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The Collapse of the Bretton Woods Fixed Exchange Rate System

Peter M. Garber

The collapse of the Bretton Woods system of fixed exchange rates was one of the most accurately and generally predicted of major economic events.¹ Hind-sight, of course, sharpens the perception of the inevitability of events and makes great prophets of those members of the spectrum of analysts who happened to get their predictions right. But the general outlines at least of the key events from 1967 through 1971 were foreseen, starting from the work of Triffin (1960), whose warnings provided the compass to policymakers implementing serious changes in the provision of liquidity and the administration of capital controls in a vain attempt to preserve the system.

The heyday of Bretton Woods, during which the system actually operated as envisioned under full convertibility, lasted only from 1959 through 1968. Associated with steady growth in world production and trade, these nine years and the preceding decade of movement toward currency convertibility are considered something of a golden age in contrast to the six-year debacle of the interwar gold standard. Yet, from the moment of full convertibility on current account transactions in 1959, the steady growth of official and private liquid dollar claims in the hands of foreigners and the reduction in official gold holdings, and especially U.S. gold holdings, convinced policymakers that, barring some alteration, the system was on a trajectory headed toward collapse.²

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1. For example, Triffin (1960) warned of the potential for the collapse of the system, and Rueff stated, "What I am sure of is that, if we remain in the same regime, we shall some day arrive at the end of the means of external payments by the United States. This will mean that, whether they want or not, whatever the agreement in the IMF and the GATT, they will have to establish an embargo on gold, establish quotas on import, impose restrictions such as the one they are now studying on foreign travel, and cut the links between nations" (Rueff and Hirsch 1965, 14).

2. Why the cumulation of foreign liquid dollar claims was a problem is not clear. Of course, if U.S. gold holdings far exceeded foreign liquid dollar claims, either in private or in official hands,

Starting from 1960, efforts to patch perceived deficiencies in the operation of the system assumed the form of perfecting interventions in the private gold market through the organization of the Gold Pool and the establishment of various formal liquidity-increasing techniques—the General Arrangements to Borrow (GAB), currency swaps among central banks, and special drawing rights (SDRs). Essentially, these were new forms of lines of credit jerry-built atop the preexisting credit lines like intergovernmental and private bank loans and drawings under the IMF's original credit provisions. Analogous to inter-bank credit lines in a domestic banking system, such changes would have tended to reduce official demand for foreign reserves. If, as claimed by the United States, U.S. balance-of-payments deficits were the result of increases in the demand for liquid foreign exchange reserves because of underdeveloped European capital markets (see Solomon 1982, 53–54), these changes, in reducing reserve demand, would have alleviated the U.S. balance-of-payments deficit, although they would have raised the price level and threatened the dollar convertibility of gold. On the other hand, if the U.S. balance-of-payments deficits were brought about by excessive U.S. monetary expansion, as claimed by various European governments, these devices would have accelerated the crisis by reducing the demand for liquid dollar claims in the face of a monetary expansion.³

The formation of the Gold Pool led generally to official gold sales by permitting an internal drain on gold and terminated in the speculative run on gold in 1968. As a temporary fix, the private market for gold was separated from the official market with the establishment of a floating private market price and a restriction that official holders of gold would transact only with each other. Finally, foreign central banks, spurred on by selling attacks on their currencies, participated in a final attack on gold, forcing an end of access to the U.S. gold window and generating a round of revaluations against the dol-

foreigners could not successfully directly run U.S. gold reserves if the entire amount of U.S. reserves was made available to defend the parity. As liquid claims accumulated sufficiently to exceed U.S. gold reserves, such a direct run was feasible. Nevertheless, the gulf between feasibility and profitability can be vast.

More generally, although foreigners may have lacked sufficient liquid claims on the dollar to have staged a run, U.S. domestic residents had claims that far exceeded U.S. gold reserves. Although gold ownership by U.S. citizens was illegal, such claims could have been shifted abroad and quickly used to run the system. These claims were ignored in the discussions at the time (except perhaps in the budding monetary approaches such as that of Mundell [1971]). Perhaps it was thought that the bulk of the claims in the United States were retail claims unlikely to be mobilized in a speculative attack while the official and private foreign claims were wholesale. Nevertheless, the wholesale U.S. money markets were the largest and the least restricted in the world. Alternatively, perhaps it was thought that controls could readily be placed on U.S. holders of liquid claims to prevent them from joining a speculative attack. The same, however, could be said for private foreign claimants, who controlled the bulk of the foreign claims. Foreign official claimants would have had to be treated more gingerly by U.S. authorities.

3. This identification problem about the causes of the European accumulation of liquid dollar claims framed much of the political dimension of the monetary debate of the 1960s.

lar. The last attempt to preserve the fixed exchange rate system through the Smithsonian Agreement was launched in December 1971. In little more than a year, however, further speculative attacks were launched on the dollar, leading to the final collapse of the system in 1973 and the shift to a managed floating regime. Thus, the dollar standard period from 1968 to 1973 can be characterized as a period of recurrent devaluation.

Interwoven with the dollar/gold trajectory of the system, other countries had episodes of foreign exchange crisis during the 1960s. The most notable of these was the pound sterling crisis from 1964 to 1967, which culminated in the devaluation of 1967. Since the pound was the second most important of the reserve currencies, this devaluation contributed to the pressure on the dollar that led to the abandonment of the gold leg of the system in 1968. Tangentially, internal political difficulties in France in 1968 caused the devaluation of the franc. Finally, reflecting the growing pressure on the system, the deutsche mark was revalued in 1969 and floated in May 1971 prior to the closing of the U.S. gold window, in response to selling attacks on the deutsche mark.

The collapse of Bretton Woods encompasses the events involved in the sequential withdrawal of convertibility of gold into dollars, thereby ending the role of gold as a liquid dollar claim, and the end of the unified fixed exchange rate regime from 1968 through 1973. The Bretton Woods institutions themselves, notably the International Monetary Fund, which had been the institution overseeing the maintenance of convertibility of gold into the dollar and fixed exchange rates, continued their existence and their forms of operation. The IMF still had the role of providing liquidity, but now generally to those countries that fixed to major currencies rather than to the countries supplying the major currencies. In addition, other important features of the Bretton Woods Agreement—free convertibility of currencies in current transactions, the dollar as a central payment and reserve medium, and the ability to adjust payment imbalances (in a managed float) without deflationary measures (i.e., those features most sought by Keynes in the wartime negotiations)—continued generally unabated.

