
The IMF Monetary Model

A Hardy Perennial

JACQUES J. POLAK

The IMF monetary model has been adapted to changing circumstances since its inception over 40 years ago. The model's chief architect examines why it still remains useful.

FROM THE DAY in 1947 when the International Monetary Fund opened its doors for business and member countries came to it seeking credit to help them meet deficits in their balances of payments, the IMF had to have an understanding of the causes of such deficits and, both qualitatively and quantitatively, of the policy measures necessary to overcome them. Only then could it come to a judgment on whether a country's policies would be sufficient to restore balance and, if they were not, to insist on a strengthened policy package as a condition for IMF credit.

The model that the IMF introduced in the 1950s to meet this need is still very much alive today. IMF Stand-By Arrangements and other financial support continue to be designed around monetary

targets serving as "performance criteria" for the release of successive amounts of financial assistance 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. There were two good reasons for this. First, at the analytical level, simplicity was inevitable in view of the paucity of basic economic data such as national income in the early postwar years for many of the Fund's member countries, the total absence of econometric models to describe their economies, and indeed, the probability that this situation would not be remedied for decades ahead. Hence the choice of a model that needed as inputs only two sets of statistics that were generally available—banking data and trade data. Second, and even more important, simplicity kept the model focused on the key variable that governments could control—domestic credit creation—that was seen as crucial to the correction of the balance of payments problems for which IMF assistance had been invoked.

The limitations on statistical data have to a considerable extent subsided, but there are still many IMF customers, both in the developing world and among the transition

economies, for which constructing an empirical model suitable for inferences about policy choices and outcomes would be a questionable undertaking. For program design as well as control, the IMF has continued to need a simple model, with a very limited number of standard variables, subject to elaboration on an ad hoc basis.

The model

The model was designed to study the effects on both income formation and the balance of payments of the two most important exogenous variables (variables determined outside the model) operating on the economies of the great majority of countries in the early postwar period: autonomous changes in exports and the creation of domestic bank credit; or, in monetary terms, foreign and domestic autonomous additions to a country's money supply. To handle the effects of these two variables 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, assuming that the demand for money is proportional to income—would be a reasonable approximation. As a second behavioral equation, the model contained a function for the demand for imports. The full model appears, in its simplest form, in the box.

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a national of the Netherlands, was the Director of the IMF's Research Department from 1958 to 1979. He is considered to be the "founding father" of the IMF monetary model. Both within and outside the IMF, the model is usually referred to as the "Polak model."

The dynamic character of this model derives from the fact that it contains both income and the change in income. Solving the model gives us values for the variables that are determined by the model, such as income and the change in foreign reserves, as weighted averages of the values for the current and past years of exports, capital inflows of the nonbank sector, and the change in the domestic credit of the banking system.

We made a large effort to test the validity of this proposition. For those interested in the never-ending debate between Keynesians and monetarists, it may come as a surprise that the simple assumptions of the model make it both Keynesian (a multiplier model with a marginal propensity to spend of 1) and monetary (based on a constant velocity of circulation). The dynamic nature of the IMF model, in contrast to most of the academic monetary models of the balance of payments, yields not only the final equilibrium value of the endogenous variables but also the time path toward these values. It was essential to be able to derive these short-term effects if the model was to be used in analyzing current policy problems and finding their solutions.

The set of four equations in the model constitutes the logical core of the IMF's programming exercise, which is known as "financial programming." Since the early 1950s, it has been the centerpiece of the analysis leading to IMF conditionality—the policy actions that a borrowing country must take to have access to IMF credit.

The model over time

Although the IMF has continued to use essentially the same model as the foundation of its credit arrangements, these arrangements themselves have continued to broaden and deepen over the years. Thus, the analytically neutral variable "credit creation" was split into credit to the private sector (usually to be encouraged) and credit to the government sector (usually to be discouraged). In a further specification, the IMF 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, but not necessarily tertiary, education) and frowning on military and other nonproductive expenditures.

Beyond filling in with ever-increasing precision the credit creation component of its conditionality, it also added further specifics of a nonmonetary character, rely-

ing on a wide spectrum of policy instruments, many of them in fields where the World Bank was also active.

