Volume Title: A Retrospective on the Bretton Woods System: Lessons for International Monetary Reform

Volume Author/Editor: Michael D. Bordo and Barry Eichengreen, editors

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-06587-1

Volume URL: http://www.nber.org/books/bord93-1

Conference Date: October 3-6, 1991

Publication Date: January 1993

Chapter Title: The Provision of Liquidity in the Bretton Woods System

Chapter Author: Hans Genberg, Alexander Swoboda

Chapter URL: http://www.nber.org/chapters/c6872

Chapter pages in book: (p. 269 - 316)

5 The Provision of Liquidity in the Bretton Woods System

Hans Genberg and Alexander K. Swoboda

Providing the wherewithal for deficit countries to finance temporary balance-of-payment deficits was one of the major concerns of those who worked on the design of a new international monetary system after the Second World War. In the literature, this aspect of the Bretton Woods system has become known as the problem of the provision of international liquidity. In view of the importance of the topic, it is not surprising that there already exist several excellent and comprehensive surveys of this issue.[1] These surveys show that, until the early 1970s, much of the academic debate could be understood as attempting to provide answers to the following questions: (1) What determines the demand for international reserves by central banks? (2) What determines the supply of reserves in the Bretton Woods system? (3) What is the desired composition of reserves, and what happens if the actual composition differs from that? (4) To the extent that additional outside reserves are created by fiat, who should benefit from the associated seignorage? The analysis of the first two questions was intended to provide the basis for an evaluation of the extent to which the system provided for an adequate quantity of reserves. The third question concerned the so-called confidence problem (or Triffin [1960] dilemma), and the fourth became identified with the "link proposal,"

Hans Genberg is professor of economics at the Graduate Institute of International Studies and director of macroeconomic, monetary, and banking studies at the International Center for Monetary and Banking Studies. Alexander K. Swoboda is professor of economics at and director of the Graduate Institute of International Studies and executive director of the International Center for Monetary and Banking Studies.

The authors would like to thank the discussants and the editors for perceptive comments and suggestions.

1. See, in particular, Williamson (1973), Cohen (1975), and Black (1985). Gardner (1969) and Horsefield (1969) contain detailed descriptions of the evolution of the content of the two main alternative proposals, the White plan and the Keynes plan, and the negotiations and debate that surrounded them.

according to which international reserve creation should be used to finance aid to developing countries.

The methodology used in the analysis of these questions and the answers arrived at in the literature are thoroughly treated in the reviews by Williamson (1973) and Cohen (1975), and we shall not devote much of our analysis to a replication of their studies.

In the mid-1970s, the focus of the literature on liquidity within the Bretton Woods system shifted. Rather than asking whether the system provided adequate reserves for the financing of balance-of-payments deficits, questions pertaining to its inflationary consequences became prominent. In part, this development reflected a change in the perception of what the main current of policy concern was, from unemployment to inflation. Thus, the "adequacy" of international reserve growth came increasingly to be judged by criteria relating to the maintenance of price stability in the (fixed-exchange-rate) world economy. In part, it also reflected a change in the analytic toolbox of economists, away from models based on fixed prices where income bore the burden of adjustment toward models in which full employment was maintained by price flexibility, away from partial equilibrium models of current-account determination toward general equilibrium models, and, perhaps most important, away from models that implicitly assumed no or little international mobility of capital toward models in which this mobility was assumed to be perfect.

In this paper, we begin in the next section by reviewing the meanings that have been attached to the term *international liquidity*. We argue that international liquidity is a fuzzy concept and that its most frequent definition—international reserves plus the value of unconditional borrowing facilities—fails to capture the most usual meaning of that concept when private international capital movements are substantial. International liquidity thus defined, however, turns out to be a most useful concept in an examination of the link between the growth and composition of international reserves, national monetary policy, the world money stock, and the medium-run course of world inflation. Definitions of these concepts are also introduced and discussed in section 5.1, which, in addition, emphasizes that any definition of *international liquidity* has a relatively clear meaning only in a fixed-exchange-rate regime.

Section 5.2 turns to a brief comparison of the views about the nature, role, and provision of international liquidity contained in the American proposal for a Stabilization Fund and the British proposal for a Clearing Union, and section 5.3 examines how the provision of international liquidity is dealt with in the Articles of Agreement of the International Monetary Fund.

The next two sections are concerned with the actual evolution of international liquidity in the system. Section 5.4 presents time-series data on various measures of the overall volume of international reserves and other international monetary aggregates as well as on the composition of these magnitudes. Section 5.5 turns to a comparison of various mechanisms by which interna-

tional liquidity can be provided. It pays particular attention to the contrast between "outside" and "inside" reserve assets, to the relation between the composition of international liquidity and its overall supply, and to possible sources of asymmetry in the provision of liquidity in a stylized model of the money supply process implicit in the functioning of the Bretton Woods system during the 1960s and early 1970s.

Section 5.6 turns to the question that became the focal point of many studies from the mid-1970s, namely, the relation between international liquidity, world inflation, and economic activity. It also presents the results of a simple econometric model that attempts to determine jointly the quantity and distribution of international reserves (between the United States and the rest of the G10 world), the evolution of the world money supply, and the rate of world inflation.

In the penultimate section, we discuss the role of international liquidity in the breakdown of the Bretton Woods system. We draw on the earlier discussion to argue that, although other explanations such as an inadequate supply or composition of international liquidity or disequilibrium exchange rates are part of the symptoms of the breakdown, an unwillingness to live up to the consequences and the logic of the dollar(-gold) reserve system as it actually functioned, with the prominent influence it gave to U.S. monetary policy, played a large role in the breakdown of the Bretton Woods regime.

We conclude in section 5.8 by attempting to draw some lessons from the way liquidity was provided under Bretton Woods and from the breakdown of that system for the proper design of fixed-exchange-rate regimes, notably of the European Monetary Union variety.

5.1 International Liquidity: Concepts and Measurement

The term *international liquidity* is generally used to refer to those assets available to the authorities of a country for the purpose of stabilizing the external value of the domestic currency. A slightly more precise definition specifies that *international liquidity* refers to those resources at the disposal of the authorities to finance external imbalances without having to engage in any form of domestic adjustment measures.[2] These definitions thus suggest that central bank holdings of foreign exchange should certainly be included in the measure of international liquidity. Since unconditional borrowing rights can

2. This definition of *international liquidity* implies a certain degree of ambiguity in the notion of an adequate level of liquidity. Since financing of deficits cannot take place indefinitely, adjustment will have to be undertaken at some point if the balance-of-payments deficit is persistent. Otherwise, the only adequate level of liquidity would be an infinite one. Some time dimension will therefore have to be included in the analysis.

As will become clear further in the text, this more precise definition also becomes difficult to implement statistically when capital mobility is high. We will argue that, for some purposes, it may be better to replace "to finance external imbalances" with "to intervene in the foreign exchange market."

also be used to acquire convertible currencies for the purpose of currency stabilization and balance-of-payments financing, it has been argued that these too should be included in a measure of liquidity on either of the above criteria. Thus, the surveys of both Black (1985) and Cohen (1975) consider a country's international liquidity to be measured by the sum of its central bank's owned international reserves and its unconditional borrowing rights. Concretely, this implies that international liquidity "consists of gold, convertible foreign exchange, reserve position in the International Monetary Fund, and Special Drawing Rights" (Williamson 1973, 687).

Even if one accepts that *international liquidity* refers to the resources available to the authorities for the purpose of financing payments imbalances without having to initiate adjustment measures, there are no objections to the precise measure that has been proposed. One of these concerns the nature of unconditional borrowing rights. For instance, suppose that two central banks conclude an agreement to create a swap facility that can be activated at the simple request of one of the parties. Should not the size of this facility be regarded as liquidity? If so, what about informal agreements between central bank governors to assist each other in times of "disruptions in the foreign exchange markets" and the possibility for the central bank to borrow convertible currencies from private-sector banks?

An even more fundamental problem with the traditional definition of *international liquidity* is that it implicitly assumes that private international capital mobility is low. To see this, consider the implications of the complete opposite assumption, namely, that capital mobility is perfect both in the sense of the absence of legal or administrative barriers and in the sense of perfect substitutability between domestic and foreign assets. To what extent does this assumption affect a central bank's ability to finance balance-of-payment deficits without having to initiate adjustment measures? To analyze this question, imagine that a country is faced with a negative shock to the demand for its exports. In order to prevent a fall in income or a change in interest rates, a domestic fiscal expansion is called for. In the absence of private capital movements, the entire shortfall of export demand will need to be financed by international liquidity as defined above. Suppose instead that capital is perfectly mobile. Now the reduction in the demand for exports can be automatically financed by the private sector at the original interest rate and employment level, provided the country is small enough to have but a negligible effect on foreign variables, most notably foreign interest rates. In other words, no official international liquidity is needed in order to finance the balance of trade deficit even though the country has engaged in no domestic adjustment measures.[3]

3. A corollary to the proposition that *international liquidity* is a difficult concept to define when capital is highly mobile is that models of the demand for international reserves by monetary authorities must then be based on other arguments than the need to finance payments imbalances. Obstfeld (chap. 4 in this volume) points this out.

To illustrate the importance of capital mobility further, consider an increase in the world interest rate facing a small country. In the limiting case of perfectly integrated financial markets, no amount of liquidity would be sufficient to finance the resulting balance-of-payments deficit if the authorities insisted on not undertaking any adjustment measures at all, including that of aligning the domestic interest rate with the foreign one. Conversely, if the domestic interest rate were adjusted appropriately, the authorities could maintain the stability of the exchange rate without having recourse to any international liquidity at all.

In view of the importance of the degree of capital mobility for the issue under discussion, it is perhaps useful to point out that it is not only the existence or absence of *legal* restrictions on capital movements that is important in this context.[4] There existed many ways to circumvent such restrictions given sufficient incentives. One that policymakers had to take particularly into account was the so-called leads and lags in payments for commercial transactions. Such leads and lags often substituted for capital movements through more open channels and appeared in the balance-of-payments statistics in the errors and omissions component. Exactly how mobile capital was during the Bretton Woods regime is ultimately therefore an empirical question. Many estimates of so-called offset coefficients suggest a high degree of capital mobility among Organization for Economic Cooperation and Development (OECD) countries during that period.[5] It is also relevant to note here that the measure of capital mobility most relevant for the purpose at hand involves a time dimension. Taking a horizon of two to four quarters, a number that seems reasonable when we discuss issues of policy effectiveness, we would argue that the degree of capital mobility under the Bretton Woods regime was quite high between industrial countries, especially during its latter years.

The basic problem that arises when attempting to define and measure international liquidity, as Fritz Machlup (1966) argued long ago, is that the concept is used in different, often inadequately specified meanings in different places and by different authors. The concept is taken to refer sometimes to the quantity of some asset and other times to its "quality," sometimes to a stock and others times to a flow, etc. The basic difficulty in defining *international liquidity* is similar to that in defining *money* and *moneyness* or, for that matter, in agreeing on what one means by a *balance-of-payments disequilibrium* and how to measure it. The simplest way to deal with the problem is to avoid using the concept altogether. Without going so far, one could adopt a simple, unambiguous, and measurable definition and use the term *international liquidity* only in that sense. This is the practice that we will adopt in much of the remainder of this paper.

4. Indeed, many participants in the conference referred to such restrictions to argue that capital mobility was low during the Bretton Woods years.

5. For examples of such studies, see Genberg (1976), Kouri (1975), and Obstfeld (1980).

By *international liquidity* we will mean the stocks of assets readily available to national monetary authorities to buy back their own currency in the foreign exchange market in the course of their exchange-rate stabilization operations. By *international liquidity,* we thus mean official international reserves as usually measured. This definition has the advantage of having as an empirical counterpart the measure of *international liquidity* used in the early surveys referred to above. It also has the advantage of identifying changes in a country's stock of international liquidity with its official settlements balance-of-payments surpluses of deficits. That, then, is the definition to which we shall try to adhere in our presentation of data and when developing our own analysis, although, when commenting on the literature, we will not be able to avoid referring to *international liquidity* in the broader senses in which it has been used. The context should make it clear which of these concepts we are dealing with.

The questions that we are interested in—the adequacy of "liquidity" or international reserves, the mechanisms by which it is created and distributed, and the link between international reserves, broader monetary aggregates, and the evolution of world income and prices—will unavoidably lead us to focus on magnitudes other than *international liquidity* narrowly defined. For instance, if we are interested in those resources available to finance payments imbalances without recourse to domestic adjustment measures, we must focus on aggregate broader than *international reserves* narrowly defined if capital mobility is perfect since, in that case, certain domestic assets are, by assumption, perfect substitutes for the central bank's foreign assets. In this instance, a focus on a broader concept such as the entire domestic monetary base (since we are concerned with *official* liquidity) would seem more suitable. The aggregate of the national domestic monetary bases of the countries making up a fixed-exchange-rate region in turn becomes a magnitude relevant to the study of what determines that region's overall monetary conditions and, hence, plays an important role in influencing the region's macroeconomic evolution. Such considerations have led to proposing the concept of the world money supply (see Day and Heller 1977) as a useful indicator of systemwide monetary (or liquidity) conditions (Genberg and Swoboda 1977; Heller 1976; Kahn 1979). On this view, liquidity is thought of more in terms of monetary theory generally than in the more narrow sense of international reserves and the financing of payments imbalances. As we shall see, this change in emphasis modifies one's view of the mechanism of the provision of liquidity (see sec. 5.5) and the effects of variations in liquidity (sec. 5.6).

One main implication of the preceding arguments is that a definition of international liquidity that focuses on "those assets that can be readily used to finance payments imbalances" is increasingly difficult to operationalize as formal and informal cooperation between central banks evolves and as capital mobility increases over time. In such circumstances, a statistical approach to the definition of *liquidity* may be more useful. Such an approach would search

for empirical relations between some (controllable) monetary aggregate and a target variable such as world nominal income growth or world inflation and would base a definition of *liquidity* on the stability of these relations in much the same way as the *money supply* is often defined in a national context.

It should also be evident that a definition of *liquidity* that is based either on the notion of assets that can be used by central banks to finance payments imbalances or on a statistical association with a variable such as world inflation (or nominal income) is useful only in the context of a fixed-exchange-rate system. For, under freely floating exchange rates, the central bank does not need to intervene in the foreign exchange market, and the concepts of world inflation and world nominal income lose most of their analytic usefulness.[6]

5.2 Contemporary Views about Liquidity Provision: The Keynes and the White Plans[7]

The reflections and debate that preceded the presentation of the Keynes (U.K.) and White (U.S.) plans for the postwar international system were influenced by the prevailing views about the sources of the interwar monetary problems, by expectations as to the nature of future balance-of-payments positions, by nation-specific issues, and by the economic doctrines adhered to by the two main intellectual architects of the plans, John Maynard Keynes and Harry Dexter White.

