable distance toward meeting the needs of the organization for analytical tools for its financial operations. Equally important, however, and relevant to countries both large and small, was the focus of the model on the key variable that the authorities could control, domestic credit creation, and that was seen as crucial to the correction of the balance of payments problems for which the Fund assistance had been invoked.

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[1]For a more detailed discussion of this aspect, see Rhomberg and Heller 1977.

The limitations on statistical data and on the practicability of interpreting these data by means of econometric tools have to a considerable extent subsided, although there are still many of the Fund's customer countries, both in the developing world and among the "transition economies", for which the design of an empirical, "Lucas-proof", model suitable for inferences about policy choices and outcomes would be a questionable undertaking. For example, while the Sri Lanka workbook contains a considerable number of behavioral equations fitted to annual data for that country, these do not add up to a country model and are used only, together with more ad hoc methods, in an iterative process to estimate future values of individual variables. It is true that ever since the mid-1970s econometricians inside and outside the Fund have made valuable efforts to build more elaborate models.[2] The insights provided by these papers did not, however, have a significant effect on the programming activities of the organization (there is not a single reference to any of them in the 1996 Sri Lanka workbook). For program design as well as control, the Fund has continued to use a simple model, with a very limited number of standard variables, subject to any elaboration on an ad hoc basis.

Section 2 presents a simple version of the model and some of the general conclusions that can be drawn from it. Section 3, which is the main dish of this paper, then explores the extent to which both the model, and the uses made of it, have been affected by developments in the world economy and by changes in member countries' policy priorities.

2. The model and its implications

The model was designed to study the effects on both income formation and the balance of payments of the two most important exogenous variables operating on the economies of the great majority of countries in the early postwar period: (1) autonomous changes in exports and (2) the creation of bank credit. The linkage of domestic autonomous expenditure to credit creation, and of exports to additions to the money supply from abroad, required a model that explicitly recognized a demand-for-money function. The evidence from many countries suggested that the simplest form of such a function, namely demand proportional to GNP, would constitute a reasonable approximation.

Over the years, there have been a number of slightly different formulations of the model. The one presented below is probably the simplest; it derives from Polak and Argy (1971 p. 206), slightly amended to make it more readily understandable in the light of OP55 (pp. 13 and 17). This model contains two behavioral and two definitional equations:

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[2] Two of these were included in *The Monetary Approach to the Balance of Payments* (International Monetary Fund 1977), the book that mainly served to bring together the original exposition of the model and the early attempts at its empirical verification. Eleven further papers of this nature by Fund staff members, of increasing sophistication, were assembled in a 1991 publication (Khan, Montiel and Haque, editors).

(1) $\Delta MO = k\Delta Y$
(2) $M = mY$
(3) $\Delta MO = \Delta R + \Delta D$
(4) $\Delta R = X - M + K,$

where:

MO = Money supply
Y = GNP
M = Imports
R = Reserves
D = Domestic Credit of the banking system
X = Exports
K = Net capital inflow of the nonbanking sector
k = the inverse of the velocity of circulation of money
m = the marginal propensity to import

The dynamic character of this model derives from the fact that it contains both Y (in equation (2)) and ΔY (in equation (1)). A solution of the four equations leads to expressions for the endogenous variables, such as ΔR and Y, as weighted averages of the values for the current and past years of the autonomous variables X, K and ΔD. (Polak and Argy, p. 207). Statistical tests done in the Fund have shown that, "on the whole, imports and income have been explained well by this model" (Polak and Argy, p. 210).The dynamic nature of the Fund model, in contrast to most of the academic monetary balance of payments models, yields not only the final equilibrium value of the endogenous variables but also the time path towards these values; the derivation of these short-term effects is essential if the model is to be used in the analysis of, and the prescription for, current policy problems (Rhomberg and Heller 1977, p. 13).

In this general form, the model, assuming its validity, can be used to draw a number of inferences that are all to some extent counterintuitive and therefore constitute a useful bag of knowledge for international officials in their relations with national policy makers who may be more inclined to project first-round results (especially if they are favorable) into the indefinite future. These findings, it may be repeated, are based on the assumption of a constant income velocity of money, and while this assumption may not hold rigidly, there is enough evidence of its approximate validity to justify the expectation that it gives a good first stab at likely outcomes. I list here four such findings:

1. A permanent increase in output--for example as a result of a discovery of petroleum, or the introduction of better agricultural techniques, while it raises income will provide only a temporary relief to the balance of payments.