Since it is one of the best-studied events in international finance, there are numerous impressive descriptions and analyses of the end of Bretton Woods, starting from before the collapse itself. These analyses span many points of view—the informed insider policymaker like Solomon (1982), the practitioner/academic in applied international finance like Triffin (1960, 1966b, 1968, 1978), the institutional historian like de Vries (1976), the academic theorist like Mundell (1971), and the legal-institutional analyst like Dam (1982).

In these pages, I will review the principal events and institutional changes that preceded the collapse and present the salient arguments for the causes of the collapse, documenting the progression of events with some data charts. I will use a graphic presentation of results from the theory of speculative attacks on fixed exchange rates that have emerged in the past decade to serve as a

descriptive aid in explaining the various points of view among policymakers in the debates of the 1960s. The events of the collapse can be silhouetted against the background of the mechanical speculative attack models in which the exchange regime is secondary in importance and in which the authorities simply use the fixed exchange rate mechanism as a source of finance (see Mundell 1971). The issue then is either how far the authority will go in dissipating its foreign exchange reserves before letting go or, alternatively, how long it will receive foreign credit through the cumulation of claims in the hands of a foreign authority.

9.1 Stepping-Stones toward Collapse

In table 9.1, I have listed the principal events and institutional changes leading to the final collapse. The list can be split into several categories. One contains those institutional changes aimed at providing additional liquidity either through credit lines like swaps and the GAB or through the creation of the SDRs, a quasi-credit, quasi-reserve settlement medium. A second category concerns the sequence of events that led to the end of gold convertibility—that is, the termination of gold's usefulness as a liquid dollar claim. The third category encompasses the events that fractured the system of fixed parities. In this section, I will concentrate exclusively on the latter two categories.

9.1.1 The Trouble with the Gold Dollar

Figure 9.1 depicts the private market dollar price of gold in London from 1960 through 1976. The flat line segment through 1968 represents the period of operation of the Gold Pool, a consortium of central banks organized in 1961 to undertake purchases and sales of gold in London to peg the market at the official price.⁴ The United States was to provide 50 percent of the gold, with the remainder coming from seven European central banks. As indicated in the figure, the Gold Pool was successful until March 1968, when it ceased operations after selling \$3 billion of gold since the previous November, with \$400 million of gold sold on 14 March alone. Of this amount, the United States expended \$2.2 billion in gold, and both the U.S. and the U.K. gold stocks declined by 18 percent between September 1967 and March 1968. At this point, the members of the Pool agreed to a two-tiered system for gold—the central banks would buy and sell gold to each other at the official price but would refrain from buying or selling in the private market. The private market price then floated upward, reaching as high as \$42.00 per ounce, but gold sales by South Africa brought the price back to about \$35.00 per ounce by the end of 1969. Thus, the attack on gold did not result in a great discontinuity in the price of gold while seriously depleting the monetary gold stock.

4. For the discussion of the Gold Pool, I lean on Dam (1982, 138–39) and Solomon (1982, 114–19).

Table 9.1 Timetable of Collapse

<i>1958</i>	
Dec.	Fourteen European countries start convertibility of their currencies for current account transactions
<i>1959</i>	
Mar.	The Triffin plan proposed
<i>1961</i>	
Mar.	Basle Agreement among central banks to hold each other's currency and to lend to each other
Oct.	Establishment of the London Gold Pool.
<i>1962</i>	
Jan.–Mar.	Start of persistent French gold purchases from the United States
Feb.	Beginning of the swap facilities to provide reciprocal lines of credit among central banks
Oct.	Beginning of the GAB
<i>1963</i>	
Oct.	Start of technical studies and discussions that would lead to the establishment of the SDR
<i>1965</i>	
Feb.	President de Gaulle and d'Estaing propose a return to the gold standard
<i>1967</i>	
Oct.	End of persistent French gold purchases from the United States
Nov.	The United Kingdom devalues the pound sterling from \$2.80 to \$2.40
<i>1968</i>	
Mar.	Gold Pool interventions end; the two-tiered market for gold begins
May	SDR amendments are sent to IMF members for approval
June	Exchange pressure on the French franc because of internal political crisis
Nov.	Exchange crisis closes markets in France, Germany, and the United Kingdom
<i>1969</i>	
July	SDR amendments are in force
Aug.	The French franc is devalued from .18 grams of gold per franc to .16 grams
Sept.	The deutsche mark floats
Oct.	The deutsche mark is revalued from \$0.25 to \$0.273
<i>1970</i>	
Jan.	First SDR allocation
<i>1971</i>	
Jan.	Second SDR allocation
May	The deutsche mark and the Dutch guilder float
Aug.	The United States suspends convertibility of the dollar into gold for official transactions, suspends the use of swaps, and imposes price controls and a 10 percent import surcharge; all countries with major currencies except France start to float, impose exchange controls, and undertake major interventions to buy dollars

(continued)

Table 9.1 (continued)

Dec.	In the Smithsonian Agreement, the G10 realign currency exchange rates in a revised fixed rate system; the United States agrees to devalue the dollar to \$38.00 per ounce of gold; average devaluation of the dollar against other currencies is 10 percent; dollar convertibility into gold by the United States was not restored, and the U.S. made no commitment to support the dollar
<i>1972</i>	
June	The pound sterling starts to float against the dollar
<i>1973</i>	
Feb.	The dollar devalued to \$42.22 per ounce of gold; all major currencies therefore revalued against the gold dollar by ten percent
Mar.	After massive interventions by foreign exchange authorities, the system of fixed exchange rates collapsed into generalized floating

Sources: de Vries (1976, xviii–xxii, 190–205); Pauls (1990, 891–98).