A highly influential view of the interwar period was that floating exchange rates were inherently unstable owing to the influence of destabilizing short-term capital flows.[8] Hence, it was taken as given that a new monetary system should be based on essentially fixed exchange rates.[9] A second prevailing view was that controls on private capital movements were useful as a stabilizing device and could be tolerated in a new international monetary system.[10]

As a result in part of the consequences of the war, it was generally expected that the United States would remain an international creditor for the foreseeable future and that Britain would be in a persistent payments deficit position. In consequence, the proposals tended to differ with respect to their treatment of the obligations of surplus and deficit countries in the system. Country-specific issues such as the treatment of the Commonwealth and the accumu-

6. This does not mean that it is impossible to choose some assets and define their aggregate as *international liquidity*, but it does mean that such a definition does not have any particular analytic or policy significance.

7. The discussion in this section has been influenced by Dam (1982, chaps. 3, 4), Gardner (1969, chap. 5), and Horsefield (1969, pt. 1). Documentation concerning the views of contemporaries in the debate can be found in these sources.

8. Nurkse (1944) is perhaps the best-known example of this view.

9. Views were not completely parallel, however. Keynes envisaged the use of exchange-rate changes as an adjustment measure, whereas White did not.

10. Views differed in degree concerning this issue as well, Keynes being less favorable toward an eventual liberalization of capital movements than White.

lated external liabilities of the United Kingdom (sterling balances) also colored the recommendations.

Finally, it is important to keep in mind that a central feature of Keynes's view of the role of international monetary arrangements was that they should put as few constraints as possible on individual nations' conduct of domestic stabilization policies, which in the British case would, it was assumed, be expansionary in order to maintain a high level of employment. The views underlying the White plan were closer to the position that domestic policies (especially of the expansionary variety) should be constrained by international obligations.

With the above elements in mind, it is easy to explain the main differences in the Keynes and the White plans with respect to the way in which the provision of international liquidity was dealt with. Keynes's plan called for an International Currency (or Clearing) Union in which imbalances between countries would be settled by deficit countries acquiring debit positions with the Union and surplus countries acquiring credit positions. The size of the facility would be equal to the sum of the "quotas" of each member country. These quotas would initially be determined as three-quarters of the sum of the countries' exports and imports averaged over the last three prewar years. The quotas would subsequently be adjusted automatically over time according to a three-year moving average of the sum of the countries' most recent exports and imports. Calculations made by Joan Robinson (1943) indicated that Keynes' formula would imply an initial size of the Clearing Union of $26 billion on the hypothesis that the members would include all United and Associated Nations.

Possibilities to draw on the Currency Union were also determined by the member's quota. Drawings of up to 25 percent were automatic. Further drawings up to 50 percent carried an interest charge and beyond that, until 75 percent, could be subject to certain conditions imposed by the Governing Board of the Currency Union.

Credit positions with the Union would be limited not to the quota but in theory only by the sum of the maximum size of debit countries' positions. Thus, if the United States were the only creditor (a possibility that was not judged improbable) and all other countries had reached their overdraft limits, then the U.S. credit position would be slightly over $17 billion, according to the illustrative calculations referred to above.[11] This figure raised fears in the United States that it would become a "milking cow" in the international monetary system and therefore proved too large for the American negotiators to accept.

The American plan for a Stabilization Fund was, as the name indicates, intended to provide short-term loans to member countries for the purpose of

11. The U.S. quota would be $3 billion. The other countries' aggregate quota would then be $23 billion, three-quarters of which defined their maximum drawing.

helping them stabilize their exchange rates in the face of temporary balance-of-payments difficulties. The resources of the Fund were made up only of paid-in contributions of the members, and its total size was referred to as being approximately $5 billion, of which the U.S. contribution was somewhere between $2 and $3 billion.[12] Since it was conceived of as a fund rather than an overdraft facility, the maximum credit position of any one country would be limited to its contribution. The maximum size of the drawings was equal to 100 percent of the quota during the first year and 150 percent thereafter.[13] There was no provision for an automatic increase in the size of the Stabilization Fund over time, as was the case with the proposal for the Currency Union. Such increases had instead to be agreed to by the members representing at least 80 percent of the quotas.

5.3 International Liquidity in the Articles of Agreement

The Articles of Agreement that defined the operations of the International Monetary Fund reflected to a significant extent the ideas expressed in the White plan for a Stabilization Fund, although compromises and adjustments had been made as a result of negotiations leading up to the meetings in Atlantic City in June 1944 and at Bretton Woods in July of the same year. To understand the process of liquidity provision in the Articles, recall that subscriptions to the Fund were made up of gold (to 25 percent of the quota—the gold tranche) and of domestic currency (75 percent of the quota—the credit tranche).[14] A country disposed of unconditional drawing rights until the Fund's holdings of its currency had reached 100 percent of the quota.[15] Defining *international liquidity* as national holdings of gold and convertible foreign exchange plus unconditional borrowing rights implies that the creation of the IMF itself did not increase the measured amount of liquidity in the system. However, the process of drawing on the Fund could lead to some limited (but temporary, to the extent that drawings were reimbursed) liquidity creation. Suppose that country A purchased the currency of country B to the extent of 10 percent of country B's quota. The Fund's holding of country B's currency would then be only 65 percent of its quota, and country B would be entitled

12. Horsefield (1969, 43), notes, however, that, although the written text of the White plan always spoke of a size of "at least $5 billion," calculations using the proposed formula for determining quotas resulted in a total size of the Fund of approximately $10 billion, with a U.S. contribution of roughly $3 billion.

13. Maximum drawing rights do not therefore appear to be as different in the two proposals as would at first appear. Keynes's Currency Union was indeed larger, but drawing rights were limited to 75 percent of the quota, whereas the White plan envisaged borrowing possibilities of 150 percent of the quota but with a smaller size of the Fund itself.

14. The total size of the Fund was originally $8.8 billion and the U.S. quota $2.75 billion (see Horsefield, 1969, table 2, p. 96).

15. In other words, the gold tranche was unconditionally available to the country. It was actually not until a decision of the executive directors in 1952 that *conditionality* was defined and that the "unconditionality" of the gold tranche was made into Fund policy.

to draw unconditionally 35 percent of its quota. The additional 10 percent beyond the gold tranche became known as the super gold tranche, and the sum of the measured international liquidity of the two countries would have increased by this amount.

If liquidity is measured in the strict sense of the previous paragraph, the only other way in which the Articles of Agreement could accommodate increases in liquidity was by means of a revaluation of gold in terms of national currencies. If a wider measure is used that takes into account, albeit in a weighted fashion, the conditional borrowing possibilities at the Fund, then the liquidity-creating capacity of the Fund would of course be enhanced.

The various "facilities" that were added to the Fund's arsenal of measures during the 1960s and 1970s to assist member countries did not increase international liquidity in the strict sense, although they presumably allowed some countries to pursue policies that were more expansionary (or less contractionary) than they otherwise would have been.

As we shall see in the next section, by far the largest source of increases in liquidity during the Bretton Woods regime was accounted for by foreign exchange holdings of member countries. To counter this "uncontrolled" mechanism of reserve creation, many academic economists and international monetary officials called for giving the IMF the capacity to create international liquidity by fiat. The special drawing rights (SDRs) that were incorporated in the First Amendment to the Articles of Agreements (agreed on in 1968 and signed by the member countries in 1969) were the outcome. The first allocation of SDRs took place in 1970 to the extent of SDR 3.1 billion, compared to a total value of official reserves of SDR 93.2 billion.[16] By the time the Bretton Woods system broke down in 1973, the corresponding figures were SDR 8.8 billion and SDR 152.4 billion, respectively, hardly a large enough proportion to allow us to draw conclusions about the effects of the creation of the SDR facility on the performance of the international monetary system under Bretton Woods.

The Fund's Articles of Agreement were in fact compatible with a variety of possible international standards and their associated ways of providing for the growth of international liquidity. The system could have operated in essence as a gold-bullion standard had member countries chosen to decrease, or at least not increase, their holdings of foreign exchange reserves and had there been no significant increase in Fund quotas or large issue of SDRs; additions to international liquidity would then have had to come from new gold production and revaluation of the official price of gold. Alternatively, it could have operated (and to some extent it did) as a gold exchange standard where an important source of additions to international liquidity would have been additions to foreign exchange reserves in various convertible currencies; as long

16. These figures as well as those quoted in the next sentence are taken from Dam (1982, table 3, p. 208).

as the ratio of gold (and other outside reserves) to foreign exchange holdings was kept within "reasonable" limits, such a system could have proved viable. Such "reasonable" limits might have constrained liquidity to too low a level, however; alternatively, adequate provision of liquidity might imply overshooting the limits and creating a confidence problem. This is of course the famed Triffin (1960) dilemma. Potentially at least, the provision of international liquidity could have mainly taken the form of increases in Fund quotas and the issue of SDRs, thus moving the system increasingly toward a "world central bank" model and toward fiat international reserves, whether backed by gold or not. Finally, there was little in the Articles of Agreement to prevent the system to evolve, as we will argue it did in the late 1960s and at least at the margin, toward a dollar standard where the provision of additional liquidity takes (almost) exclusively the form of accumulation of dollar holdings by non-U.S. monetary authorities.

That the Bretton Woods system evolved in practice first toward a gold exchange standard and later toward something resembling a pure dollar standard is due to a variety of reasons that are beyond the scope of this paper. We might, however, mention that the possibility, adopted by the United States, for a member to discharge its parity maintenance obligations by freely buying and selling gold within prescribed margins facilitated the move toward a gold exchange standard in which various countries stabilized their currencies in terms of the dollar while the United States stabilized the dollar price of gold. Moreover, the fact that the total potential fluctuations of any two non-U.S. currencies in terms of each other were thus twice as large as that between the dollar and other currencies was one reason why foreign exchange reserves took predominantly the form of dollars. This was of course not the only reason: the facts that the U.S. dollar was one of the few convertible currencies after the Second World War, that dollar assets enjoyed a relatively broad market, that the major part of the stock of monetary gold was in the hands of the United States, and that the Marshall Plan made it possible for the rest of the world to accumulate international reserves in spite of the so-called dollar shortage were at least as important.

5.4 The Evolution of International Liquidity: The Principal Facts

In order to understand how the Bretton Woods system provided for liquidity in practice, it is now necessary to turn to some data. For this purpose, we define *international liquidity* as the sum of central bank holdings of foreign exchange, gold, and SDRs plus their position at the IMF, a concept that is referred to as *total reserves* in *International Financial Statistics*. Figure 5.1 shows the evolution of this total as well as two subcomponents for the IMF's group of "industrial countries."[17] Two facts stand out in this figure—the literal

17. The subcomponents are "IMF position" (dashed line in the figures) and "IMF position + SDR holdings + gold" (solid line [outside reserves]).

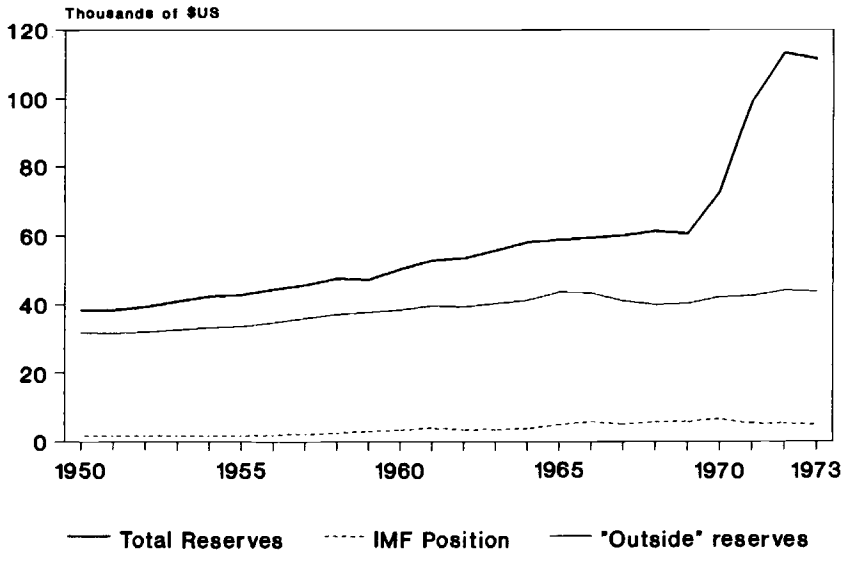

Fig. 5.1 All industrial countries

explosion of total reserves in the last three years of the sample and the predominant part played by the foreign exchange component of total reserves not only in these final years but during the entire sample period.[18] We shall argue below that both these facts are critically important for understanding the functioning of the Bretton Woods system as well as its breakdown.

If changes in the *total* value of international reserves are influenced primarily by its foreign exchange component, the same is not true if the determinants of the reserves of the United States and of the rest of the industrialized countries are taken separately. Figures 5.2 and 5.3 contain the relevant data series. They indicate that *redistribution* of reserves between regions took place not only through changes in foreign exchange holdings but also to a large extent through variations in the other components of international reserves.[19] Ideally, one would want to complement the data presented in figures 5.1–5.3 with data concerning the breakdown of the foreign exchange component of international reserves into dollars and other currencies, on the one hand, and also to obtain

18. Correlation coefficients between, on the one hand, annual changes in total reserves, and, on the other, changes in foreign exchange holdings, in holdings of gold and SDRs, and in the reserve position vis-à-vis the IMF (excluding SDRs) are .99, .13, and −.49, respectively, for the 1951–71 sample. For the 1951–69 sample, the corresponding correlation coefficients are .60, .29, and .06, respectively.

19. For example, although the correlation coefficient between annual changes in total reserves and the subcomponent "foreign exchange" for the rest-of-the-world (non-U.S.) group of industrialized countries is .98 for the period 1951–71, it falls to .50 for the period 1951–69. The corresponding correlation coefficients between changes in "total reserves" and changes in "holdings of gold and SDRs" for the same group of countries are .50 and .80, respectively.