2. A lasting increase in exports will produce a lasting increase in reserves but only a transitory improvement in the balance of payments. Probably the most striking confirmation of this general proposition was provided by the complete--and to many unexpected--

disappearance of the huge balance of payments surpluses of the oil exporters within a few years of the first oil shock.

3. Any once-for-all increase in credit will, over time, fully leak out through increased imports.

4. The stock of money is an endogenous variable; accordingly, control over the expansion of credit can achieve a desired balance of payments result, control over the money supply can not.[3]

For the further purpose of designing (or analyzing the adequacy of) the complex of a country's policies to deal with its balance of payments situation, it has been found useful to concentrate on the balance sheet of the central bank and its credit activities, rather than on a consolidation of the balance sheets of the monetary system as a whole as in (3). This requires the introduction of the definition:

(5) $\Delta H = \Delta R + \Delta DCB$,

and the behavioral equation:

(6) $\Delta MO = q\Delta H$,

where H is reserve money (currency plus reserves of commercial banks), DCB is domestic credit of the central bank and q is the "money multiplier".

The set of equations (1), (2), (4), (5) and (6) constitutes the logical core of the Fund's programming exercise, which has received the name of Financial Programming, and since the early 1950s has made up the center piece of the analysis leading to Fund conditionality: the stipulation of the policy actions on the part of the borrowing country that the Fund requested as conditions for the country's access to credit from the Fund. In the model's practical application, the validity of the behavioral equations is not taken for granted but tested, or, for the purpose of making projections, amended as necessary in the light of any available

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[3] In the mid-1960s, the minister of finance of an industrial country that suffered from frequent balance of payments difficulties advised a visiting Fund mission that the country was addressing that problem by keeping the increase in its money supply to x percent (I forgot the figure) per year, and was truly surprised by the staff's comment that the policy stance adopted amounted to replacing any money that leaked out through the balance of payments so that the leakage could continue. A more recent example of a similar fallacy is found in the claim that "there is no evidence of a fundamental deterioration in Mexico's monetary and fiscal policies" as the cause of Mexico's reserve losses, on the ground that the rate of growth of the money supply in Mexico in 1994 (at about 10 percent) was significantly lower then in the previous year, when it had been about 30 percent, (Buira 1996, p. 313).

information. Accordingly, projected numerical values for the relevant variables are not found by solving a set of equations but by making iterative calculations.[4] A particularly valuable by-product of this programming approach is that it forces the analyst to use (which frequently means: to construct) a set of consistent data on the balance of payments, government finance and the accounts of the banking system.

The model stops at the explanation of ΔY and does not continue to an explanation of its real and price components (Δy and Δp). This may seem surprising, given the obvious interest of what Fund programs would do to real production and prices--or, as OP55 puts it, "output and inflation targets are major factors in deciding upon the policy package" (p. 13). The origin of this apparent gap in the model lay in its focus on a *monetary* variable, the change in reserves, which could plausibly be argued (as it was in Polak 1957) to be independent of the quantity/price split of Y; so that from a prescriptive point of view it was possible to postulate a direct link between domestic credit creation and the change in reserves.

But why was this gap never filled? While one can think of a number of equations that would determine either Δp (the change in the price level) or Δy (the change in real GNP), it is questionable that any of these formulations would have the empirical validity that equations (1) and (2) have. For example, while it may be reasonable to assume that in some small open economies the domestic price level is fully dependent on the world price level and the exchange rate, we know that other small countries have succeeded to inflate themselves into an overvalued currency. Or again, one could postulate an assumption on the behavior of the price of domestic goods as a function of the ratio between actual and potential output (Khan and Montiel 1990, p. 190), but unless the realism of such a postulate is established it would be rash to incorporate it in the model underlying the Fund's policy approach.