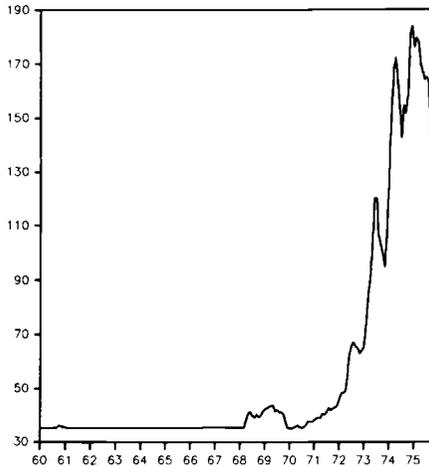


Fig. 9.1 Private market price of gold in dollars (London), 1960–75

The run on gold resulted from speculation about a possible devaluation of the dollar. This was natural in the light of the steady decline in U.S. gold reserves, driven by conversions of dollars to gold by the French starting in 1962 and culminating in 1966. In March 1961, the world and U.S. monetary gold stocks were \$40.6 and \$17.4 billion, respectively. By the end of December 1967, these amounts had reached \$41.6 and \$12 billion, respectively, and the U.S. gold stock fell to a low point of \$10.7 billion at the end of March 1968 (see Board of Governors 1976, 918). When the French gold-purchasing program began in the first quarter of 1962, the U.S. gold stock was \$16.8 billion. Of the \$3.3 billion decline through the third quarter of 1966, \$2.8

billion was purchased directly by France, almost exactly the amount by which the French gold stock increased. In the same period, German gold holdings increased by \$600 million, exactly balancing the decline in the U.K. gold stock, but there were no other major acquisitions of gold by other countries.

These drains drove the United States almost to the limit of its willingness to intervene in the gold markets. Political problems broke out in France shortly after the advent of the two-tiered system, and this provided the opportunity for the United States to buy almost \$1 billion of French gold during the next year. To this extent, gold in the hands of central banks still served as a liquid dollar claim. In the final attacks in 1971, this was about all that the United States was willing to sell back to foreign central banks before it abandoned convertibility.⁵

9.1.2 The Trouble with the Dollar

The period through the advent of the two-tiered gold system was one of slowly increasing short-term dollar liabilities held by foreigners and of decreasing U.S. gold stocks, as predicted by Triffin (1960). Figure 9.2 indicates that liquid dollar liabilities in the hands of foreign official institutions exceeded the U.S. gold stock in the latter half of the 1960s. Figure 9.3 depicts the short-term dollar claims, both official and private bank claims, held abroad in comparison to the U.S. gold stock. These claims were relatively flat until the advent of the two-tiered system. The exception is the United Kingdom in the three-year period leading to the devaluation of the pound sterling in 1967. After the start of the two-tiered system, claimants in the major countries began to accumulate short-term dollar claims. Figure 9.4 indicates that these liquid dollar claims were mainly acquired by foreign banks since official claims did not rise, with the exception of Japan in 1968.

These increases were not the result of funding for U.S. current account operations. Figure 9.5 shows that the U.S. current account did not register a deficit until 1971. This is remarkable given that the United States was seriously engaged in a war from 1965 through 1972 with the peak years of military operations from 1967 to 69.

In figures 9.3 and 9.4, short-term dollar claims began to leap upward dramatically in mid-1970, and these are almost entirely additions to official reserves. Until the end of official gold conversions by the United States in August 1971, there was a continuous and massive selling attack on foreign currencies. Figure 9.6 indicates the extent of official foreign intervention in support of the exchange rates. The interventions in the third quarter of 1971 and the first quarter of 1973 indicate massive speculative attacks on foreign central banks. Germany floated the deutsche mark twice—in October 1969 after an upsurge in official dollar purchases followed by a 10 percent revalua-

5. The United States has sat on a monetary gold stock of about \$11 billion (now evaluated at \$42.22) ever since.

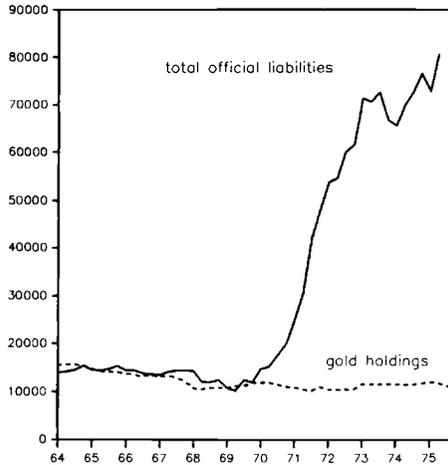


Fig. 9.2 Total official liabilities and gold holdings, quarterly, 1964–75

Source: IMF, *International Financial Statistics*

tion and in May 1971. The realignments under the Smithsonian Agreements did not end the selling attacks—the massive acquisitions of official dollar claims did not cease until generalized floating began in March 1973. Figure 9.7 indicates the extent of the realignments of the various currencies.

In figures 9.8 and 9.9, I include data on some monetary conditions in the United States that drove these events. The charts indicate secularly increasing growth rates that are consistent across the various measures of the money supply, at least through 1974. They also indicate an accelerating U.S. inflation paralleled by inflation rates in the other countries.

9.1.3 The Bank Analogy

Policy efforts and criticisms of U.S. policy during the 1960s centered on the U.S. balance-of-payments deficit, defined as official U.S. gold sales plus foreign accumulations of liquid dollar claims on the United States. Sensitive to the criticisms of the persistent deficits run up under this definition and to the Triffin argument that large accumulations of liquid dollar claims abroad ultimately threatened the system, U.S. policymakers imposed a sequence of current account and especially capital account controls to stem the increase in short-term liabilities.⁶

Notwithstanding the concentration on and the criticism of U.S. balance-of-payments deficits, other voices argued that the cumulation of short-term

6. These included higher taxes on U.S. corporate earnings abroad and capital controls such as an interest equalization tax on foreign borrowing in the United States, an interest equalization tax on long-term U.S. bank loans to foreigners, a limitation of U.S. funding of U.S. banks' foreign operations, and a limitation of funding by U.S. corporations of direct investment abroad.