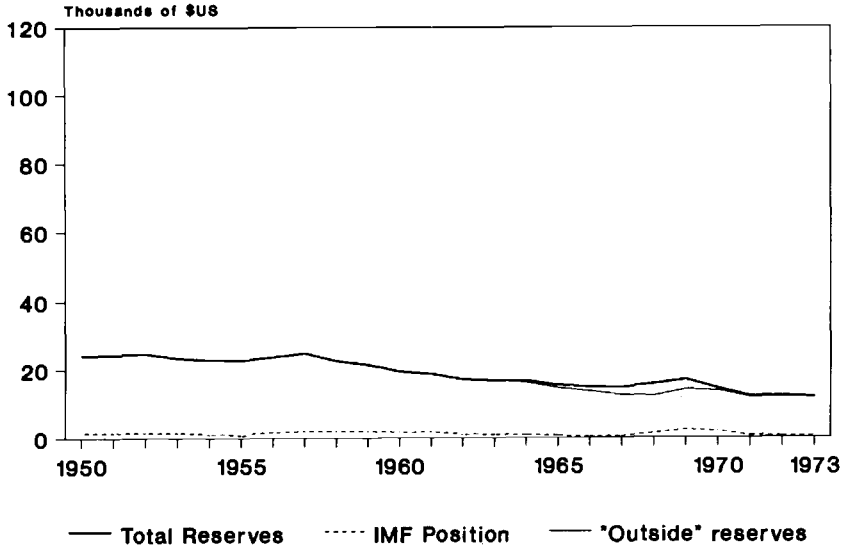

Fig. 5.2 United States

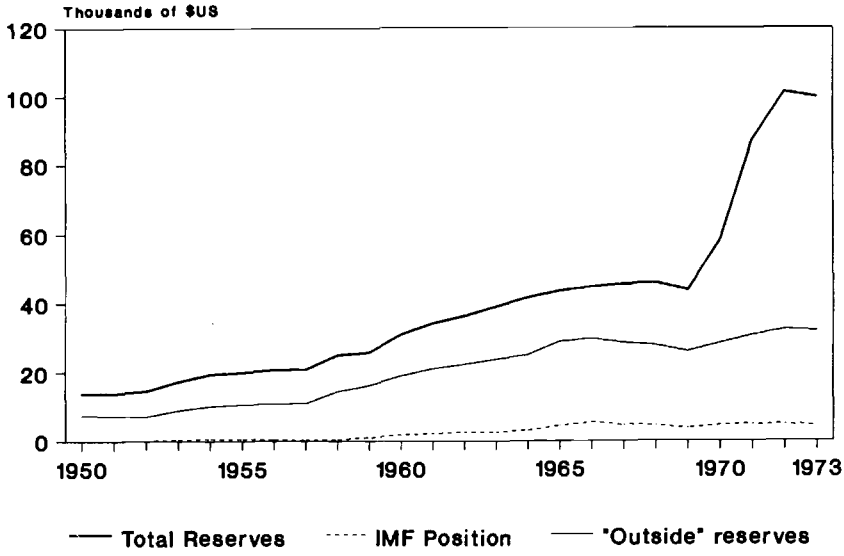

Fig. 5.3 Industrial countries other than the United States

data on the share of Euro-currency deposits in the total holdings of foreign exchange assets of central banks, on the other. Reliable data on these breakdowns are unfortunately not readily available. There are reliable indications, however, that the share of dollar assets in total foreign exchange reserves was predominant (apart from the sterling area and CFA [Colonies Françaises d'Afrique] holdings of sterling and French francs) throughout the period and that it did not decline significantly. There are also indications that Euro-currency deposits of most central banks remained modest at least for G10 countries, where an agreement was reached to limit their scope.

The data presented in figures 5.1–5.3 raise a number of questions concerning the provision of liquidity in the Bretton Woods system:

- To what extent is the evolution of total reserves in the system beyond the control of institutions like the IMF?
- To what extent is the reserve position of the non-U.S. group of countries (and therefore the balance of payments of the United States) determined by their demand for reserves or by the supply of reserves of the United States?
- Is the provision of reserves excessive, insufficient, or adequate?

These questions are taken up in subsequent sections of this paper, occasionally in terms of the traditional literature on the Bretton Woods system, but mainly in terms of an interpretation that emphasizes the relations between the data in figures 5.1–5.3, the evolution of prices and economic activity in the system, and the conduct of monetary policy in the United States and in the rest of the countries. This suggests that data concerning the evolution of inflation and monetary policy during the period in which the Bretton Woods regime was in operation are relevant to questions concerning the "adequacy" of the supply of international reserves.

That such data are not much emphasized in the traditional analysis of the adequacy of international liquidity is partly due to that question being discussed mainly within the framework of the demand for reserves literature. Much of that literature was intended to shed light on the question of whether the level of international liquidity actually supplied in the Bretton Woods system was "adequate." It did not, however, always provide a satisfactory answer because, by focusing only on the demand for reserves, it did not specify how authorities would behave if they were not on their demand curve. It was often assumed implicitly that insufficient reserves would lead to the imposition of controls on international trade or the pursuit of excessively contractionary economic policies, leading in both cases to recession and unemployment. This suggests looking for signs of such policies and trying to relate them to the international reserve position of the country. The obvious difficulty with this approach is that policy is influenced by many factors, and it may therefore be difficult to isolate the effect of reserve shortages. In addition, the traditional analysis is often based on an individual country approach to the demand for reserves, which does not always translate easily into examining the "adequacy" of the stock of international reserves for the world as a whole.

An alternative means of discussing the adequacy of reserves is to recognize the monetary nature of these assets and argue that changes in the world stock of international reserves will in the medium term be related to the evolution of monetary policy in the constituent countries and to the world price level. According to this view, the rate of growth of international reserves may be considered adequate if it results in a rate of world inflation that is desirable. Figure 5.4 contains some data that are relevant for judging the adequacy of the provision of reserves under Bretton Woods using this criterion. Three aspects of this figure are worth highlighting. First, abstracting from the episode in the early 1950s associated with the commodity-price boom at the time of the Korean War, there is a relatively steady increase in the rate of inflation during the sample period, especially in the 1960s. Second, this increase in the rate of inflation is associated with an equally steady increase in the average rate of growth of money in the world that is suggestive of a causal relation between these variables.[20] Third, the rate of growth of international reserves does not exhibit the same steady increase as the other two variables, although the very rapid growth at the very end of the sample does coincide with rapid growth rates of the other variables as well.

The two subsequent sections will discuss some theoretical models and empirical studies that have attempted to explain these relations.

5.5 The Evolution of International Liquidity: The Mechanisms

This section seeks to provide an integrated explanation of three features of the Bretton Woods system, as it actually operated, that were emphasized in the previous section: first, the dominant role of the foreign exchange (mainly U.S. dollar) component of international reserves in the evolution of total international reserves; second, the mechanism by which total international reserves are distributed between the United States and the rest of the industrialized world; third, the connection between the creation and distribution of international liquidity thus narrowly defined, national monetary policies and money stocks, and the broader aggregate that we have called the world money stock. In addition, our explanation will outline the connection between these monetary magnitudes and income and prices.

The explanation that we offer in this section is based on a modified "global monetarist" view of the reserve creation and distribution mechanism. The presentation will be kept relatively brief and intuitive as we have developed it more fully and formally elsewhere.[21]

The basic point of the analysis is to recognize that strictly fixed exchange rates imply that, for certain purposes, the "fixed-exchange-rate world" is an

20. We are referring here to the medium-term trend rates of growth of both variables, which are clearly increasing throughout the sample. Questions relating to the short-term relation between the two variables will be discussed in sec. 5.6.1 below.

21. See, in particular, Genberg and Swoboda (1977a, 1981) and Swoboda (1978). Swoboda (1991, sec. II.2) offers a presentation that is similar to that in the text.

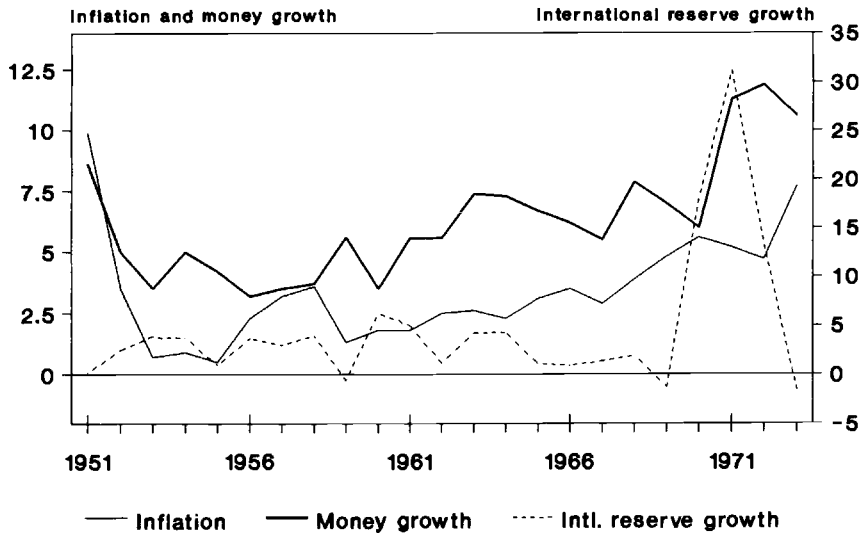

Fig. 5.4 Aggregates for industrial countries (annual percentage growth rates)

appropriate unit of analysis. For that "world," it is appropriate to think of the determination of monetary variables such as "world" money income, inflation, nominal interest rates, and so forth in terms of the evolution of "world" monetary aggregates such as the world money supply, monetary base, or supply of international reserves. This does not mean that national (or "regional") issues are unimportant, however. But what needs to be explained is both (and simultaneously) the evolution of world magnitudes and deviations of national inflation, interest rates, and income growth from the common average. In that perspective, balance-of-payments disequilibria are viewed as distributional issues where it is the payments adjustment mechanism that moves actual international reserves toward their equilibrium distribution. The basic principles governing such a world are most easily stated in terms of long-run equilibrium relations. But these long-run relations are likely to be established relatively quickly in chronological time when goods and capital markets are closely integrated.

More specifically, it is goods arbitrage, reinforced by changes in aggregate spending brought about by reserve flows, that will ensure in the medium run a high degree of convergence in national inflation rates. This means not that there will be no observed difference in national inflation rates but that there will be a strong common trend in these rates. Observed deviations from the common trend would then reflect one or several of the following four factors: nominal exchange rates that are not strictly fixed (occasional changes in parity and movements within intervention margins); statistical discrepancies in the collection and construction of price indices across countries (so-called errors of measurement); changes in equilibrium real exchange rates (so-called real

disturbances); and temporary disequilibrium changes in real exchange rates due to divergent macroeconomic (especially monetary) policies eventually inconsistent with the maintenance of a fixed parity. The common trend in inflation rates, the world rate of inflation for short, then, is determined by the evolution of the world money stock relative to output, in analogy with the determination of the national rate of inflation (or of the rate of growth of nominal national income) by the trend rate of growth of the national money stock in a closed economy. Determination of the world money stock, however, is a somewhat more complex affair than determination of a national money stock, as we shall argue shortly.

There is evidence (some of which is reviewed in subsequent sections) that the industrialized countries' economies were sufficiently integrated between 1959 and 1971 for this view to have a great deal of short-run relevance and for it to make sense to speak of a world rate of inflation, the evolution of which was broadly governed by that of the world money stock, defined as the aggregate of national money stocks converted into the same currency at the prevailing parities. Between the late 1950s and the early 1970s, the Bretton Woods system functioned like a monetary union. Parity changes were relatively few, inflation rates converged to the world average, monetary disequilibria were rapidly resorbed by changes in the world average rate of inflation and by international reserve flows (the counterpart of payments deficits and surpluses), and goods and capital markets became closely integrated. Capital flowed not in response to the irrational whims of speculators but in economically correct response to the incentives provided by the trends in the national macroeconomic, and more specifically monetary, policies of the times.

The simultaneous determination of the world money stock, the world's stock of international reserves, and the distribution of the latter through the payments adjustment mechanism therefore deserves particular attention. It turns out that the specific institutional arrangements of the prevailing fixed-exchange-rate system, most notably international reserve holding patterns, play a crucial role in that simultaneous determination.

Roughly speaking, one can think of the world money stock as the product of a money multiplier times a monetary base consisting of the sum of the domestic components of national monetary bases plus the total of international reserves available in our fixed-exchange-rate world. Things are relatively simple if these international reserves are "outside" reserves (nobody's liability) such as gold or SDRs that are fixed in quantity or at least whose growth does not depend on national monetary policies.[22] Consider, for in-

22. A more complete analysis would clearly distinguish two types of outside reserve systems: commodity and fiat international reserves. The supply of the former reacts to changes in the real value of the commodity and thus provides an automatic stabilizer to the world price level, provided the marginal cost function of producing the commodity is rising and stable. Fiat international reserves do not fulfill this automatic stabilization function, but their supply has the advantage of not being subject to productivity shocks. They have a further advantage in allowing for seigniorage gains. Much of the remainder of sec. 5.5 is reproduced from Swoboda (1991).

stance, a system in which gold is the only international reserve asset but in which national monetary authorities need not keep a strict proportionality between their gold reserves and their domestic assets. Divide that world into two countries or regions, the United States and Europe. Imagine that the United States decides to increase its money supply by an open-market purchase of bonds. This results, at first, in an increase in the U.S. money stock equal to the increase in the monetary base times the U.S. money multiplier. But it also creates an excess supply of U.S. dollars, which tends to depreciate that currency on the foreign exchange market and, when the gold points have been reached, results in an outflow of gold from the United States toward Europe. This reduces the initial increase in the U.S. money supply and increases the European money supply by the inflow of gold into Europe times the European money multiplier. The process will continue until the initial equilibrium distribution of the world money stock into its U.S. and European components has been reestablished. In the end, the world money stock will have increased by the amount of the initial increase in the domestic component of the U.S. monetary base times the world money multiplier, itself a weighted average of the two regional money multipliers; at the same time, the gold stock of the United States will have decreased and that of Europe increased by the same amount; and the increase in the world money stock will have resulted in an increase in world money income sufficient to resorb the initial excess of money in the world created by the monetary expansion. One remarkable feature of this scenario is its symmetry: had it been Europe that had made an initial open-market purchase of bonds of the same size as that of the United States, the end result in terms of the world money stock and price level would have been exactly the same; the only difference would have been that Europe would have lost, and the United States gained, gold.