There are thus good reasons to leave Δy and Δp, as it were, dangling as quasi-exogenous variables in the Fund's operational model in its projecting mode. While there are elements in both Δy and Δp that may be susceptible to systemic projection, it is likely, especially in smaller countries, that special factors--crops, the opening of a new mine, the impact of recent exchange rate changes-- have an influence that can better be estimated by a set of informed guesses than by the application of a formula which, at best, is known to hold

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[4] OP55 (p. 13/14) is, I believe, mistaken in attributing the need for an iterative procedure to the introduction into the model of the equation for imports (which that paper does not include in the simplest model it presents). It appears to confuse this technical aspect of the model with what is a good reason for choosing the slow road of iteration in considering policy alternatives, namely that the choice of a target value, for example for ΔR, cannot be finally made until its consequences on the dependent variables are fully worked out. If the results of adopting one set of "targets" turns out too harsh to be acceptable, targets may be adjusted, instruments may be reset and, perhaps, new instruments may need to be devised to bring about more favorable values for some of the "exogenous" variables--such as pressure on donors to grant more aid, or the removal of some long-standing barriers to exports.

for a broad group of countries on average over time (for an example, see Sri Lanka, pp.105-122). To deal with a problem of this nature, a truncated model is to be preferred over one that pretends to be complete. In many practical applications, the price/quantity split could readily be brought in from outside the model. The impact of a modest increase in the value of exports on an economy with some degree of slack could be anticipated to be essentially all reflected in Δy; a substantial increase in credit creation in an economy on the edge of inflation would probably all show up in Δp. One would know which scenario applied and design policy recommendations accordingly.

3. The model over time

Although the Fund has continued to use essentially the same model as the foundation of its credit arrangements, these arrangements themselves continued over the years to broaden and deepen. Thus the analytically neutral variable "credit creation" was split in its two sectoral components, credit to the private sector (usually to be encouraged) and credit to the government sector (usually to be discouraged). In a further specification, the Fund moved toward advice on specific types of taxes (with some taxes judged more acceptable than others) and on various types of expenditure, endorsing social safety nets and education (especially primary, not necessarily tertiary education) and frowning on military and other non-productive expenditures.[5] Beyond filling in with ever increasing precision the credit creation component of its conditionality, it also added further specifics of a non-monetary character, relying on "a wide spectrum of policy instruments...[that] also involved close collaboration with the World Bank in program design" (OP55, p. 29). Thus many programs in recent years have contained major policy understandings on structural adjustment, price and trade liberalization, deregulation of the labor market, privatization and many other policies. But since none of these could conveniently be captured in econometric equations, no attempt was made to build them into the model. Thus while "financial programming" and the underlying simple model continued to provide the packaging for the Fund's arrangements, the contents of the packages became increasingly complex over the years. A major effort was also made to set the Fund's programs against a medium term background, including the sustainability of a country's fiscal, balance of payments, and foreign debt situation. But this was done by means of a separate model that left the monetary model intact for the study of near-term effects.[6]

In the remainder of this paper I discuss the extent to which the model has (or has not) been modified to accommodate one additional policy variable, the exchange rate, and two new policy objectives, medium-term growth and the control over inflation.

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[5] For a discussion of the increasingly engaged nature of the Fund's conditionality, see Polak (1991).

[6] For a brief indication of the model used for medium-term projections, see footnote 8 below.

The exchange rate

The design of the model in the early postwar years reflected two characteristics of the world economy in that period: the par value regime and a dominant upward trend in world demand. Balance of payments problems that brought countries to seek the assistance of the IMF were typically due to bursts of excessive domestic expansion, and could usually be cured by the introduction of financial restraint. If the expansion had festered long enough to raise the domestic price level above that in the rest of the world, there would be a need for a compensating change in the par value; and in the limited number of countries subject to chronic inflation, it might even be necessary to include a regular dose of compensating depreciation in Fund programs (Robichek 1967, p. 9); otherwise, an adjustment program could be expected to succeed, usually quite quickly, without an exchange rate change (Polak 1991, p.36). In an age when the world was broadly on a full-employment path, there was, unlike the situation in the 1930s, little incentive for countries to resort to currency depreciation as a means to raise their level of real income, quite apart from the fact that the Articles of Agreement banned "competitive depreciation". Thus, the same research in the Fund that stressed the importance of monetary policy for the balance of payments was bound to conclude that in a situation of full employment the effects of a devaluation on both the balance of payments and the real economy would likely be small, nonproportional and transitory (Alexander 1952, p. 274). Indeed, the main outcome of that research was the discovery of certain ways in which devaluations could help to correct the excess demand that had caused the payments deficits in a full-employment economy. Among these ways were shifts in income toward groups that would save more or pay more in taxes (Polak 1948 [1991]), real balance effects, and perhaps effects of money illusion (Alexander 1952). In contrast to later concerns about the deflationary effect of currency depreciation (see, for example, Lizondo and Montiel 1989), these causes of an expected downward shift in aggregate demand were seen at the time as welcome contributions to overcoming the excess demand that was assumed to be the cause of the country's payments difficulties, and which otherwise would have to be corrected by new policy measures.