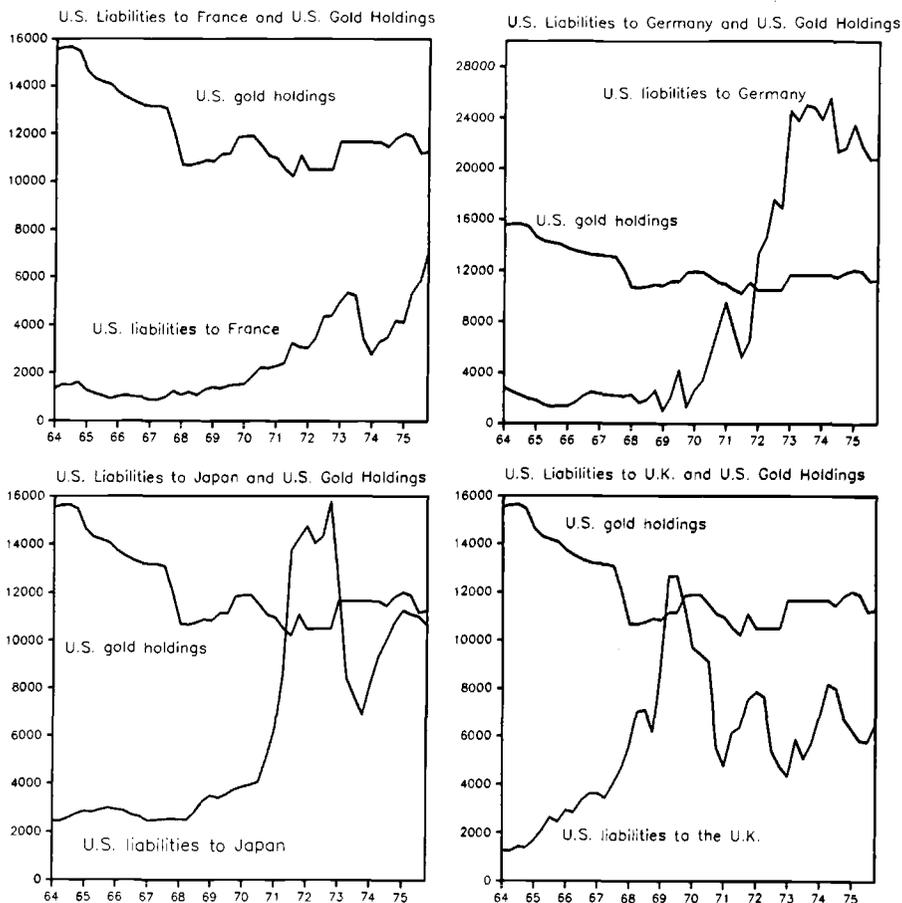


Fig. 9.3 Total official and private liquid dollar claims vs. U.S. gold stock by country, quarterly, 1964–75

Note: U.S. liabilities are short-term liabilities to governments and banks

claims signaled no problem in need of correction, at least in the form of capital controls.⁷ Since the United States consistently booked current account surpluses until 1971, the balance-of-payments deficits entirely indicated the repackaging of assets that is the business of any financial intermediary. Balancing the increases in short-term dollar claims against the United States were increases in long-term, less liquid dollar- or foreign-denominated assets as well as short-term U.S. claims on foreigners. Effectively, the United States, taken as a whole, was operating as a bank to foreigners, providing liquid dol-

7. For the bank analogy, see, e.g., Kindleberger (1965). For a rebuttal, see Triffin (1966a).

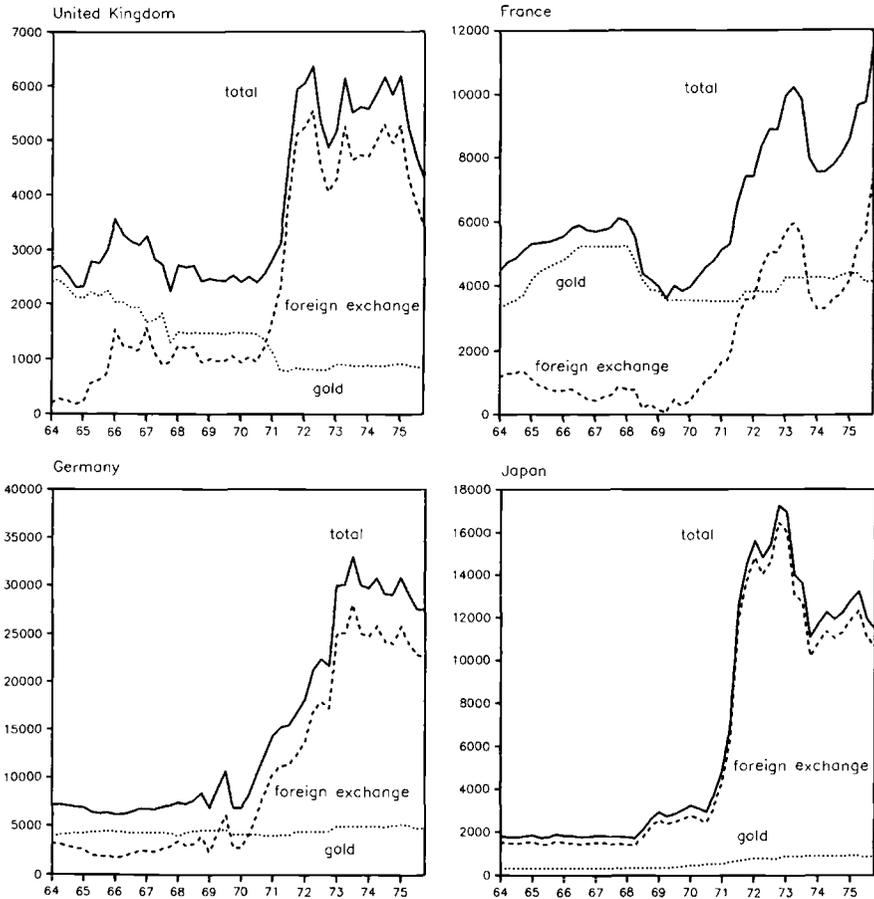


Fig. 9.4 Official reserve composition by country foreign exchange reserves, gold reserves, total reserves

lar liabilities against less liquid assets. Until 1968, it offered general convertibility of its liabilities through a gold reserve and through the interventions of the Gold Pool. Therefore, gold also could be held as an additional dollar claim. Afterward, it offered official convertibility of gold into dollars to the other central banks, so both before and after 1968 the United States was the world's central bank.