This symmetry and simplicity is lost when international reserve assets are composed, at least partly, of "inside" assets, that is, of national currencies. Consider the polar case of a dollar standard where Europe's central bank holds U.S. Treasury bills as a reserve asset. Consider, first, the effects of an open-market purchase by the Fed. As before, this results in an initial multiple increase in the U.S. money stock, an excess supply of dollars, and a U.S. payments deficit. As the European monetary authorities intervene to prevent the appreciation of the ecu beyond the intervention margin around parity, the latter translates not into a loss of gold for the United States and a gain for Europe but only into an increase in the U.S. Treasury bills held by Europe's central bank, whose money stock witnesses a multiple expansion as a consequence. The end result is therefore an increase in the world money stock of greater magnitude than that which occurs under the gold standard since there are no international reserve losses by the United States to moderate the increase in the U.S. money stock. The European money stock bears, as it were, all the burden of adjusting to the initial increase in the U.S. monetary base. The monetary policy of the United States is singularly powerful in that instance,

and the increase in world nominal income will be similarly magnified. Will the power of European monetary policy also be magnified under a dollar standard? The answer is a resounding no. To see this, consider an expansionary monetary policy in Europe. The initial effect is similar to the gold standard case: an increase in the supply of, say, ecus and a payments deficit for Europe. The consequence of that payments deficit is now simply a reduction in the U.S. Treasury bills held by Europe but with no effect on the U.S. monetary base and money supply. Europe's payments deficit will last as long as its money supply has not returned to its initial level and with it the world money stock and price level. All that will have changed in the end (which admittedly may come only after a while) is the composition of the European monetary base: the European central bank's holdings of U.S. Treasury bills will have declined by an amount equal to the increase in its holdings of domestic bonds.

Under a dollar standard, then, European monetary policy is robbed of any long-run effectiveness, whereas U.S. monetary policy becomes singularly effective. These conclusions, in their extreme version at least, are based on a number of restrictive assumptions, such as perfect substitutability between European and U.S. bonds, and hold only for the long run. But the qualitative results regarding the strong asymmetries that arise in an inside reserve system are very robust. Our argument is that the way in which the Bretton Woods regime actually functioned, especially in the latter part of the 1960s and in the early 1970s, closely resembles the hypothetical dollar standard that we have just sketched. Before we buttress that argument by empirical evidence in the next section, we illustrate it briefly diagrammatically.[23]

Figure 5.5 relates national money stocks in the United States (M^{US}) and the rest of the world (M^*) to the world money stock (M^W), which is the sum of the two national money stocks converted into a single currency unit at the prevailing parity. The lines M_0^W, M_1^W, M_2^W, represent increasingly larger world money stocks; by an appropriate choice of units (exchange rate equal to one), the slope of these lines will be minus one. The points on a given M^W line represent all the possible distributions of the given world money stock among the two regions. Only one such distribution, however, is compatible with official settlements balance-of-payments equilibrium since the latter requires, in the absence of real shocks, that the two national money stocks stand in a specific relation (ratio) to each other. Suppose that a balance-of-payments equilibrium is attained along line *OP*. Assume an initial equilibrium at *A*.

Consider, first, the outside reserve case. An open-market operation in the rest of the world that increases the money stock there from M_0^* to M_1^* initially (before other adjustments) moves the system to *B*. But, given initial values of all other variables, there is now an excess supply both of money in the world as a whole and of rest-of-world (ROW) currency relative to U.S. currency.

23. A similar illustration and more detailed explanation can be found in Genberg and Swoboda (1981).

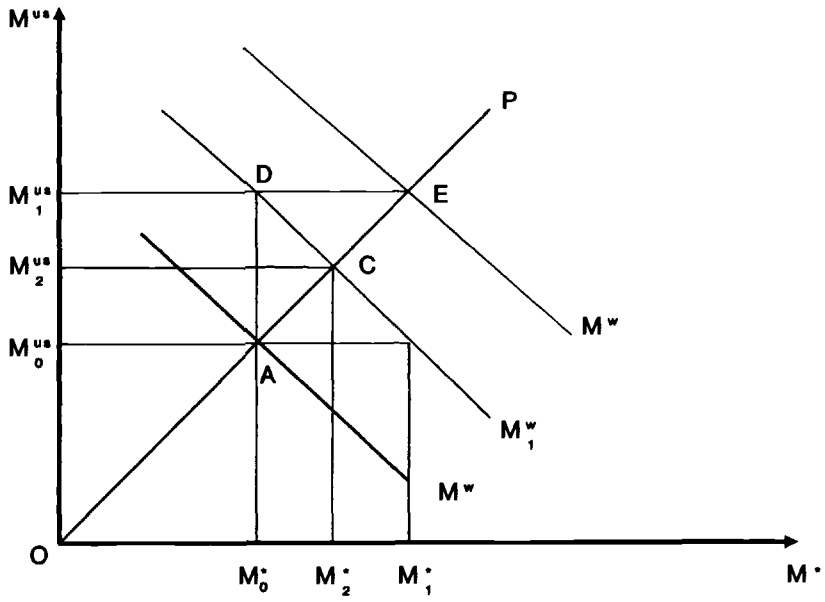

Fig. 5.5 The determination of the world money stock under alternative monetary standards

There is, in other words, both an excess demand for goods, which tends to raise world nominal income, and a ROW payments deficit. To the latter corresponds a redistribution of outside (say, gold) reserves from the rest of the world to the United States and a corresponding redistribution of the world money stock moving the system from B to C along M_1^w. Final equilibrium will be at C. The symmetry of the system can be illustrated by considering an equivalent increase in the world money stock brought about by an increase in the U.S. money supply from M_0^{us} to M_1^{us}. At D, we now have an excess supply of U.S. dollars, and redistribution of reserves and money stocks again brings the system to rest at C.

Consider now an inside reserve system. Assume, for simplicity, an extreme version of the latter: a dollar standard where the U.S. monetary authorities do not allow international developments to affect the U.S. money stock (or where the rest of the world holds only U.S. Treasury bills as reserves). That regime sharply alters the effectiveness of monetary policy in the two regions. As before, an expansion of the ROW money stock to M_1^* would initially bring the system to point B. Again, there is a ROW deficit, but this does not result in a redistribution of the world money stock and an increase in the U.S. money stock. The "only" thing that happens is a loss of reserves by the rest of the world; this will go on until the ROW money stock is reduced to its initial level at A and the payments disequilibrium is eliminated. In full equilibrium, then,

monetary policy in the rest of the world is completely robbed of its effectiveness. In sharp contrast, the effectiveness of U.S. monetary policy is magnified under a dollar standard. An increase in the U.S. money stock to M_1^{us} again initially brings the system to D, but now the U.S. deficit and the ROW surplus result only in an increase in the ROW money stock. The final equilibrium is at E rather than C, and the world money stock increases to M_2^w rather than only to M_1^w.

5.6 International Liquidity, Money, and Inflation

The surge of inflation in the late 1960s and the early 1970s that became recognized as a worldwide phenomenon gave rise to a number of studies that attempted to look at a relation between this acceleration of inflation, its international character, and the growth of international liquidity and money. Most of these studies assumed that the observed growth of international reserves was exogenous and proceeded to test for effects of the growth of these reserves on worldwide inflation. In this section, we first briefly review the main conclusions that emerged from these studies. We then present some results of a model in which both the worldwide inflation rate and the distribution of reserves between the United States and the rest of the industrialized countries are endogenous.

5.6.1 A Brief Look at the Literature

Heller (1976) is an example of a number of studies that appeared in the mid-1970s and that focused on the international aspect of inflation, attempting to explain it by some measure of global monetary expansion.[24] Using average annual data for 127 countries and for the period 1955–74, Heller found statistically significant relations between the growth of international reserves and the growth of money, on the one hand, and between the growth of money and the aggregate inflation rate, on the other. In both cases, the best results were obtained when lagged effects were allowed for, with money growth lagging behind reserve growth by about one year and inflation lagging behind money by approximately two years.[25] Heller treated the growth rate of international reserves as exogenous in the regression equation. Subsequent studies used tests proposed by Sims and Granger to test the "causality" patterns between these variables. On the basis of such tests, Genberg and Swoboda (1977a) concluded that movements in world monetary aggregates caused movements in world nominal income and the world price level. Kahn (1979), using quarterly data and distinguishing between industrial and developing countries,

24. Other studies include Genberg and Swoboda (1977a), Meiselman (1975), and Parkin (1977).

25. A regression of inflation directly on the growth of international reserves also showed a statistically significant effect with a lag of between three and four years.

also concluded that the growth of international reserves was the causal factor in the reserves-inflation relation, especially for the industrial countries and the period 1957–72.

According to these and a number of similar studies, the growth of liquidity (international reserves) was an important factor in the accelerating inflation of the late 1960s and early 1970s. The studies were, however, largely silent on the underlying reasons for the growth of international liquidity. As we have seen in section 5.4 above, this growth was dominated by movements in foreign exchange reserves, which in turn were not the result of a decision of any monetary authority in particular but rather the outcome of an interaction between the monetary policies followed in the United States, on the one hand, and those followed in the rest of the Bretton Woods world, on the other, as explained in the previous section. A fuller understanding of the process of reserve growth and inflation and its relation to monetary policies thus requires an integrated explanation that combines the arguments and empirical evidence put forward in the previous section with the kind of regression results obtained by Heller and others. We now turn to a modest attempt at such an explanation.

5.6.2 A Model of the Growth of International Reserves, of Their Distribution, and of Worldwide Inflation

The model that we propose as an explanation of both the evolution of international reserves and the medium- to long-term inflation rate in the Bretton Woods system combines an analysis of and evidence of the world money supply process with the statistical relation between inflation and the world money supply. As will become apparent shortly, it is a quite simplified model, and we certainly do not consider it as providing a complete explanation of the phenomena we are interested in. The intention is to see whether it can capture the main features of the data presented in figures 5.1–5.4. The model can be thought of as a dynamic version of that illustrated in figure 5.5.

The model contains money demand ([1] and [2]) and money supply ([3] and [4]) equations for two regions (the United States and the rest of the G10 countries, respectively, in the empirical application) and adjustment equations ([5] and [6]) that explain, respectively, the growth rate of nominal income in the G10 world and the growth of international reserves in the system:[26]

$$M_t^d = M_0 P_t^w y_t^{\eta} e^{\epsilon i_t^w}, \tag{1}$$

$$M_t^{*d} = M_0 P_t^w y_t^{*\eta^*} e^{\epsilon^* i_t^w}, \tag{2}$$

$$M_t = m_t B_t, \tag{3}$$

$$M_t^* = m_t^*(A_t^* + R_t^*), \tag{4}$$

26. The model is very similar to that specified and estimated in Genberg and Swoboda (1977b), although the country coverage in the empirical application and also the estimation technique are different.

$$\Delta \ln Y_t^w = \sum_{i=0}^{n} \gamma_{1,i} \Delta \ln M_{t-i}^w + \sum_{i=1}^{m} \gamma_{2,i} [\ln M_{t-i}^w - \ln (M^d + M^{*d})_{t-i}] + \sum_{i=1}^{2} \gamma_{3,i} \Delta \ln Y_{t-i}^w, \tag{5}$$

$$\Delta \ln R_t^* = \alpha_1 [\bar{R}_t^* - R_{t-1}^*], \tag{6}$$

where M^d = money demand, M = actual quantity of money, P = price level, y = real income, m = money supply multiplier, B = monetary base, A = domestic source component of the monetary base, and R = international reserves.

The money demand equations are conventional.[27] The specification of the money supply relations imposes a long-run version of the asymmetry view according to which the monetary base in the United States is immune to changes in international reserves in the other countries be it because the Federal Reserve sterilizes the effects of such changes or because the other countries do so in its place.[28] Notice, however, that, in view of the fact that redistribution of reserves is not assumed to be instantaneous (see the discussion of eq. [6] below), we allow for short-run effects of monetary policy in the non-U.S. countries on the world money stock and hence on world inflation.

Equation (5) describes the growth of world nominal income in a fairly commonplace monetarist manner. The current growth rate is assumed to depend partly on a distributed lag of the growth of the world money supply and partly on excess holdings of money measured by the discrepancy between the outstanding and the desired stock of money in the world.[29]

The specification of the non-U.S. countries' balance-of-payments surplus or deficit implicit in (6) is a shorthand way of catching the combined effects of the multitude of factors that affect the trade, service, and capital accounts in the international transactions between the two regions. The rate of change in the stock of international reserves held by non-U.S. central banks is explained by a simple partial adjustment mechanism that depends on the differ-

27. A superscript *w* refers to the entire world (G10 countries), an asterisk indicates the nine non-U.S. countries, and variables without a superscript pertain to the United States.

28. This assumption is justified by the empirical evidence presented in Genberg and Swoboda (1981). There we estimated reduced-form equations for the evolution of the money stock in a group of fourteen industrial countries including the United States and for the money stock of the thirteen non-U.S. countries in that sample. The explanatory variables were, inter alia, the domestic source components in the two regions, what we here call *A*. The empirical results indicated strongly the presence of asymmetries between the effects of monetary policies originating in the United States and similar policies originating in the other countries. The effects of changes in relative income levels and in the evolution of "outside" reserves likewise pointed to assymmetries. While the methodology we used in that study did not allow us to test explicitly for complete long-run offsets of non-U.S. monetary policy, the strong short-run asymmetries suggest that the specification we adopt here may be justified. Giovannini (1988) compares the gold standard of 1870–1913, the Bretton Woods system, and the European Monetary System and argues that the first and the third exhibit a greater degree of asymmetry than the second.

29. Implicit in this specification is the recognition that changes in the rate of money growth may have a short-run influence on output and employment. We believe that the long-run effect is primarily on the inflation rate, however.

ence between the long-run equilibrium level of this stock. R^* (defined, as it were, by the intersection of OP and M_0^w in fig. 5.5), and last period's actual level. $\bar{R}^*$ is in turn determined by the requirement that, in the long run, the distribution of the supply of money in the world economy must correspond to the distribution of demand, that is,

$$\frac{M}{M + M^*} = \frac{M^d}{M^d + M^{*d}}. \tag{7}$$

To illustrate the workings of the model, and, in the spirit of section 5.5, to show the difference between monetary policies originating in the United States, on the one hand, and those originating in the rest of the G10, on the other, consider the effects of and increase in B and in A^*. The initial response in both cases is for world nominal income to start increasing. Equation (7), however, implies that an expansionary policy in the United States increases the equilibrium level of reserves in the rest of the world, whereas a similar policy there reduces it as the equilibrium distribution of the supply of money is reestablished. The secondary effect of the U.S. monetary expansion thus reinforces its effect. The increase in A^*, on the other hand, is neutralized by a fall in R^* until ultimately the supply of money inside as well as outside the United States is back at its original level, as is nominal income in the world. The length of time that this process takes to work itself out depends crucially on the parameter α_1 in equation (6). The values of γ_1 and γ_2 will at the same time determine the movements in world nominal income.