As the par value system unraveled, the exchange rate became a frequent component of Fund standby arrangements.[7] But this did not require a radical change in the model. Exports already entered the model as an exogenous variable so that forecasting exports, whether with or without the exchange rate as one of the determining variables, was in any event performed outside the model (Sri Lanka, pp. 136-138). To the endogenous import equation an exchange rate term could readily be added (Sri Lanka, pp. 139-141). Indirect effects on prices and output and on government finance, as well as direct effects (if they can be ascertained) on capital movements have to be taken into account in the reduced form equation of the system in which the demand for money, the change in net domestic assets and domestic credit

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[7] The proportion of Fund programs (for countries that did not belong to currency unions) that included exchange rate action increased from 32 percent in 1963-72 to 59 percent in 1973-80 to 82 percent in 1981-83 and close to 100 percent thereafter (Polak 1991, p. 36).

creation converge (OP 55, p. 41). Since, as noted, it is in any event not feasible to design a complete set of structural equations for the kind of economies with which the IMF works and solve this set for numerical policy numbers, the addition of the exchange rate as a variable had the effect of making the process of iteration more laborious rather than changing it in a fundamental way; it also, of course, made it possible to address explicitly a second objective in the Fund's arrangements, the pursuit of full use of the country's productive capacity.

Both the balance-of-payments and the short-term growth objective required not only that the exchange rate with which a country entered a stand-by arrangement was economically justified, but also that the rate would continue to meet that test in the face of uncertain external developments and--a more frequent concern--internal inflation. To achieve this objective, the conditionality of a stand-by arrangement typically includes a prescribed minimum *level*--or, if rebuilding of the stock of reserves is considered a necessity--a minimum *path* for net international assets that the country must observe to draw successive installments of its stand-by credit. The instrument by which countries ensure, if necessary, the observation of this limit is, normally, the exchange rate.

The standard conditionality of the Fund thus evolved toward the inclusion of a double monetary prescription: a ceiling on the expansion of domestic assets of the central bank to achieve an acceptable (flow) balance of payments result and a floor under its holdings of net foreign assets to bring about a satisfactory (stock) reserve outcome and, at the same time, make sure that the central bank would not use excessive intervention to counter market pressures toward a more depreciated exchange rate.

Medium term growth

As the strongly expansionary trends that had characterized the world economy in the third quarter of the 20th century came to an end and an increasing number of developing countries had recourse to Fund finance and Fund programs, the members of the Fund and the institution itself became increasingly concerned about the impact of these programs on the growth prospects for the countries that needed to borrow under them.. "Growth" in this context meant two different things, not always sufficiently distinguished in the policy discussions, namely: (i) the increase in real GDP, especially after a country had experienced a negative shock, that could be achieved within the country's existing productive capacity, and (ii) the increase in output over the medium or long term to be achieved by the growth of capacity.

We have already noted, in the previous section, the potential impact of a change in the real exchange rate on capacity utilization. With respect to the second dimension, there has of course been no shortage of growth models going back to those developed by Roy Harrod and Evsey Domar in the 1940s. A variant of these models is still used in the World Bank (under the acronym RMSM, pronounced "Rimsim") and in the Fund to make medium-term macroeconomic projection. One may wonder at the survival of these models which omit what are nowadays considered the most important factors determining the growth of developing

countries, such as outward orientation, realistic prices, privatization, reform of the financial sector and, in general, governmental attitudes toward the economy.[8] But even if these models are accepted as simply spelling out one possible road to growth, their domination by long-term supply factors makes them too far removed from the short-term, demand-type monetary models than that one could expect success in crossbreeding these two types of models. A brief comment on two attempts at linkage confirms this expectation.