Many IMF-supported 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 simple model underlying it continued to provide the packaging for the IMF's lending arrangements, the contents of the packages became increasingly complex over the years. Over time, a number of changes to the model have been considered, in particular with respect to the exchange rate, medium-term growth, and control over inflation.

The exchange rate. The design of the model in the early postwar years reflected two characteristics of the world economy at that time: the par value regime of fixed exchange rates 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 of 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 IMF-supported programs. 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 to raise their real incomes, quite apart from the fact that the IMF's founding charter, its Articles of Agreement, banned competitive depreciation.

As the par value system unraveled, provisions about the exchange rate became a frequent component of IMF Stand-By Arrangements. But this did not require a radical change in the model. Exports already entered the model as an exogenous variable, and forecasting them, with or without the exchange rate as one of the determining variables, was in any event performed outside the model. To the import equation (determined within the model) an exchange rate term could readily be added. Effects on prices, output, government finance, and (if they could be ascertained) on capital movements, had, of course, also to be taken into account. Since, as noted, it is in any event not feasible to design a complete set of structural equations for most of the economies with which the IMF works, the addition of the exchange rate as a variable merely had the effect of making the process of iteration more laborious rather than changing it in a fundamental way. It also made it possible to address explicitly two policy objectives: maintaining a healthy balance of payments and the pursuit of full use of the country's productive capacity.

To ensure that a country's exchange rate would remain sufficiently competitive during the period of a Stand-By Arrangement, the IMF normally includes in such an arrangement a provision that a country must hold a minimum level of net international assets to be able to draw successive installments of its stand-by credit, the idea being that the instrument by which countries would ensure the observation of this limit would be the exchange rate. The standard IMF conditionality thus evolved toward the inclusion of a double monetary prescription: setting a ceiling on the expansion of the domestic assets of the central bank to achieve an acceptable balance of payments result (a flow concept) and a floor under the central bank's holdings of net foreign assets (a stock concept) to bring

The IMF monetary model

$$\Delta MO = k\Delta Y \quad (1)$$

The change in a country's money supply (ΔMO) is proportional to the change in its income (ΔY) by a factor k , which is the inverse of the velocity of circulation of money (Y/MO); thus, $k = MO/Y$.

$$M = mY \quad (2)$$

The demand for imports (M) is a function of a country's income (Y), where m is the country's marginal propensity to import.

$$\Delta MO = \Delta R + \Delta D \quad (3)$$

The change in the money supply (ΔMO) is by definition equal to the change in a country's foreign reserves (ΔR) plus the change in the domestic credit of the banking system (ΔD).

$$\Delta R = X - M + K \quad (4)$$

The change in foreign reserves (ΔR) is by definition equal to exports (X) minus imports, plus net capital inflows of the nonbank sector (K).

about a satisfactory level of foreign reserves, and to ensure that the central bank would not use excessive intervention to counter market pressures for 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 twentieth century came to an end, the IMF and its members became increasingly concerned about the impact of IMF programs on the growth prospects of the countries that needed to borrow under them. Growth, in this context, meant two different things, which were 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 with the country's *existing* productive capacity; and (ii) the increase in output over the medium or long term that could be achieved through the *growth* of productive capacity.

I mentioned earlier the potential impact of a change in the real exchange rate on capacity utilization. With respect to the second dimension, it is curious that for their medium-term macroeconomic projections both the IMF and the World Bank continue to rely on highly mechanical growth models of the Harrod-Domar family, first developed in the late 1940s. In these models there is no place for what the two institutions themselves consider 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, government attitudes toward the economy.

Rather than expanding its model, the IMF has pursued the double objective of stabilization with growth by appraising the different items entering its existing model on the basis of their potential contributions 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 on both the taxation and the expenditure sides of "net credit to the government," referred to earlier, reflected an increasing desire on the part of the IMF that the understandings reached with member countries on short-term stabilization would, at the same time, contribute to medium-term growth.