5.6.3 Estimation Results

To see whether the simple model described by equations (1)–(7) is capable of explaining the main features of inflation and international reserve movements during the Bretton Woods era, we estimated the parameters in the money demand functions and the reduced-form income growth and reserve flow equations with quarterly data taken from *International Financial Statistics* for the G10 countries and the period 1959:1–1971:4. The measure of excess money supply necessary for the income growth equation was the estimated residual in the equation

$$\ln M_t^w = \ln (M_t^d + M_t^{*d}) + u_t. \tag{8}$$

Log-linearizing the right-hand side around the sample averages of the money stocks and using the demand equations (1) and (2) gives an equation that can be written[30]

$$\ln \left(\frac{M}{P}\right)_t^w = c_0 + \eta \ln (y_t^w) + (1 - s^{US}) (\eta^* - \eta) \ln y_t^* + [s^{US}\varepsilon - (1 - s^{US})\varepsilon^*] i_t^w + u_t. \tag{9}$$

30. The constant $s^{US} = .59$ is defined to be the share of the U.S. money supply in the G10 total evaluated at the sample average.

Ordinary least squares estimation applied to this equation produced estimates of η and η^* equal to .89 and 1.42 with t-values of 8.49 and 13.94, respectively. The weighted average of the interest semielasticities was estimated to be $-.023$ with a t-value of 5.95. The estimated values of u_t were used as the measure of the excess supply of money in the estimation of the parameters in equation (5). The results were[31]

	$\gamma_{1,0}$	$\gamma_{1,1}$	$\gamma_{1,2}$	$\gamma_{1,3}$		Sum
Estimate	.10	.27	$-.28$	.09		.19
t-value	-1.52	.70	1.20	.87		1.83
		$\gamma_{2,1}$	$\gamma_{2,2}$	$\gamma_{2,3}$	$\gamma_{2,4}$	Sum
Estimate		.25	.11	.40	.04	.81
t-value		1.86	.73	2.86	.03	3.69
		$\gamma_{3,1}$	$\gamma_{3,2}$			
Estimate		1.04	$-.44$			
t-value		7.30	-3.52			
		$\bar{R}^2 = .80$, D-W = 1.92				

Judged by the $\bar{R}^2$ and the Durbin-Watson statistic, the results are satisfactory. The sum of the estimated adjustment parameters as well as their implied lag patterns are consistent with previous estimates of the effects of the world money supply on world inflation.

In order to estimate the reserve flow equation (6), the long-run equilibrium condition (7) was first used to express the equilibrium level of non-U.S. reserves in terms of y, y^*, M, m^*, and A^* as in (10):

$$\bar{R}_t^* = k_0 + [\ln M_t - \ln m_t^* - s_{A^*} \ln A_t^*] \frac{1}{S_{R^*}} + \frac{\eta^*}{S_{R^*}} \ln y_t^* - \frac{\eta}{S_{R^*}} \ln y_t + \frac{1}{S_{R^*}}(\varepsilon - \varepsilon^*) i_t^w. \tag{10}$$

Substituting this relation into (6) and estimating the unknown parameters by ordinary least squares gave the following results:[32]

31. Since we do not have an equation that splits the growth of world nominal income into its price and output components, we make the simplifying assumption that real output is exogenous in our system. This makes the model recursive so that it can be estimated with the ordinary least squares technique. If changes in money growth also affect real income in the short run, then eqq. (5) and (6) would have to be estimated jointly, unless the income elasticities of the demand for money were the same in both regions, a condition that does not seem to be fulfilled, according to our estimates.

32. Tullio (1979) estimates an equation for the U.S. official settlements balance that is similar in spirit to our equation. He also finds empirical support for a monetary interpretation of the balance-of-payments adjustment mechanism.

	α_1	η	η^*	$(\varepsilon - \varepsilon^*)/S_{R^*}$
Estimate	.24	1.22	1.72	−.01
t-value	3.24	4.80	5.55	−.36
	$\bar{R}_2$ = .44, D-W = 1.46			

It is interesting to note that the estimates of the income elasticities of demand for money obtained in this equation are not significantly different by the usual statistical criteria from those obtained directly from the estimation of (9), a result that instills some confidence in the model. The estimate of α_1 implies an "offset coefficient" of .24 within the quarter and, if *real* output were assumed to be independent of the money supply, an offset in one year of .67. This rather rapid adjustment process is presumably the basic reason why movements in interest rates, prices, and economic activity were very similar in the countries included in our sample and why analysis of the determination of these variables should be conducted at the global level rather than country by country.

The values of the estimated parameters accord well with the interpretation we give to them in terms of the theoretical model. This constitutes one element of empirical evidence in favor of our proposed view of how the Bretton Woods system functioned. The R^2 statistics also suggest that the model fits the data reasonably well. However, these statistics would give an exaggerated impression of the model's ability to track the data when lagged values of the dependent variable are used as explanatory variables. To facilitate an evaluation of the model's performance, we therefore used it to generate dynamic forecasts for the sample period studied. Figures 5.6–5.8 contain the actual values and the dynamic forecasts of the level of world nominal income, the world price level, and the international reserve holdings of the non-U.S. countries.[33] The general impression that these figures convey is that the model tracks the data reasonably well. As expected, short-run movements are not well explained, but the general patterns are captured. For nominal income and the price level, this may partly be because of the illusion given by the trend increase in these series, but it should be noted that the model does pick up the slight fall in the growth of nominal income that occurred in the second half of 1966 and early 1967 and the subsequent acceleration. The period of slower growth starting in the second half of 1969 is also visible in the model's forecast. Figure 5.7 also reveals that the general acceleration of the world price level is picked up by the model.

For our purposes, the most satisfying feature of these figures is the ability of the model to capture the salient features of the evolution of international reserves during this period not only because this is the main focus of the paper

33. In generating the forecasts for the price level, it is assumed that real output is exogenous.

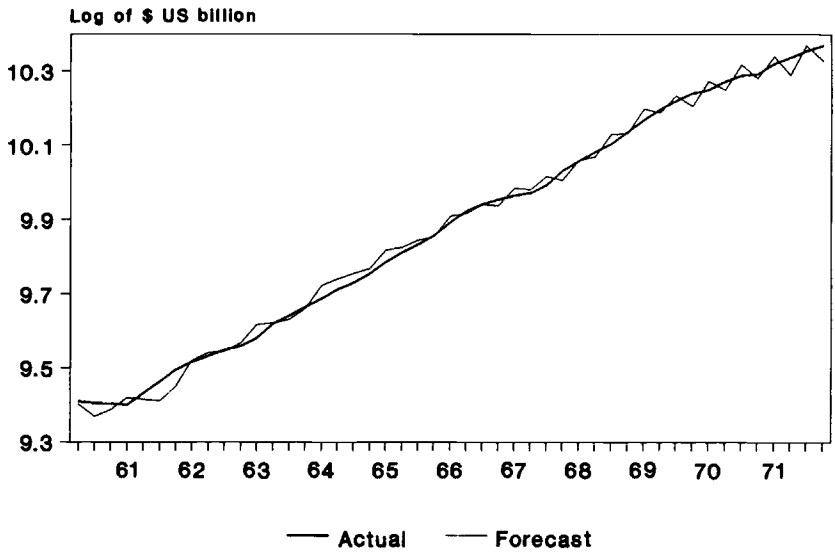

Fig. 5.6 World nominal income

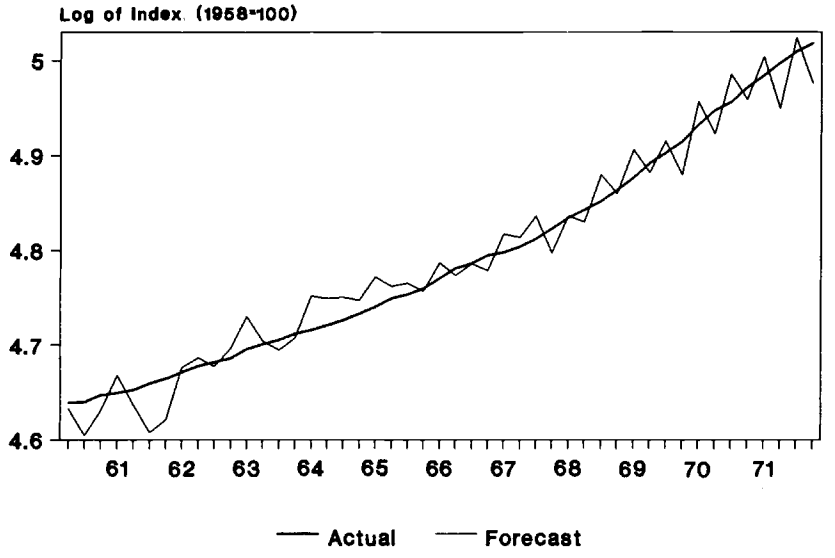

Fig. 5.7 World price level

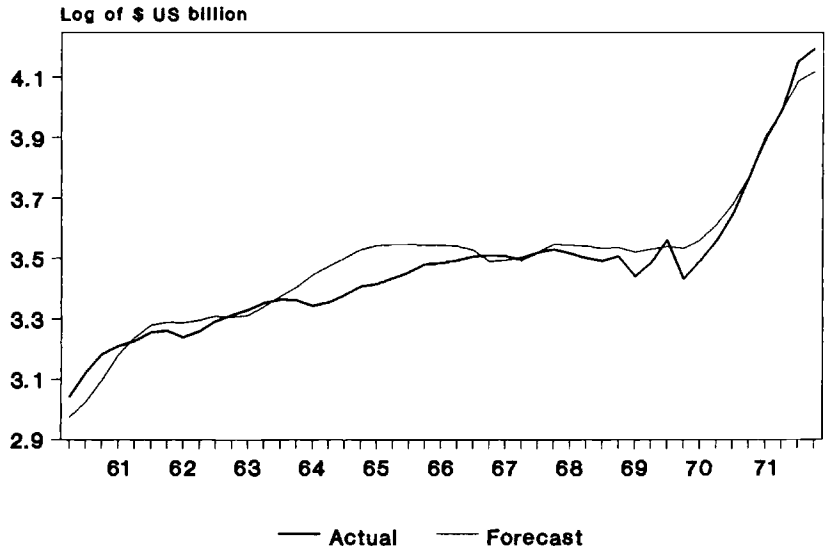

Fig. 5.8 International reserves outside the United States

but also because it is less dominated by a steady time trend than the other two variables.

In order to gain additional insights into the respective roles of money demand factors and money supply factors for the evolution of international reserves, it turns out to be instructive to reestimate the model for a period not including the last three years of the sample utilized so far and to perform out-of-sample simulations.[34] The estimation results using data until 1968:4 do not change the results very much as far as the equations for world money demand and world nominal income growth are concerned. In particular, the income elasticities in the money demand equations turn out not to be significantly different from those obtained for the full sample, and the variable capturing excess money supply continues to be a significant (at the 5 percent level) factor explaining nominal income growth.[35] The latter result is particularly noteworthy in view of suggestions that the empirical link between monetary growth and world inflation during the Bretton Woods system is due only to the period 1970–72, a claim made by Rabin and Pratt (1981) in their comment on Heller (1976). Our results show the contrary, that excess money growth had an important influence on world inflation well before that.

34. Such simulations were suggested by M. Obstfeld and the editors of the volume.

35. The growth rate of the world money supply also continues to have a positive influence on the growth rate of world nominal income, but the corresponding coefficient estimates are imprecise. Details of the results may be obtained from the authors.

Using the shorter sample changes the estimates of the reserve flow equation (6) in two important respects: the point estimate of the parameter α measuring the speed of adjustment falls to .13 from .24, and the parameters associated with the real income variables are very low and estimated very imprecisely.[36] A plausible explanation of the first of these changes is in our view to be found in an increase in the degree of capital mobility toward the end of the 1960s. As we shall see presently, this explanation is consistent with the simulation results obtained for the period 1969–71.

A potential reason for the imprecise estimates of the effects of real income on reserve flows for the period 1960–68 can be gleaned from the solid line (dubbed *demand pressure*) in figure 5.9, which shows the evolution of the ratio of real income in the "rest of the world" to real income in the United States.[37] It is possible that the relatively modest variation in this variable during the period 1960–68 makes it difficult to isolate its importance by regression methods. If this explanation is correct, the sharp upswing starting in 1967 and lasting until the end of the sample provides enough variability to sharpen the coefficient estimates.

Figure 5.9 allows us to discuss the so-called demand versus supply explanations of the balance-of-payments deficit of the United States, which, as we have seen, for all practical purposes can be equated with reserve accumulation by the other countries we are concerned with. A relative increase in the real income of the United States (a reduction in the variable labeled *demand pressure*) increases the relative demand for dollars and tends to reduce the balance-of-payments deficit of the United States. The variable labeled *supply pressure* measures the evolution of the supply of dollars relative to the home-produced (i.e., as a result of "domestic credit" and multiplier changes) supply of other monies in the system. An increase in this variable would tend to lead to a deficit in the U.S. balance of payments and to an increase in international reserves elsewhere. We note that, from the beginning of the 1960s until the end of 1967, neither the supply nor the demand side generated any significant pressure on reserve outflows from the United States. Money supply influences ran if anything in the opposite direction, whereas a higher income elasticity of demand for money outside the United States compensated for the somewhat lower real growth to cause the relatively flat path of international reserves that was shown in figure 5.8. This picture starts to change in 1967. The relative real growth performance of the United States deteriorates, and an outflow of reserves is prevented only by a continuing relative restraint on the side of the supply of money. This lasts until 1969, when all factors work in conjunction

36. The implied value of η^* is .85, but its standard error is so large that this estimate is not significantly different from the elasticity 1.42 deduced directly from the estimate in the money demand function. The implied point estimate of η_1, on the other hand, is negative, but with a t-value less than one.