Chand (1989) constructs a "growth-oriented model of financial programming" that contains much wisdom about financial programming, but its sole finding with respect to growth is rather pedestrian: the part of output that is left for investment depends on the propensity to consume, the tax ratio and government consumption, plus the supply of savings from abroad (his equation (23)); that amount of investment, multiplied by ICOR (the incremental capital/output ratio) determines the growth of capacity.[9] In a more ambitious exercise, Khan and Montiel (1989) bring about a full-scale marriage between the Fund's monetary model and the Bank's RMSM. The resulting hybrid model suffers from three weaknesses: it is not able to handle either of the two tasks for which its components were designed; it has lost the simplicity that was part of the attraction of the two separate models; and, above all, it yields scant rewards in terms of new insights with respect to growth-oriented adjustment (Polak 1990).[10]

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[8] The projections in these models are based on a combination of (i) a *target* growth rate for the economy with (ii) plausible *forecasts* for the outside world and (iii) the dubious *assumption* that any growth in output must equal the product of *new investment* multiplied by ICOR (the incremental/capital output ratio of that new investment, which is often assumed to equal that ratio in the recent past). If the exercise shows that the expected domestic saving and foreign capital do not produce the desired growth rate, the analyst is advised to think up various structural reforms that might in a general way, unrelated to the model used, ameliorate the outcome.(Sri Lanka, ch. VIII).

[9] Practically the same thought, without the benefit of a model, is contained in a description of the Fund's programming technique 22 years earlier, when Robichek (1967, p. 4) notes "the need to frame programs that are compatible with aspirations for rapid economic growth. This means that the financial programs must make provision for high levels of capital formation. This, in turn, implies a rate of saving in the private and public sectors that is sufficiently high to close any heretofore existing gap and still provides additional finance for that part of the extended investment activity for which additional foreign financing is not available."

[10] In their reply, Khan and Montiel (1990) do not quarrel with my misgivings about the value of the merged model as a tool for analyzing adjustment with growth in developing countries but ask, fairly enough, that the marriage of the two models not be pronounced a failure until one has seen the quality of the offspring (p. 188). After nearly a decade, however, I am not aware of any blessed events to be reported.

In practice, therefore, the double objective of stabilization with growth was pursued, not by an expansion of the model, but by an attempt to appraise the different items entering into the model on their potential contribution to growth. The first step in this direction, the introduction of a sub-ceiling on credit to the government, served the purpose of ensuring an adequate supply of credit to the private sector. The further refinement of the entries of both the taxation and the expenditure sides of "net credit to the government" referred to at the beginning of this section reflected an increasing desire on the part of the Fund that the understandings reached with member countries on short-term stabilization would at the same time contribute to medium term growth.

Inflation concerns

The combination of monetary instruments used in Fund programs to guard against an unfavorable development in the balance of payments does not provide protection against deviations from the program in the opposite direction. A more favorable balance of payments than envisaged at the time of the program could lead to overperformance on the reserve target and hence, unless the level of domestic credit creation was kept correspondingly below ceiling, to a larger increase in the money supply than had been programmed. It is probably fair to say that up to the 1970s this possible outcome did not cause much concern. Countries enjoying temporary high export prices or manifestations of Dutch disease would not normally be users of IMF credit, but the Fund might caution them to to restrain credit creation in order to build up reserves for a likely rainy day.[11] For countries that had borrowed from the Fund, better than expected balance of payments or reserves performance were seen as welcome developments that might lead to early repayment of Fund credit. Moreover, the increase in the money supply might be welcome if it was provoked by a shift in the demand for money, perhaps as a result of a return of greater confidence in the currency as one of the results of the program. But developments in the 1980s and even more strikingly in the 1990s have made it necessary to revise attitudes toward these issues. A study of the Fund's financial arrangements with 36 countries over the period 1988 to 1992 showed that "targets for broad money growth were overshot by wide margins in about two thirds of the program years; in most countries this reflected mainly larger-than-expected foreign assets....*These developments illustrate the power of financial programs in general, and credit restraint in particular, for building reserves but* [equally] *their weakness for curbing money growth and, ultimately, inflation, particularly when the exchange rate is not used as a nominal anchor*" (Schadler and others, 1995, pp. 20-21; italics in original).

This concern was especially provoked by the occurrence of rates of inflation not seen since the early postwar years, indeed of hyperinflation, both in countries that had been afflicted by the debt crisis and in many of the new members of the Fund in Eastern Europe and

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[11] In fact, the first results of the IMF monetary model appeared in a 1950 paper by E.M. Bernstein on the high price of coffee and how producers should guard against dissipating their increased export earnings (Polak 1994, p. *xxv*).

in the former Soviet Union.[12] In all these countries the control of inflation became the first order of business, often ahead of dealing with potential balance of payments problems, which in both groups of countries had been made less threatening by the undervaluation of their currencies under the pressure of capital flight. In these circumstances controlling the money supply became an indispensable policy instrument, and the last decade has seen an active debate in the Fund on the circumstances in which, and the techniques by which, this could be achieved.