9.1.4 Why Would Foreigners Demand Liquid Dollar Claims?

The French criticism of the Bretton Woods system was that it gave the United States a great advantage as a central bank and did not force any corrective measures when foreigners acquired its liquid liabilities or gold (see Rueff

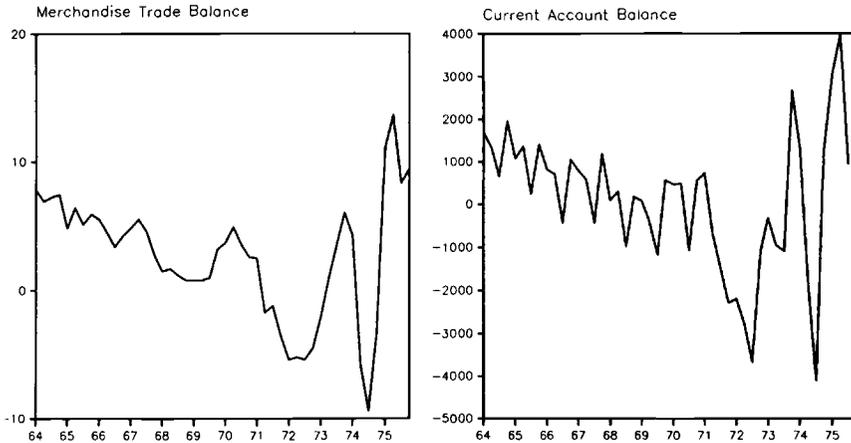


Fig. 9.5 U.S. current account and merchandise trade balance
 Source: IMF, *International Financial Statistics*

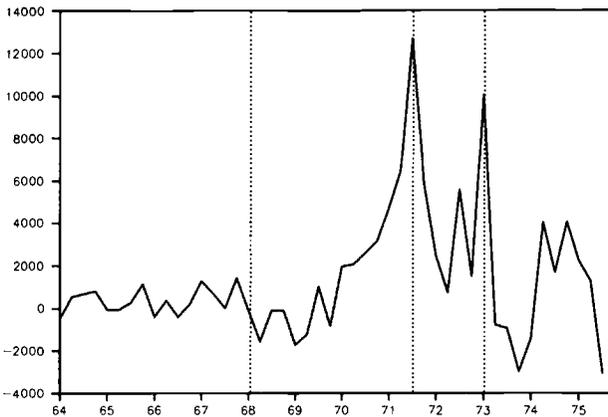


Fig. 9.6 Changes in U.S. official reserves (net): Gold sales + foreign exchange sales + increases in foreign official liabilities

and Hirsch 1965, 2-3; and Solomon 1982, 55). As a result, foreign assets were being bought cheaply.

The dollar was and still is the most liquid currency.⁸ It encompassed a huge market and consisted of extensive, liquid money and financial markets ser-

8. A liquid payments system is one in which a large number of transactions can be settled with only a small transfer of good funds. Thus, a good measure of liquidity is the ratio of payments transactions to interbank reserve borrowings. For example, in the domestic market, this would currently be the ratio of domestic payments to Feds funds purchased, a ratio that is quite high relative to the less liquid Eurodollar market and to other currencies.

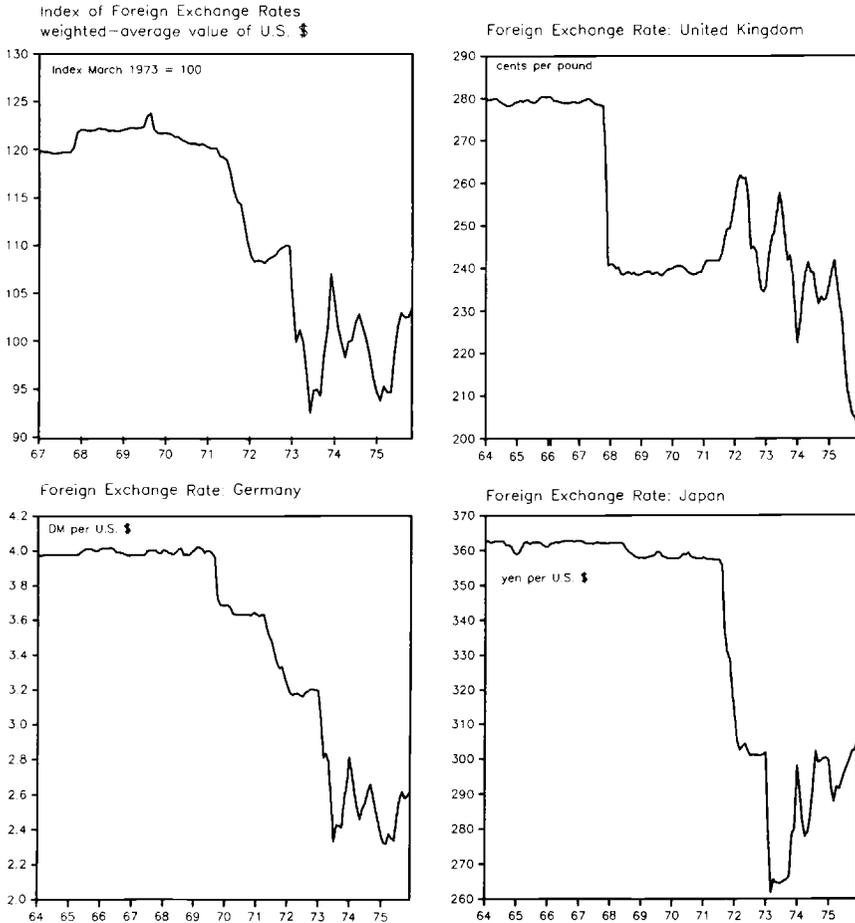


Fig. 9.7 Exchange rates: Dollar vs. various currencies

vicied by a central bank rooted in the obligation to provide liquidity to the financial system in the British tradition. Other major countries, notably Germany and Japan, severely restricted their money markets to force wide spreads on their protected banking systems. This made their banks uncompetitive in the provision of wholesale liquidity to international markets and added to the advantages that the dollar possessed as the international unit since its liquidity was more lightly taxed. Of course, other countries could have competed in fostering their currencies as the world's payment medium, but they apparently preferred to aid local financial monopolies and to maintain financial control by taxing liquidity in their currencies.