37. Both variables in the figures are normalized to have zero mean and unit standard deviation.

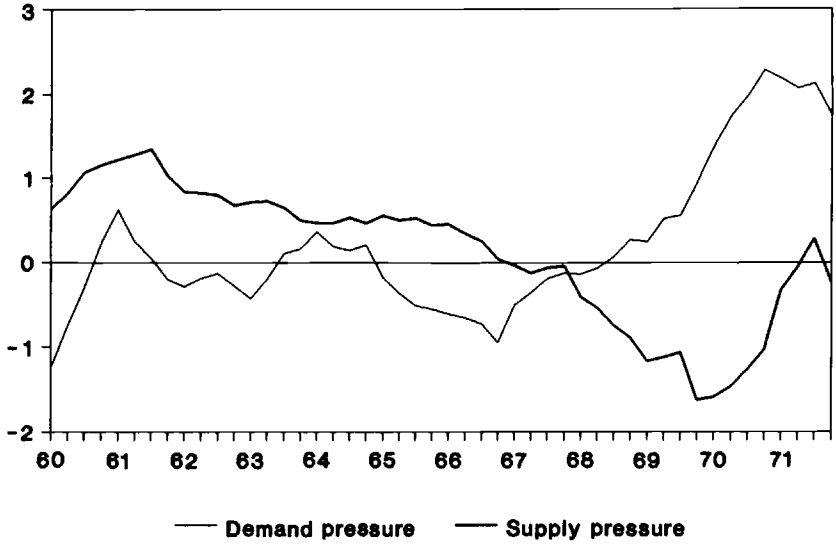

Fig. 5.9 Demand and supply pressures on reserves

to generate a balance-of-payments deficit for the United States: real growth is lower in the United States, the income elasticity of demand for money is higher abroad, and U.S. monetary policy is becoming relatively more expansionary. It is not surprising, at least according to the model that we are proposing, that international reserves in the system practically explode during 1970 and 1971. We shall return to the relation between the evolution just described and the breakdown of the Bretton Woods system in section 5.7 below.

Before doing so, we present two sets of dynamic simulations of the model based on estimates calculated using data until the end of 1968. The first, figure 5.10, shows the combined effects of the low income coefficients and the low speed of adjustment found in the estimates of equation (6). Clearly, the model is underpredicting the reserve evolution in the rest of the world toward the end of the sample even though the effect of the expansionary effects coming from the money supply side are visible during the last two years. Figure 5.11 imposes the income elasticities obtained in the estimates of the money demand equation for the full sample period on the system but retains the low speed of adjustment estimated for the shorter sample. The overall fit is substantially improved, and the main difference between this simulation and that shown in figure 5.7 above is now only the lag of the predicted reserve adjustments in the period 1969–71. As we have already suggested, an increase in the degree of capital mobility toward the end of the sample can explain why actual reserve flows responded more rapidly during the end of the Bretton Woods years than one would have predicted in 1968 on the basis of our model.

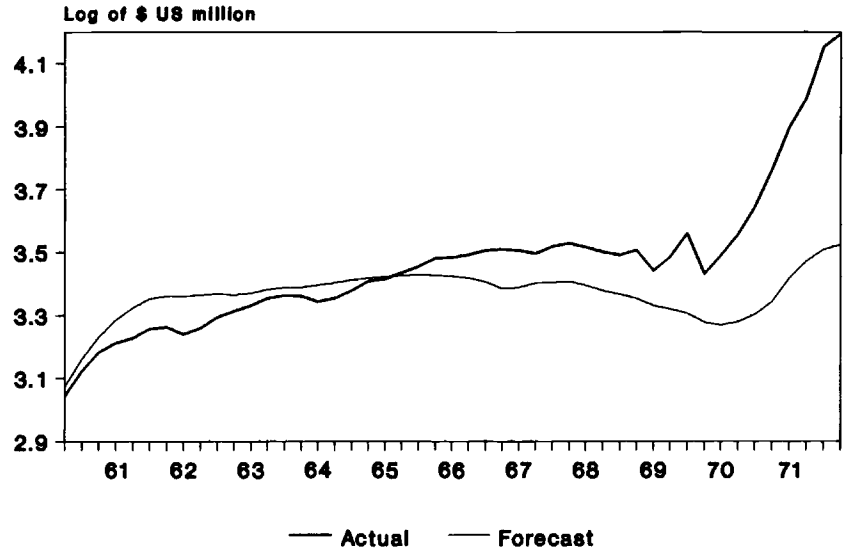

Fig. 5.10 International reserves outside the United States

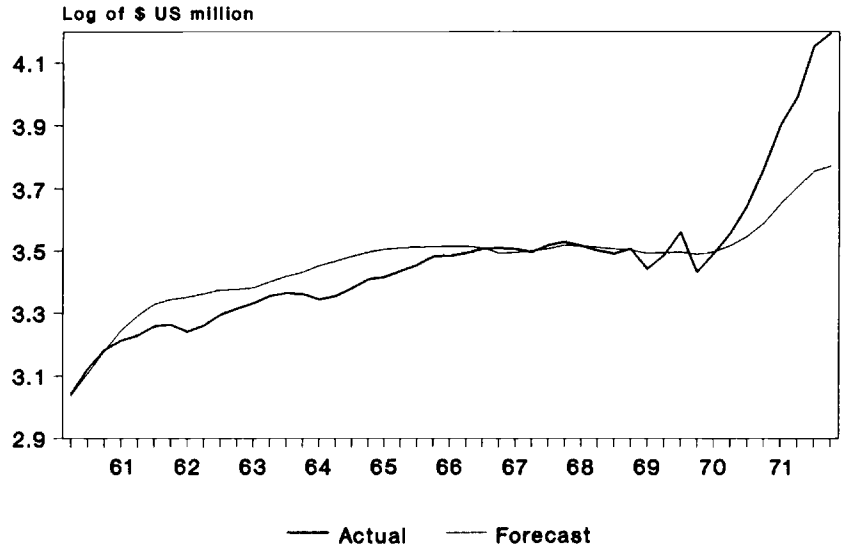

Fig. 5.11 International reserves outside the United States

5.6.4 Simulation of Scenarios That Would Have Prevented the Reserve Explosion

If we accept the view that the estimated model does capture the essential aspects of the inflation–money growth–reserve distribution nexus under Bretton Woods, then we can use it to look at the consequences of some counterfactual changes in the variables we have assumed to be exogenous.[38] Figures 5.12 and 5.13 show the consequences of two types of policy aimed at limiting the explosion in international reserves that took place in 1970 and 1971. In the first, we assume that domestic assets of the central banks outside the United States increase in 1970:1 and stay above the historical path by a constant amount thereafter.[39] We note that this policy indeed leads to a loss of reserves (relative to the control solution that was run with historical values of the exogenous variables), which accumulates rather quickly. The increase in domestic assets leads to an initial increase in the money supply, but this increase is offset by the reserve loss so that, after one year, only 33 percent of the initial expansion remains. The world price level increases temporarily as a result of the expansionary policy.

Figure 5.13 shows the consequences of a reduction in the level of the U.S. money supply taking effect in the first quarter of 1970 and remaining at the new level until the end of the sample. The fall in international reserve holdings is again visible. This time, however, there is a permanent reduction in the money supply outside the United States and a permanent fall in the world price level. The asymmetry between the policies originating in the United States, on the one hand, and those originating in the rest of G10 countries, on the other, that is built into the model as a long-run property emerges clearly after only a few quarters, a consequence of the size of the estimated adjustment parameters in equations (5) and (6).

The last exogenous change that we investigate is a switch in the demand for money to dollars from other currencies, leaving the total demand unchanged. This has the consequence of decreasing the equilibrium level of international reserves outside the United States and setting in motion an adjustment that involves not only a decrease in actual reserve holdings but also a fall in the world money supply and a fall in the world price level (see fig. 5.14). This process is exactly the same (but with the opposite sign) as that suggested by

38. Two shortcomings of the model should be kept in mind when the following simulation results are interpreted. The first concerns the treatment of real output as an exogenous variable that is not influenced by monetary policy even in the short run. The second is the assumption of the exogeneity of the U.S. money stock. It would clearly be desirable to relax these assumptions in future research. For the present, we limit ourselves to pointing out, in our commentary on the breakdown of Bretton Woods in sec. 5.7, that its timing was partly the result of out-of-phase business cycles in the United States and the rest of the world, evoking divergent policy responses in the two regions (expansionary in the United States, restrictive elsewhere).

39. The example is chosen in view of illustrating the properties of the model and the adjustment mechanisms that we think were important in the Bretton Woods system rather than with the intention of suggesting what policies should have been pursued.

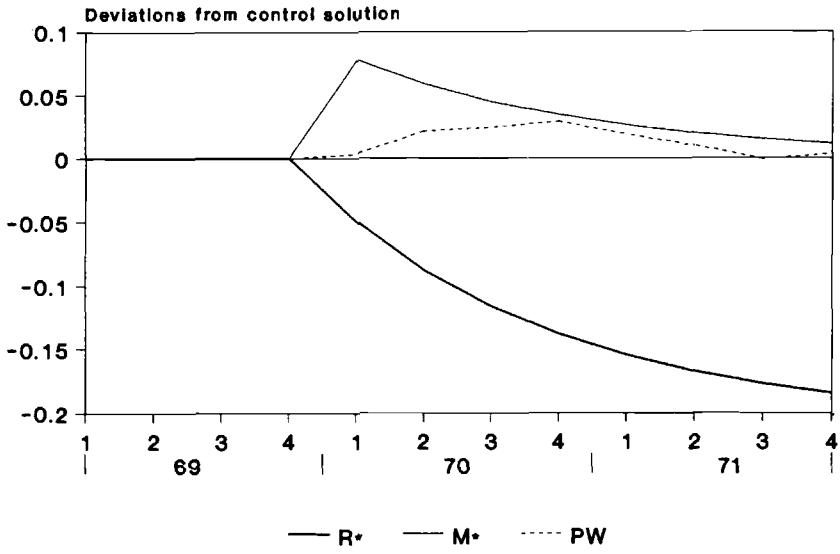

Fig. 5.12 An increase in A^*

Heller (1976) as a partial explanation for the observed explosion of reserves in 1970 and 1971.[40] Although the model that we have estimated and simulated in this section is quite simple, we believe that it captures the essence of the adjustment and liquidity mechanisms in the latter years of the Bretton Woods era. It shows clearly how the provision of liquidity in the system was an endogenous response to monetary policies in the member countries and to the asymmetry that characterized the arrangement. This view of the Bretton Woods system has important implications for the interpretation of its breakdown, a topic to which we now turn.

5.7 International Liquidity and the Breakdown of Bretton Woods[41]

The Bretton Woods regime broke down "formally" on 15 August 1971. Its collapse followed on, or coincided with, the explosion of the U.S. deficit in 1970. It is thus tempting to attribute the breakdown to an excessive creation of international liquidity or, alternatively, to the absence of an adequate external adjustment mechanism, at least of the U.S. balance of payments. The empirical evidence and the analysis presented in the previous sections, however, caution against such an interpretation. The breakdown did not occur because adjustment was sluggish or functioning badly in an economic sense

40. It should be noted that the model estimated in this section is capable of explaining the explosion of reserves without reference to instability in the demand for money functions.

41. The following analysis is in part based on Swoboda (1991).

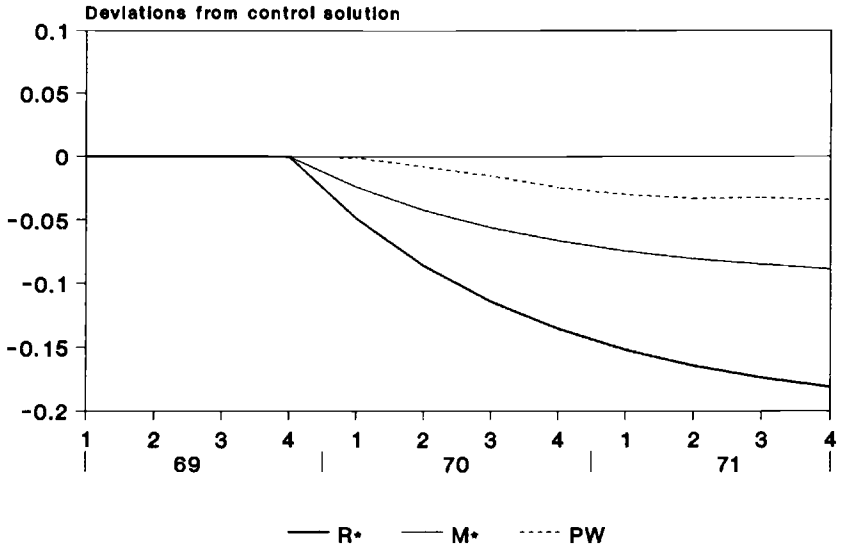

Fig. 5.13 A decrease in U.S. money supply

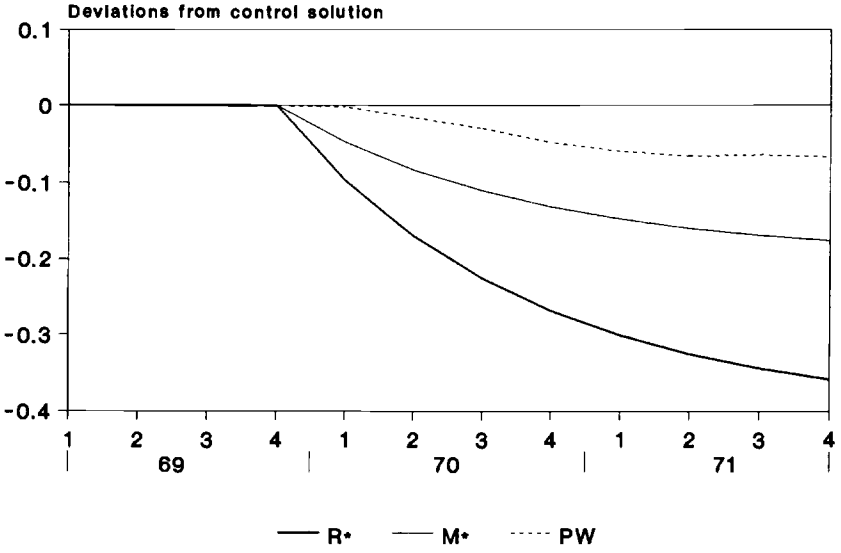

Fig. 5.14 An increase in the demand for dollars

given the nature of the prevailing international monetary regime. On the contrary, the system was adjusting all too well and very speedily to the shocks to which it was subjected, adjusting in a way that was entirely consistent with its inner logic.

On a very general level of analysis, a major reason for the breakdown of Bretton Woods was that the predominance of the United States came under attack. The reconstruction of Europe and the emerging power of Japan meant that the relative economic and political strength of the United States had declined from its height at the end of the Second World War, paving the way for a political challenge to its dominance. In addition, economic policy in the United States, which until the mid-1960s had been broadly consistent with the interests of some of its major partners, turned more lax, and therefore less acceptable, thereafter. The U.S. rate of inflation, which had been below the average "world" rate of inflation until 1965, began to rise toward that average in the next two years and rose above it after 1967.