These new developments present the countries affected by them, and the IMF in its task of providing advice and guidance, with a wide range of new challenges. They also raise questions with respect to the continued relevance of a model that had been designed with substantially less taxing situations in view.

As the most striking example, the treatment of government deficits simply as elements in the magnitude of credit creation reflects a view on the structure of the capital market that is increasingly unrealistic for the great majority of countries. Governments in many countries may find it possible to finance deficits on local capital markets and thus, by raising interest rates, draw in capital from abroad and in the process to shore up the value of their currency.

In order for the model to reflect these new realities of the financial conditions of some of the countries now seeking assistance from the Fund it would need to be expanded in at least three respects:[13]

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[12] The problem how to apply the model to situations in which inflation risks were an important concern of countries using Fund credit had arisen on some earlier occasions, of which the Philippines in the mid-1980s probably drew the greatest attention. The issue is discussed at length in OP55, pp. 22-24.

[13] What apparently would not need to be changed in the model is equation (1) which stipulates a constant marginal velocity of money. Available evidence suggests that that equation remained broadly valid. The Fund staff study referred to above noted that "[t]ypically...velocity remained steady or rose...(Schadler 1995, p. 20). The experience of 25 countries in Eastern Europe and in the area of the former Soviet Union analyzed by Havrylyshyn (1995, pp. 22-25) found that in each of these countries, once the money supply was brought under strict control, inflation also fell to single digits per month in a matter of months. (Compared to the enormous magnitude of the percentage changes in ΔMO and Δp, any changes in Δy would be insignificant). A sophisticated econometric calculation for Russia using monthly data for 1992-94 showed a close correlation, with a distributed lag of around 3-4 months, between broad money and the consumer price index (Koen and Marrese 1995, pp. 60-61). But in the short run, there is evidence of a more complex relationship between changes in the rate of inflation and velocity (De Broek, Kránýak and Lorie 1997).

1. The flexibility of international capital movements makes the treatment of that variable (K in equation (4)) as exogenous no longer tenable. K would have to be made at least in part endogenous, dependent on both the domestic interest rate and exchange rate expectations. Bearing in mind that an important component of K nowadays may be the outflow or the return flow of domestic flight capital, this change in the model alone would present a major challenge.

2. Allowance would have to be made for the fact that the domestic interest rate, which does not even appear in the simple model, may be strongly affected by the size of the government deficit, whether that deficit is financed from the banking system or in a nascent domestic capital market.

3. Yet another extension of the model would be needed to assist governments in the choice between two possible exchange rate policies, either of which may be appropriate in the circumstances described: a floating rate to block the inflationary impact caused by an oversupply of "money of foreign origin," or a fixed exchange rate (or one moving at a predetermined crawl), to provide a psychological anchor to the price level, even though it may cause a competitive disadvantage if there remains some inertial inflation in the economy. To assist in this choice, the exchange rate would need to find a place in the model not only in terms of its effect on trade flows but also with respect to inflation expectations.

In a formal sense, it would not be particularly difficult to introduce these three extensions of the model. Indeed, versions of the model including the domestic interest rate and its effect on capital flows date back to its early days. (Argy 1969, Polak and Argy 1971). But such extensions would be essentially useless unless it were also possible to obtain some order of magnitude of the coefficients in the newly introduced equations. And that, unfortunately, is *not* possible.

In this setting, the Fund has had to forego the comfort of its old model and base its conditionality on a set of ad hoc instruments that seemed plausible in the circumstances.

With respect to government finance, the Fund has found it necessary in recent years to go behind ceilings on bank credit to direct restrictions on the government deficit, however financed, because government deficits, even if financed in a domestic capital market, crowd out investment by the private sector. Indeed, in the press reports on the Fund's relations with many countries (Russia, Argentina, Pakistan, to name a few) agreed limits on the deficit as a percent of GNP have become the most prominent feature.