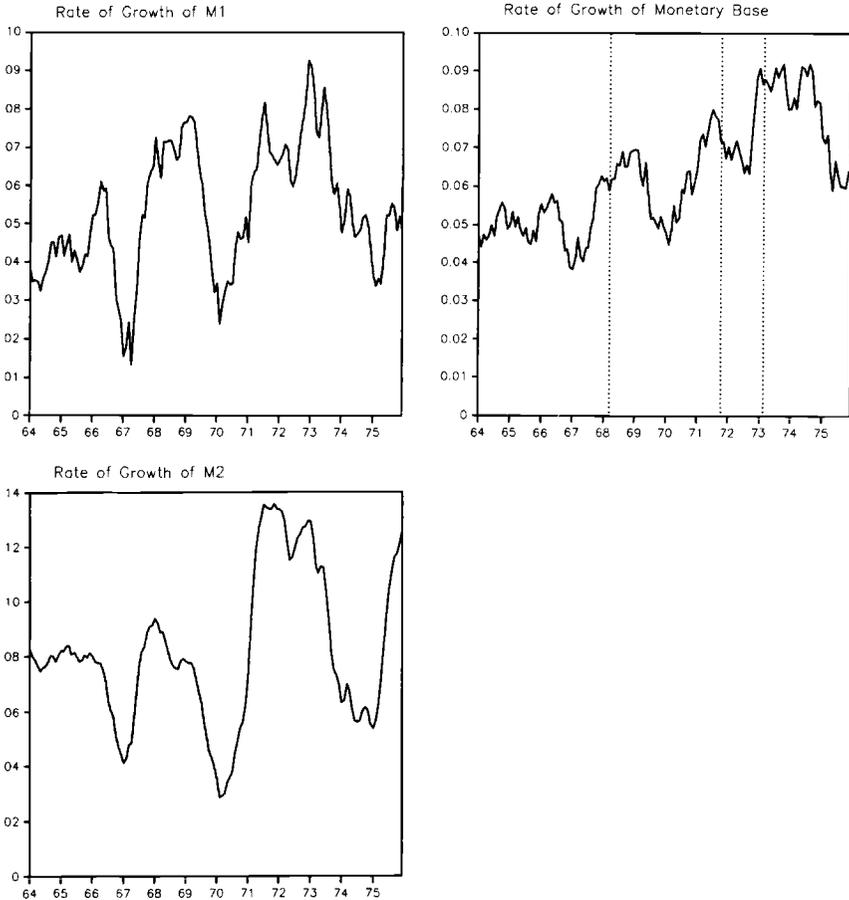


Fig. 9.8 U.S. monetary stock growth rates

9.1.5 The Cost to Foreigners of Holding Liquid Dollar Claims

There need be no inherent problem with a fiat monetary system with one country's central bank providing the liquid funds. Through the Federal Reserve or other instrumentalities, the United States provided liquidity through a thick grid of lines of credit to other central banks. The dollar reserves held by the foreign monetary authorities as the ultimate source of liquidity were primarily bank liabilities and money market instruments earning a competitive rate. Foreign central banks therefore did not lose seigniorage on these funds or pay an inflation tax (as in Mundell 1971, chap. 16). Rather, they gave up seigniorage to the United States only to the extent of the same liquidity premium that the price of all money market instruments and deposits in the

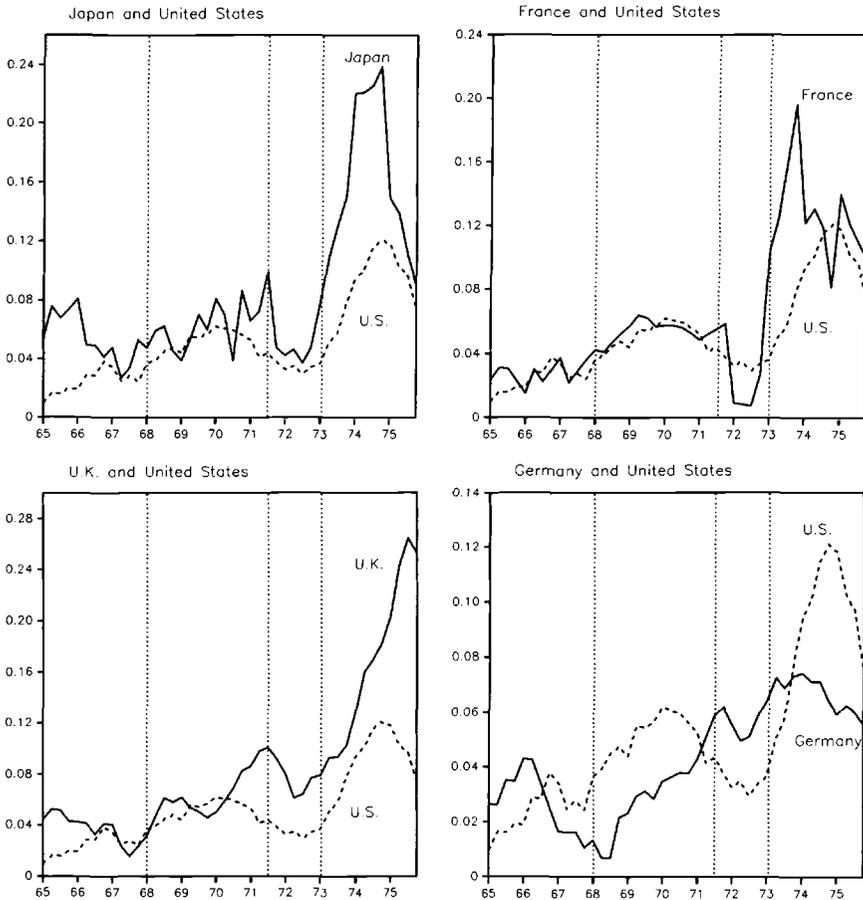


Fig. 9.9 Consumer inflation rates in various countries, quarterly, 1964–75

Source: For the United States, data are from the consumer price index. For all other countries, data are from the IMF, *International Financial Statistics*.

United States bore—that is, the prorated cost of the zero-interest-bearing reserve deposits held at the Federal Reserve by the U.S. banking system.

In an inflationary environment, however, the associated rise in the Fed funds rate raises the cost of liquidity if the U.S. banking system cannot proportionally reduce its reserve holdings because the cost to the banking system of reserve holdings rises. In this case, the spread between liquid and illiquid securities rises, and holding liquid dollar securities is more costly in terms of yield forgone. Since dollar liquidity is more costly, U.S. holders and official and private foreign holders of liquid dollar securities will reduce their real holdings by switching to less liquid alternatives.