The timing of the breakdown did indeed coincide with the explosion of the U.S. payments deficit in 1970. That explosion can be explained by our model of endogenous reserve creation and distribution without the need to invoke such notions as speculative attacks on the dollar, disequilibrium exchange rates, or exogenous increases in international liquidity.

As we have suggested in section 5.6.3 above, a confluence of demand and supply pressures generated a growing excess supply of dollars in the late 1960s and early 1970s. A high, and increasing, degree of capital mobility rapidly transformed these excess supplies into a U.S. payments deficit and a corresponding explosion of reserves elsewhere. As figure 5.8 above illustrates, demand pressures had already started to build up in 1967. For about two years, these were countered by relatively moderate money supply behavior.[42] This changed in 1969 and, especially, in 1970. The evolution of real incomes in the two regions continued to put pressure on the U.S. balance of payments, and a relatively more expansionary American monetary policy now added to this pressure. A desynchronization of the business cycle in the two regions, combined with national monetary policies that were being assigned to internal balance rather than to external balance, thus destabilized the fixed-exchange-rate regime. High capital mobility ensured that these inconsistencies rapidly precipitated the breakdown of that regime.

The basic implication of our analysis is thus that the Bretton Woods regime did not collapse because it endemically provided excessive liquidity. In one sense, it provided just the right amount of liquidity given its inner logic.

42. It is important to keep in mind that what matters for reserve flows is the evolution of money demand and money supply determinants in the United States *relative to* their evolution in the rest of the world. The *combined* supply in the two regions relative to the *combined* demand, on the other hand, will determine the evolution of world inflation. Thus, it is quite possible that aggregate monetary policy was too expansionary for price stability in the period 1967–68 at the same time as money supply growth in the United States was lower than elsewhere and therefore did not yet produce reserve outflows.

Rather, it was an unwillingness to live up to the consequences of that logic that was the fundamental cause of the breakdown.[43] Reserve creation was an endogenous variable in the regime. Given the regime, the only way to avoid its untoward consequence, the excessive world rate of inflation, would have been a more moderate increase in the U.S. rate of monetary expansion. Such moderation would have avoided the dramatic increase in dollar reserves outside the United States. That increase could also have been avoided, even given the high actual rate of U.S. monetary expansion, had the rest of the world accelerated domestic credit creation. But, in that case, world inflation would have been as high as, or even higher than, it actually was.

5.8 Implications for the Design of Fixed-Rate Regimes

The implications of the preceding analysis for the design of fixed-exchange-rate regimes, notably of the European Monetary Union (EMU) variety, are rather obvious. We will comment briefly on only two such implications by way of conclusion.

In the first place, it is in the logic of fixed-exchange-rate systems that national monetary policy loses its autonomy, or, to put it another way, that it spreads to the rest of the world and is effective (in the long run) only insofar as it affects the fixed-exchange-rate area's aggregate rate of monetary expansion. The way in which the area's aggregate money stock is determined is therefore of the utmost importance to monetary conditions in the area as a whole. That way, in turn, depends largely on the specific institutional arrangements governing national holding patterns of international reserves—international liquidity if you wish. These arrangements (together with other factors such as countries' sizes) determine the effective power of individual countries in setting the area's common monetary policy. If changes in international reserves predominantly take the form of changes in holdings of claims on one of the member countries, the provision and distribution of international liquidity within the area becomes largely endogenous, and the monetary policy of the reserve currency issuing country broadly sets the common monetary policy. This is why the design of the exchange-rate pegging arrangements within the EMU and that of the proposed European Central Bank are of such importance. It also suggests that the continuation of present European Monetary System arrangements is predicated on Germany remaining a low-inflation country within the area.

The loss of monetary autonomy implied by fixed exchange rates, even for a

43. We thus do not consider that the system itself was internally flawed. We prefer to speak of inconsistencies between the logic of that system, which says that fixed exchange rates, high capital mobility, and independent monetary policies are incompatible, and the actual conduct of policies. This does not mean of course that policies should necessarily have been subordinated to the maintenance of the system. Dealing with that issue requires evaluating the costs and benefits of fixed vs. flexible exchange rates.

large region that holds its reserves in foreign exchange, as the Bretton Woods regime demonstrates, has a further implication for the design of a European Central Bank. To the extent that that bank's charter specifies, as we believe it should, the pursuit of price stability as its primary objective, it should not be required to stabilize the value of the ecu in terms of the dollar within an imposed band. For a conflict may otherwise arise between the European Central Bank's price stability objective and its exchange-rate stabilization obligations. Such obligations should not be undertaken until such a time as a universal reform of the international monetary system, and possibly the creation of a world central bank and currency, takes place.

References

Black, S. W. 1985. International money and international monetary arrangements. In *Handbook of international economics,* vol. 2, ed. R. W. Jones and P. B. Kenen, 1153–93. Amsterdam: North-Holland.

Cohen, B. J. 1975. International reserves and liquidity. In *International trade and finance,* ed. P. B. Kenen, 411–52. Cambridge: Cambridge University Press.

Dam, K. W. 1982. *The rules of the game: Reform and evolution in the international monetary system.* Chicago: University of Chicago Press.

Day, W. H. L., and R. Heller. 1977. The world money supply: Concept and measurement. *Weltwirtschaftliches Archiv* 113(4):693–717.

Gardner, R. N. 1969. *Sterling-dollar diplomacy: The origins and the prospects of our international economic order.* New expanded ed. New York: McGraw-Hill.

Genberg, H. 1976. Aspects of the monetary approach to balance of payments theory: An empirical study of Sweden. In *The monetary approach to the balance of payments,* ed. Jacob A. Frenkel and Harry G. Johnson, 298–325. London: Allen & Unwin.

Genberg, H., and A. K. Swoboda. 1977a. Causes and origins of the current worldwide inflation. In *Inflation theory and anti-inflation policy,* ed. E. Lundberg, 72–93. London: Macmillan.

———. 1977b. Worldwide inflation under the dollar standard. Graduate Institute of International Studies–Ford Discussion Paper no. 12. Geneva, January.

———. 1981. Gold and the dollar: Asymmetries in world money stock determination, 1959–1971. In *The international monetary system under flexible exchange rates: Global, regional, and national: Essays in honor of Robert Triffin,* ed. R. Cooper, P. B. Kenen, J. B. de Macedo, and J. van Ypersele, 235–57. Cambridge, Mass.: Ballinger.

Giovannini, A. 1988. How do fixed-exchange-rates work: The evidence from the gold standard, Bretton Woods and the EMS. In *Blueprints for exchange rate measurements,* ed. M. Miler, B. Eichengreen, and R. Portes, 13–41. New York: Academic.

Heller, H. R. 1976. International reserves and world-wide inflation. *International Monetary Fund Staff Papers* 23:61–87.

Horsefield, J. K., ed. 1969. *The International Monetary Fund, 1945–1965: Twenty years of international monetary cooperation.* Washington, D.C.: International Monetary Fund.

Kahn, M. 1979. Inflation and international reserves: A time-series analysis. *International Monetary Fund Staff Papers* 26:699–724.

Kouri, P. 1975. The hypothesis of offsettting capital flows: A case study of Germany. *Journal of Monetary Economics* 1(1):21–39.
Machlup, F. 1966. The fuzzy concepts of liquidity, international and domestic. in *International Monetary Economics: Collected Essays by Fritz Machlup*, 245–59. London: Allen & Unwin.
Meiselman, D. I. 1975. Worldwide inflation: A monetarist view. In *The phenomenon of worldwide inflation*, ed. D. I. Meiselman and A. B. Laffer, 69–112. Washington, D.C.: American Enterprise Institute for Public Policy Research.
Nurkse, R. 1944. *International currency experience*. Geneva: League of Nations.
Obstfeld, M. 1980. Sterilization and offsetting capital movements: Evidence from West Germany, 1960–1970. NBER Working Paper no. 492.
Parkin, M. 1977. A "monetarist" interpretation of the generation and transmission of world inflation: 1958–71. *American Economic Review: Papers and Proceedings* 67:164–71.
Rabin, A., and L. J. Pratt. 1981. A note on Heller's use of regression analysis. *International Monetary Fund Staff Papers* 28:225–29.
Robinson, J. 1943. The international currency proposals. *Economic Journal* 53: 161–75.
Swoboda, A. K. 1978. Gold, dollars, Euro-dollars, and the world money stock under fixed exchange rates. *American Economic Review* 68(4):625–42.
———. 1991. The road to European monetary union: Lessons from the Bretton Woods regime. 1991 Per Jacobsson Lecture, Basle, 9 June 1991.
Triffin, R. 1960. *Gold and the dollar crisis*. New Haven, Conn.: Yale University Press.
Tullio, G. 1979. Monetary equilibrium and balance-of-payments adjustment. *Journal of Money, Credit, and Banking* 11(1):68–79.
Williamson, J. H. 1973. International liquidity: A survey. *Economic Journal* 83:685–746.

Comment

Stanley W. Black

This paper has the care and elegance that we have come to expect from Hans Genberg and Alexander Swoboda in discussing the international monetarist point of view. But it is a decidedly idiosyncratic view of international liquidity, in my opinion. Unlike the authors of the Bretton Woods Agreement, Genberg and Swoboda assume a high degree of international capital mobility. As they say, they "must focus on an aggregate broader than *international reserves* narrowly defined if capital mobility is perfect since, in that case, certain domestic assets are, by assumption, perfect substitutes for the central bank's foreign assets." So they focus on the entire domestic monetary base. This may seem appropriate in Switzerland, where the domestic component of the monetary base is composed of Swiss francs. But it seems highly doubtful for most members of the International Monetary Fund with convertible currencies during the Bretton Woods period.

Stanley W. Black is the Georges Lurcy Professor of Economics at the University of North Carolina at Chapel Hill.

In their discussion of the role of international liquidity in the Keynes and White plans and in the Articles of Agreement of the International Monetary Fund, they focus on the *provision* of liquidity without in my view giving a satisfactory definition of its *function*. Therefore I will offer my own.

Central banks have been established in most countries to regulate the quality of domestic money, conceived of as a device to facilitate transactions in the marketplace and to act as a temporary store of value and as a unit of account for contracts. Such regulation is required to avoid fraud and counterfeiting and to ensure the exchangeability of different types of money such as currency and bank deposits for each other at par.

International trade conducted between residents of countries using different currencies requires access to foreign exchange. Full exploitation of the benefits of comparative advantage requires unrestricted convertibility between domestic and foreign currency for both domestic and foreign residents at essentially the same rate of exchange. Such convertibility is not a simple matter to achieve. Only about 30 percent of the members of the International Monetary Fund can do so.

Maintenance of convertibility requires the holding of sufficient hard currency reserves either in the central bank or in commercial banks to guarantee the continued access to foreign exchange of domestic residents. This is true under floating exchange rates as well as under pegged rates. At times, countries such as France, Italy, Great Britain, and even the United States have had convertibility problems.

Under the assumption of perfect capital mobility, there is no such problem since domestic and foreign assets are by assumption perfect substitutes. But for the large majority of the world's population that does not live in a hard currency or reserve center country, convertibility is a continuing problem, one that the Bretton Woods system was designed to deal with. A major purpose of the founding of the International Monetary Fund was "to assist in the establishment of a multilateral system of payments in respect of current transactions among members and in the elimination of foreign exchange restrictions which hamper the growth of world trade" (Article I).

Genberg and Swoboda rightly describe the monetary standard of the Bretton Woods system as a gold exchange standard that evolved toward a dollar standard. Their depiction of this evolution rests on the "global monetarist" model involving a region of fixed exchange rates linked by goods market arbitrage into a common world inflation rate determined by the evolution of the world monetary base, a money multiplier, and the growth of the demand for world money.

They argue that "the industrialized countries' economies were sufficiently integrated between 1959 and 1971 for this view to have a great deal of short-run relevance." Now there is no doubt that, as a simplification, there is a great deal of truth in this statement. However, I cannot help but feel that it is an oversimplification that omits important factors, distorts an understanding of

the multiple reasons for the breakdown of the system, and imposes an overarching view, to use Anna Schwartz's words, that participants and originators of the Bretton Woods system would not have agreed to as relevant.

Specifically, Keynes rejected the quantity theory as an explanation of behavior for the domestic economy. And he certainly rejected the implications of Hume's law "rules of the game" for international monetary arrangements. So did White and his associates. They explicitly designed a system that would *not* have to allow domestic monetary policy to be completely dominated by external factors.

Obstfeld (chap. 4 in this volume) argues effectively that the Bretton Woods system involved substantial sterilization of reserve flows. Alan Stockman (chap. 6 in this volume) believes that the Bretton Woods system did not work according to a simple model. He finds it difficult to determine whether all countries had the same inflation rate. The data suggest to him that "countries had some scope for monetary-policy independence," at least according to "the natural interpretation of the evidence."

In support of their view, Genberg and Swoboda present their model of the 1959–71 Bretton Woods system as a world dollar standard. The model of equations (1)–(4) is indeed simple, but it is allowed to become more realistic by two dynamic adjustment equations ([5]) and [6]). The first shows the response of world inflation to monetary growth, while the second gives the relation of the non-U.S. industrialized countries' reserve holdings to the excess demand for money. The latter depends in equation (10) on the difference between the demand for base money outside the United States and the domestic source base of money outside the United States, with a lag in adjustment, as in Hume's law.

The model seems to work well enough statistically, although I have three questions to raise about it. First, it is surprising that the quarterly demand for world money (9) can be estimated with no lags. Second, Rabin and Pratt's criticism of Heller addressed not the relation between money and inflation, as asserted by Genberg and Swoboda, but the relation between reserve growth and money growth.[1] In Genberg and Swoboda's work, this takes the form of equations (6) and (10). Their estimates of that relation over the shorter sample 1959:1–1968:4 excluding the breakdown period show a significantly lower speed of adjustment (.13 vs. .24) and unsatisfactory estimates of the income elasticities, as compared with their results over the complete sample. The out-of-sample simulations of the model in figures 5.10 and 5.11 are far less impressive as explanations of the explosion of reserves outside the United States than was the simulation in figure 5.8. I believe that this weakens the support for their model of global monetarism since the strength of the reserve-money

1. See A. Rabin and L. J. Pratt, "A Note on Heller's Use of Regression Analysis," *International Monetary Fund Staff Papers* 28 (1981): 225–29; and Robert Heller, "International Reserves and World-wide Inflation," *International Monetary Fund Staff Papers* 23 (1976): 61–87.

link depends on the inclusion of the enormous explosion of base money in 1970–71 as the system broke down.