To stave off imported inflation caused by an expansion in the money supply, the Fund has favored a free (upward) float in many CIS countries, taking comfort from the fact that the currencies of many of these countries are so deeply undervalued that a measure of appreciation would not undermine their competitiveness, in particular since these countries were also experiencing a rapid increase in labor productivity. (In a number of transition countries in Central Europe, by contrast, the uncertainty created by widening of the exchange

rate band has proved sufficient to calm the rate of inflow). It should be noted, however, that governments that accepted a floating rate in principle (and whose fiscal policies were not always entirely solid) sometimes proved less than enthusiastic in its implementation and often tended to practice something close to a fixed rate.

While the prevention of excessive creation of domestic credit and the targeting of a desired increase in reserves are relatively straightforward, the avoidance of an excessive increase of the money supply raises more questions. In the first place, the normal effect of a successful stabilization after a period of high inflation is an increase in the demand for money. An inflow of money from abroad to meet this demand--and the corresponding overshooting of the reserve target--are entirely desirable, and to frustrate this demand by either a float or (with a fixed rate) putting a ceiling on the money supply would needlessly depress the economy.[15] A ceiling on base money would imply open-market sales of government paper at high domestic interest rates, which could be extremely costly. In addition, the resulting rise in domestic interest rates could attract more money from abroad, thus setting up a vicious circle.

Without much of a model to go by, the Fund has in recent years tended to adopt an "all risk" policy, furnishing its arrangements with CIS and Baltic countries with a triple set of keys: a ceilings on domestic credit, a floor under net international assets and an indicative target for base money, reserving for periodic reviews a judgment as to the need for additional anti-inflationary action.

But for these countries, the exceptional situation described may be expected to subside as and when inflation comes down and the exchange rate stabilizes. In many of these countries the competitive advantage of an undervalued currency has been substantially eroded and while the concerns about inflation have to some extent abated, those about the payments position cannot safely be disregarded. At the same time, the continuing lack of confidence in banks has prevented the slowdown in velocity that has been typical of the end of inflation elsewhere. Thus, these countries may now increasingly find themselves in the position where the prescription offered by the simple version of the monetary model suffices: a ceiling on net domestic credit to protect the balance of payments plus a floor under reserves to ensure that the authorities do not overreach themselves in defending the stable value of their currencies. At some stage, confidence in the currency will rise and the resulting increase in the demand

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[15] In its 1994 stabilization program, Brazil introduced slowly rising quarterly limits on the stock of base money as evidence of its commitment to bring down inflation. But the success of the stabilization effort, which brought inflation down from 47 percent in June 1994 to a monthly average of 2 percent per month in the last quarter caused a sharp increase in the demand for money which made the originally planned path for the growth in reserve money wholly unrealistic, and in November of 1994 the limit on base money was eliminated; but since the anti-inflation program had taken hold, the disappearance of a limit on base money did not undermine that program.

for money will pull in reserves. When that occurs, it will be possible to rejoice over the increase in reserves without feeling qualms about the rise in the money supply.
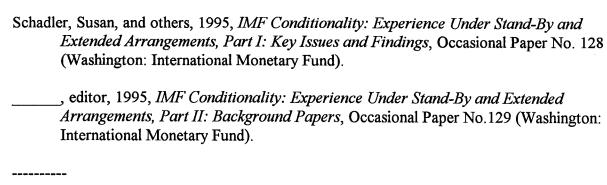
For an entirely different group of countries, however, the model would seem definitely to have lost most if not all of its applicability. Among the 14 countries that make up the Central and West African monetary and economic unions, there are no figures of (and indeed there is no meaningful concept of) country-by-country currency circulation nor, consequently, of a national money supply. The magnitude of credit extension is controlled by the common central banks for each region as a whole, and the development of regional money and interbank markets that could rapidly redistribute within the zone all credits expressed in the common currency (the CFA franc) has deprived the control of credit creation within any one country of economic meaning. Thus, for the Fund's operational purposes the government's domestic borrowing requirement has in practice become the only immediate instrument to influence the level of demand in individual countries (Clément 1996, p. 76). Similar considerations would apply to the members of any other group of countries among which there was full effective movement of capital without any exchange rate risk, most particularly of course in the future the member countries of the European Monetary Union.[16]

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[16] As long as countries participating in EMU remain individual members of the IMF they would be able to use Fund credit and the question of an appropriate model to set the conditionality for such credit remains relevant (Polak 1997).

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