The fixed rate Bretton Woods system was designed to make all currencies

liquid in terms of the dollar as the unit of account. To provide this liquidity, local central banks guaranteed the market price of their currencies in the de facto world unit of account at par by making the market in dollars at fixed rates. Providing such liquidity required liquid dollar funds or credit lines, so the United States was automatically the source of liquidity to the other central banks. Although gold was officially the ultimate settlement mechanism for the United States, dollars were the ultimate settlement medium for the rest of the world; but the official status of gold made it also useful to other countries as a liquid claim. The inflation of the dollar led to the abandonment of the fixed exchange rate system, as foreign central banks found that they were taking excessive dollar positions in providing their liquidity services, but not to the abandonment of the dollar as the ultimate unit of account and source of world liquidity.

9.2 A Graphic Interpretation of the Issues of the Debate

In this section, I will graphically depict the conceptual system that framed the discussions about the progress of the Bretton Woods system toward collapse.⁹

The stages in the disintegration of the Bretton Woods exchange rate system can be described graphically as in figure 9.10. The vertical axis is the price of gold in terms of a basket of goods. P_g is \$35.00 per ounce, and P is the price level. The total world stock in ounces of gold is represented by the length of the horizontal axis from O to B .

The private demand for gold is negatively related to the relative price of gold. The curve labeled D is the demand for gold used for industrial purposes. At first, I will assume that the demand for gold is static; I will change this later to an assumption that the private demand for gold grows with real income. If the relative price of gold is expected to grow less rapidly than the real interest rate, speculative hoards of gold will not be held.

Alternatively, gold can be held as a liquid dollar claim, generally by governments. The interpretations of the events leading up to the 1968 collapse rest on a presumption that there was a well-defined world demand for real liquid dollar-denominated claims (the sum of monetary gold, short-term bank liabilities, Treasury bills, etc.—items convertible instantly into good funds) that depended positively on the level of world real economic activity. In a fixed exchange rate system with gold and other currencies convertible into the dollar, gold and other liquid dollar claims satisfied this demand.¹⁰ In December 1965, the world monetary gold reserve—that is, the official stock readily

9. The model that I use is a graphic version of a gold standard model in Barsky and Summers (1988). Similar models can be found in Flood and Garber (1984) and in Barro (1979).

10. Liquid claims in other currencies like sterling also satisfied part of this demand, but I will ignore them for simplicity.

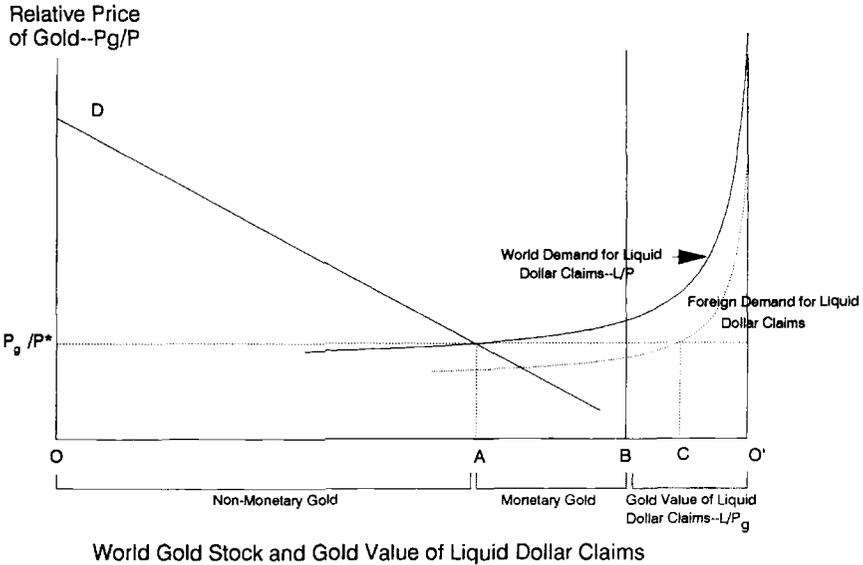


Fig. 9.10 Equilibrium price level in a dollar standard with gold convertibility

convertible to dollars—was about 1.23 billion ounces; this fell to 1.15 billion ounces by March 1968 after the run on the Gold Pool.

Equilibrium pairs of the gold value of world liquid dollar claims and the relative price of gold are depicted by the curve labeled L/P , where L is the nominal value of liquid dollar claims.¹¹ For this curve, the origin is labeled O' . On the horizontal axis to the left of the origin O' to B , I plot the gold value of liquid dollar claims L/P_g . The demand for real liquid claims depends positively on real world income, but for now I will assume that real income is fixed. The demand for real liquid claims is then constant so that the product $L/P = L/P_g \times P_g/P$ remains unchanged, a relation depicted by the hyperbola in the figure. Any point on the hyperbola represents the same ratio of nominal liquid dollar claims to the price level. The dashed line hyperbola represents the real value of foreign liquid dollar claims and monetary gold, which total $O'C$ in the diagram. The split of foreign demand between monetary gold and liquid dollar claims is indeterminate in this model.

The equilibrium world price level P^* is such that the relative price P_g/P^* clears the gold market—the total stock of gold is then equal to the amount demanded for industrial purposes OA and the amount used for monetary re-

11. I have assumed that gold- and dollar-denominated liquid claims are perfect substitutes in satisfying the demand for dollar liquidity. If there is confidence in the system, however, dollar claims will be preferred because they bear a market interest rate while gold does not. That gold is held indicates a belief that there may be a capital gain from gold.

serves AB . At the price level P^* , the gold value of world liquid dollar securities supply plus world monetary gold AB satisfies the world demand for liquid dollar claims.

9.2.1 Expanding Demand for Reserves

Suppose now that world real income increases. This will shift the position of the parabola representing demand for liquid claims outward, as in figure 9.11 to the curve labeled $[L/P]'$. In the absence of an increase in the supply of world liquid dollar claims, the new equilibrium price level will be lower at P^{**} , raising the relative price of gold to P_g/P^{**} and driving additional gold into monetary reserves to meet the demand. Since deflation has been anathema since the 1930s, a policy precluding the creation of additional liquid dollar claims was not acceptable. The problem of how to prevent deflation in the face of increased demands for liquid dollar claims was labeled the *liquidity problem*.