My third question has to do with the fact that the model makes it appear that nothing was wrong with the system until 1969. Figure 5.9 shows that, "until the end of 1967, neither the supply nor the demand side generated any significant pressure on reserve outflows from the United States." Only in 1969 and 1970 did "a relatively more expansionary" American monetary policy, in conjunction with demand factors, generate a balance-of-payments deficit for the United States. Genberg and Swoboda argue that the evidence shows that the only way to have avoided a breakdown in the Bretton Woods system "would have been a more moderate increase in the U.S. rate of monetary expansion." Now it is well-known that there was pressure on U.S. gold reserves beginning as early as 1960, shortly after the resumption of convertibility in Europe. The Gold Pool effort to stabilize the London gold price began in 1960 and was formalized in 1962. The pressure was generated by the increasing undervaluation of gold at $35.00 an ounce in the context of the gold-dollar exchange system. Paul De Grauwe has recently pointed to the gold-dollar exchange standard as breaking down because of the application of Gresham's law.[2]

Given their model, Genberg and Swoboda show that it is capable of reproducing some of the features of the breakdown, if shocked with an increase in U.S. monetary growth or a shift in portfolio preferences from U.S. to foreign money demand. With this viewpoint, they conclude that the system broke down not because it was flawed but because of excessive U.S. monetary growth, combined with the unwillingness of a resurgent Europe to accept the rate of inflation imposed by U.S. monetary policy.

This view contains much of the truth. But I would argue that it omits some important factors, including the gold-dollar problem mentioned above. Robert Mundell described the combination of capital mobility and pegged exchange rates with independent monetary policies and sterilized reserve flows as an "international disequilibrium system."[3] Thus, the system itself was flawed, not merely or only U.S. behavior. I would add that the automatic financing of U.S. deficits provided by the system was a fatal temptation to a U.S. government that has always put domestic policy concerns first. In the late 1960s, President Lyndon B. Johnson was desperately seeking to finance the Vietnam War and a domestic War on Poverty at the same time without raising taxes. So I would argue, with others, that the logic of the system was flawed and that, in combination with the factors cited by Genberg and Swoboda, this led to the breakdown of the system.

One point on which I would disagree with Genberg and Swoboda is their

2. See Paul De Grauwe, *International Money: Postwar Trends and Theories* (Oxford: Oxford University Press, 1989).

3. See Robert Mundell, "The International Disequilibrium System," *Kyklos* 14 (1961): 154–72.

characterization of the Bretton Woods system as "adjusting all too well and very speedily to the shocks to which it was subjected." The global monetarist viewpoint imposes a high speed of adjustment on a system that instead suffered from reluctant adjustment, both in the surplus countries and in the United States.

Finally, what should be concluded about liquidity under the Bretton Woods system? I would say that it was the *standard* of liquidity, the gold-exchange standard, that was flawed and that excessive reliance on U.S. liabilities as reserve assets sowed the seeds of its failure. Otherwise, however, the arrangements for providing liquidity to member nations of the International Monetary Fund and setting up rules for the appropriate use of liquidity and the balance between adjustment and financing that are laid out in the IMF's Articles of Agreement are issues with which any monetary system should and must deal.

Comment

John Williamson

It is almost inevitable that the author of a survey article cited as an example of the conventional wisdom of a previous generation will judge a paper like this in terms of what he perceives to be progress and regress vis-à-vis his own work, and I shall not attempt to resist the temptation to do what comes naturally.

The most significant progress is Alexander Swoboda's definitive clarification of the determinants of the aggregate money supply of a fixed-exchange-rate area under alternative institutional arrangements.[1] Had I written my survey article after that paper, my treatment of the determinants of reserve supply would surely have been substantially better.

I cannot, however, agree with the authors that the traditional analysis neglected the questions about the relation between reserves, money supply, and inflation on which they focus. On the contrary, my own survey article christened the hypothesis that they favor the "international quantity theory" and treated its testing as one of the principal unresolved issues in the field. Genberg and Swoboda essentially assume it to be true, without presenting evidence that seems particularly pertinent to the issue. That is regress, not progress.

One of the foundations of the international quantity theory—the theory that the evolution of a world reserve base drives world inflation—is that reserves constitute a constant fraction of the monetary base in each country. Genberg and Swoboda assume this to be true and ignore the alternative hypothesis (pio-

John Williamson is a senior fellow at the Institute for International Economics.

1. See Alexander K. Swoboda, "Gold, Dollars, Euro-Dollars and the World Money Stock under Fixed Exchange Rates," *American Economic Review* 68, no. 4 (1978): 625–42.

neered by Triffin)[2] that reserves are treated as inventories that derive their utility by fluctuating so as to permit the stabilization of other variables of greater welfare significance, like output. It is not clear to me that this hypothesis is inconsistent with their empirical results since most versions of the inventory view of reserves also predict that reserves will grow in line with nominal income in the long run, but it is difficult to be sure when the competing views are not clearly specified in such a way as to draw out their contrasting implications.

They also assume that the Bretton Woods system was fundamentally a dollar standard, despite an interesting passage in which they point out that the Fund's Articles "were in fact compatible with a variety of possible international standards"—a gold bullion standard, a gold exchange standard, or a dollar standard. At one point they even admit that "to some extent" it did operate as a gold exchange standard and merely claim that it evolved toward a dollar standard "in the late 1960s and . . . at the margin." Yet, when they come to specify and estimate a model of how the Bretton Woods system worked, it is an uncompromising model of the dollar standard—which is certainly not what the authors of Bretton Woods thought they were creating.[3]

My own view[4] has always been that the system remained essentially a gold exchange standard until 1968, at which point the adoption of the two-tier gold market (and its implicit threat that the United States would retaliate for any extensive use of the legal right to buy gold at the official price by closing the gold window) transformed the system into a dollar standard. (I also take the view that a dollar standard was emotionally unacceptable to the rest of the world, which meant that this could be only a very temporary solution.) One question posed by the paper is whether the success of Genberg and Swoboda in fitting their model to the data compels a reassessment of that position. The key question is whether U.S. monetary policy was unconstrained by the U.S. reserve position prior to 1968, as is hypothesized by equation (3). That equation is not in fact tested in the present paper: instead, the authors appeal to empirical evidence presented in an earlier paper, which showed a degree of asymmetry in the response to U.S. as opposed to foreign monetary policy but also decisively refuted the hypothesis that only U.S. monetary policy matters.[5] Note that Giovannini concluded that the Bretton Woods system had been

2. See Robert Triffin, "National Central Banking and the International Economy," *Review of Economic Studies* 14 (February 1947): 53–75.

3. See, e.g., Bordo (chap. 1 in this volume); McKinnon (Comment on chap. 13 in this volume); or John Williamson, "Keynes and the International Economic Order," in *Keynes and the Modern World*, ed. D. Worswick and J. Trevithick (Cambridge: Cambridge University Press, 1983).

4. Which seems to coincide with that of Bordo (but not McKinnon).

5. See Hans Genberg and Alexander K. Swoboda, "Gold and the Dollar: Asymmetries in World Money Stock Determination, 1959–1971," in *The International Monetary System under Flexible Exchange Rates: Global, Regional and National*, ed. R. N. Cooper, P. B. Kenen, J. B. de Macedo, and J. van Ypersele (Cambridge, Mass.: Ballinger, 1981).

distinctly more symmetrical than the European Monetary System or even the gold standard.[6]

Thus, neither of the crucial disputes between the traditional (Triffinesque) view of how Bretton Woods worked, and would collapse, and the revisionist monetarist view of what it was all about are illuminated by the empirical model of the paper. The success of Genberg and Swoboda in getting a reasonable fit for their model does not compel one to accept their quixotic explanation for the breakdown of Bretton Woods.

That breakdown had nothing to do with a political attack on U.S. hegemony. On the contrary, the main enthusiast for subverting the monetary leadership of the United States had been unceremoniously removed from the world scene by the French people shortly before, having tried but failed to induce other countries to join France in mounting an official run on the dollar during his years in power. The breakdown was instead a consequence of the failure to make timely repairs and renovations to the system designed by Keynes and White for a world of low inflation, without capital mobility, and with ample gold stocks. That system was in many ways a very attractive one: it largely succeeded in avoiding a waste of resources on unnecessary unemployment, in preventing the competitive use of exchange-rage policy, and in desynchronizing the business cycle internationally while building in an early warning signal of emerging inflationary pressures and providing an automatic stabilizer that would limit the damage caused by excess demand (in terms of a buildup of inflationary momentum) until needed deflationary measures could become effective.[7]

However, by the late 1960s, the system needed reforming in order to accommodate differential inflation and to provide an acceptable adjustment mechanism that was still usable in the presence of capital mobility, as well as to supplement the supply of reserves. Genberg and Swoboda attack the contention that the breakdown was caused by the lack of an adjustment mechanism by arguing that "the system was adjusting all too well and very speedily to the shocks to which it was subjected, adjusting in a way that was entirely consistent with its inner logic." Instead, the problem was "national monetary policies that were being assigned to internal balance." Now if there is any one core element of the Bretton Woods system—something on which Keynes and White agreed, that dominated the design of policy throughout the period when the system functioned, that motivated the alternative strand of theorizing that Genberg and Swoboda neglect in their paper—it was the primacy given to continuous pursuit of internal balance. To say that adjustment would have

6. See Alberto Giovannini, "How Do Fixed Exchange Rate Regimes Work: The Evidence from the Gold Standard, Bretton Woods, and the EMS," in *Blueprints for Exchange Rate Management*, ed. M. Miller, B. Eichengreen, and R. Portes (New York: Academic, 1988).

7. John Williamson, "On the System in Bretton Woods," *American Economic Review* 75 (May 1985): 74–79.

been feasible if only policymakers had not worried about internal balance is like saying that crime could be ended by abolishing all laws—technically true, but hardly helpful.

I am of course well aware that practicing monetarists do not share the conviction that policy is able to do much to help preserve internal balance, but that is a proposition that should be debated on its merits and not taken as an axiom. Actually, even monetarists concede that policy can limit inflation, so it is a bit surprising to find Genberg and Swoboda arguing that the rest of the world could have avoided the breakdown by accelerating domestic credit creation, at the cost of increased inflation. That point is also technically true, but hardly helpful as policy advice.

Thus, the primary cause of the breakdown of Bretton Woods was the absence of an adjustment mechanism that respected the core value of the system, namely, the preservation of internal balance, as well as being compatible with the degree of capital mobility that had developed by the late 1960s. Had that lack been remedied in good time, by adoption of the crawling peg in a form that gave the United States the right to devalue the dollar at its own initiative, the reformed Bretton Woods system could have survived the monetary adventures of the Nixon administration.

Genberg and Swoboda are also on dubious ground in arguing that a European Central Bank committed to the pursuit of price stability as a primary objective "should not be required to stabilize the value of the ecu in terms of the dollar within an imposed band." What is true is that a commitment to price stability is incompatible with the defense of a constant nominal band. But there is no inconsistency if a wide band is defined in real terms, so that the nominal band is adjusted automatically in response to differential inflation. Suppose that such a system of limited flexibility—a wide band combined with a crawling peg—had already been in effect in 1969. The relaxation of U.S. monetary policy at the end of that year would then have led the dollar to depreciate toward the bottom of its band, giving Europe short-run protection against the outflow of dollars and the acceleration of inflation in the United States. As American inflation increased, the par value of the dollar would have depreciated, thus maintaining the European defense against imported inflation. When the executive directors of the IMF threw out these proposals for limited flexibility during their drafting of the exchange rate report,[8] they condemned the world to the certainty that Bretton Woods would break down and that the many good features of the best monetary regime the world has ever known would be lost in the process. We have been paying the price ever since.

8. International Monetary Fund, *The Role of Exchange Rates in the Adjustment of International Payments* (Washington, D.C., 1970).

General Discussion

Ronald McKinnon argued that the story that Bretton Woods's collapse was due to an excess supply of money created by the United States was incomplete. He argued that the data on U.S. monetary aggregates do not display a big enough jump in the late 1960s. The factor that he believed best explains the event was currency substitution—a massive shift in demand away from dollar assets toward other convertible currencies. The dollar was talked down by authorities who believed that it was overvalued because of the diminishing current account surplus. This was perceived by the foreign exchange market, leading to a run on dollar assets. *Paul Krugman* agreed that the collapse was due to a widespread perception that the dollar was overvalued in real terms.

Maurice Obstfeld posited another mechanism whereby a change in the demand rather than the supply of money could have precipitated collapse—a pure expectational shift. He argued that, if a dollar devaluation was suddenly expected, this would cause U.S. interest rates to rise and European rates to fall, in turn leading to shifts in money demand like those that would occur under currency substitution. *Robert Mundell* argued that, once gold became demonetized in March 1968, this eliminated the gold component of usable resources, in turn fostering a large increase in the demand for international reserves.

Richard Cooper elaborated on the point (based on annual changes in the U.S. monetary base from 1963 to 1972) that U.S. monetary aggregates did not accelerate sufficiently before 1971 to produce the collapse. He pointed out that there was an explosion in international reserves, but not the base, in the late 1960s. The base accelerated in 1972, only after the gold-dollar link was completely severed.

Robert Solomon described how the big explosion of reserves in the surplus countries and the massive U.S. balance-of-payments deficit in 1970–71 came about. U.S. interest rates were relatively high in the second half of the 1960s and attracted funds from the Eurodollar market, especially as U.S. banks borrowed from their branches in Europe. The drain of funds from Europe gave the United States an official settlement surplus in 1968 and 1969. The pattern was reversed in 1970, when the United States went into recession, reducing interest rates. U.S. banks repaid their branches in Europe. These funds flowed back to Europe, swelling reserves. The increase in European reserves then fostered speculation of imminent realignment of exchange rates.

Both *Maurice Obstfeld* and *Paul Krugman* argued that, in the face of perfect capital mobility, the traditional concepts of reserves and liquidity were not meaningful.

Finally, *Max Corden* suggested that the fundamental flaw of the Bretton Woods system was not the lack of an adjustment mechanism, as John Williamson had argued in his Comment, because the system did allow for changes in the exchange rate. The problem was that countries did not use the exchange-

rate adjustment mechanism. Surplus countries opposed devaluation because of concern over the competitiveness of their export industries. Deficit countries opposed devaluation because of concern over speculation. For Corden, the fundamental flaw in the system was capital mobility—that an adjustable peg system could not be reconciled with high capital mobility.

This Page Intentionally Left Blank