Inflation concerns. Limits on credit creation can ensure a minimum balance of payments outturn, but they do not provide

protection against deviations from the program in the opposite direction. Exceeding the foreign reserve target is often followed by a larger increase in the money supply than had been assumed in the program. It is probably fair to say that up to the 1970s, this possible outcome did not cause much concern; it might rather be seen as a welcome development that might lead to early repayment of IMF credit. But developments in the 1980s, and even more strikingly in the 1990s, have shown how such overperformance might also lead to shockingly high inflation, both in countries that had been afflicted by the 1980s debt crisis and in many of the IMF's new members in Eastern Europe, the Baltics, and the Commonwealth of Independent States (CIS). In all these countries, controlling inflation became the first order of business,

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often ahead of dealing with potential balance of payments problems. The IMF thus had to face the question of how this objective was to be integrated into its model. Changes in three directions seemed to be necessary:

- The flexibility of international capital movements makes the treatment of that variable as exogenous no longer tenable; their dependence, at least in part, on both the domestic interest rate and exchange rate expectations would need to be allowed for. Bearing in mind that an important component of international capital flows nowadays may be the outflow or the return flow of domestic flight capital, this change in the model alone would present a major challenge.

- 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.

- 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, since governments have to face the choice between two possible exchange rate policies: a floating rate to block the inflationary impact of an oversupply of "money of foreign origin"; or a fixed (or crawling) exchange rate to pro-

vide a psychological anchor to the price level, even though that might cause a competitive disadvantage if there remained some inertial inflation in the economy.

In a formal sense, it would not be particularly difficult to introduce these three extensions into the model. But that would be essentially useless unless it were also possible to obtain some order of magnitude of the coefficients for the variables in the newly introduced equations. And that, unfortunately, is not possible. In this setting, the IMF has had to forgo 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 IMF has found it necessary in recent years to go behind ceilings on bank credit to the government and introduce direct restrictions on government deficits. Even if financed in a noninflationary way in the domestic capital market, such deficits crowd out investment by the private sector. Indeed, in the IMF's relations with many countries (Argentina, Pakistan, and Russia, to name a few), agreed limits on the budget deficit as a percent of GDP have become the most prominent feature of adjustment programs.

To stave off imported inflation caused by an expansion in the money supply owing to higher foreign inflows, the IMF has favored a free (upward) float in many of the CIS countries, taking comfort from the fact that the currencies of many of these countries were so deeply undervalued that a measure of appreciation would not undermine their competitiveness, in particular since they were also experiencing a rapid increase in labor productivity.

While the prevention of excessive domestic credit creation and the targeting of a desired increase in foreign reserves are relatively straightforward, the avoidance of an excessive increase in 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 foreign reserve target—are entirely desirable, and to frustrate this demand by either floating the exchange rate or (with a fixed exchange rate) putting a ceiling on the money supply would needlessly depress the economy, as Brazil found out in 1994. Putting a ceiling on base money (currency held outside banks plus banks' claims on the central bank) would

imply that the central bank would have to engage in 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.

Finding itself without much of a model to go by, the IMF has in recent years tended to adopt an "all risk" policy, furnishing its arrangements with CIS countries and with the Baltic states with a triple set of keys: a ceiling on domestic credit, a floor under net international assets, and an indicative target for base money, in addition to using the occasions of periodic Executive Board reviews under Stand-By Arrangements to judge the need for additional action.

The exceptional situation in these countries may be expected to subside as and when inflation comes down and the exchange rate stabilizes at something closer

to an equilibrium level. In that new situation, the concerns about inflation may to some extent have abated, but concerns about the payments position can no longer be safely disregarded. Increasingly, then, the CIS countries will 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 foreign reserves to ensure that governments do not overreach themselves in defending the value of their currencies. At some stage, confidence in the currency and the banks, which is still painfully low in these countries, will rise and the resulting increase in the demand for money will pull in foreign 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, namely those that are part of

a monetary union, the model would seem definitely to have lost most, if not all, of its applicability. In such countries there is no meaningful concept of a national money supply, and government finance, in particular the government's domestic borrowing requirement, becomes the only way to influence the level of demand. The IMF has had to figure this out in its dealings with the African countries of the CFA franc area. Perhaps it will some day get an opportunity to apply this knowledge in Europe if a member of the future European Economic and Monetary Union finds it necessary to avail itself of the IMF's balance of payments support. **F&D**

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