As one solution to the liquidity problem, the United States could expand short-term dollar claims, part of which would be acquired either by foreign central banks or by other foreign claimants, assuming that part of the shift in demand comes from foreign income growth. This would increase the total of foreign liquid claims against the United States and require the United States to sustain a deficit on its balance of payments. In the context of the early 1960s, with the United States in surplus on current account, a deficit on the balance of payments required the United States to accumulate longer-term claims against foreigners, financed partly by the acquisition of short-term claims against the United States by foreign exchange authorities or other foreign entities. In figure 9.12, expansion of liquid dollar claims would move rightward the origin O' for the demand curve for liquid dollar claims to O'' . A sufficient increase in liquid dollar claims would then maintain a stable price level at the original P^* when there is an increase in demand for liquid claims. If this process continues, the ratio of monetary gold to liquid dollar claims and to foreign holdings of dollar exchange will constantly decline. Nevertheless, as long as there is confidence in the stability of the price level, there is no reason to attack the system.¹²

In this context, the United States contended that it had a balance-of-payments deficit because foreigners demanded liquid dollar claims rather than because of mismanaged macroeconomic policy or some fundamental disequilibrium in exchange rates. If the United States took steps to eliminate the deficit, it would generate deflation.

12. For an exposition of this result in a dynamic context, see Flood and Garber (1984). Any reserve ratio is consistent with the preservation of the system. Indeed, the ratio can monotonically decline toward zero without a collapse as long as the monetary expansion is consistent with a stable price level.

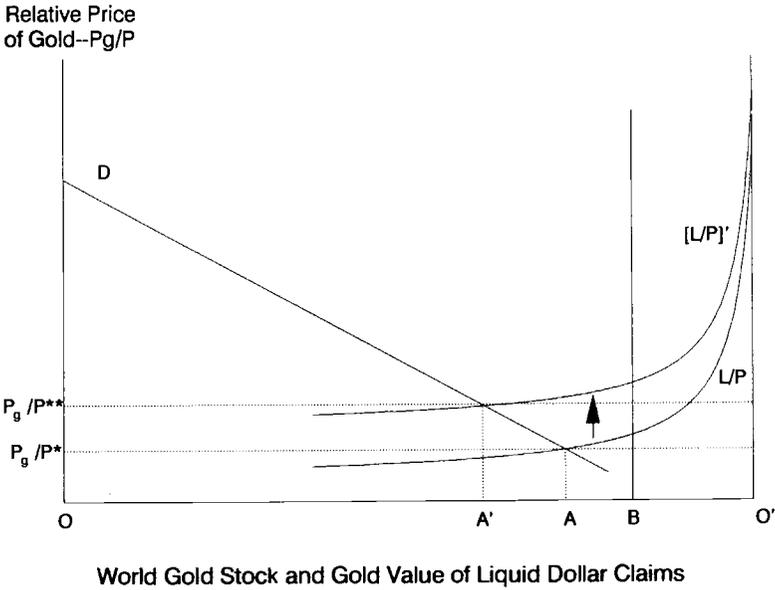


Fig. 9.11 A deflation with an increased demand for liquid dollar claims

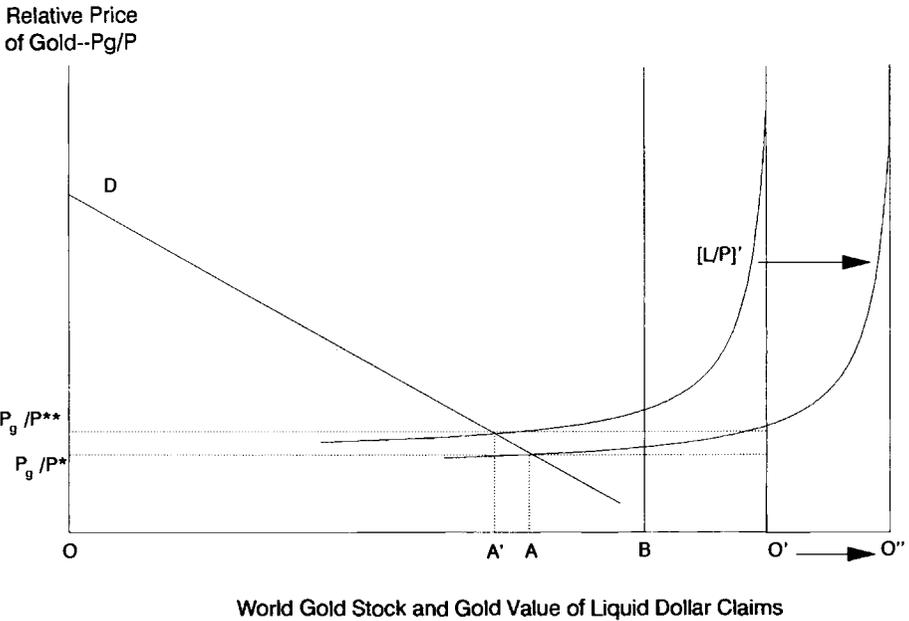


Fig. 9.12 An expansion in liquid dollar claims stabilizes the price level

9.2.2 The Addition of Further Dollar Claims: SDRs

The addition of an internationally acceptable reserve unit fixed to the gold value of the dollar, the SDR, is essentially an increase in liquid dollar claims and would cause movements in O' like those described in figure 9.12. Ideally, the amount of SDRs would have increased to meet the foreign demand for liquid dollar claims and would have obviated the need for the United States to operate with the payments deficits required to supply foreign demands. Alternatively, the SDR supply might have been in addition to the supply of liquid dollar claims and would have exacerbated the inflationary tendency inherent in the system.¹³

9.2.3 A Collapse of Gold Convertibility

Two different stories can explain the collapse of the system of gold convertibility with the dollar. First, in the context of figure 9.12, gold convertibility will eventually end in the presence of liquid dollar claim expansions beyond the amounts required to match increases in the demand for liquid claims with price level stability. In figure 9.12, such expansions are depicted as rightward movements in the origin O' . For a while, such movements increase the price level, although gold convertibility can be maintained. At some point, official gold reserves are exhausted, and the convertibility between liquid dollar claims and gold must be abandoned. Gold then ceases to serve as a form of liquid dollar claim. In figure 9.13, I have represented this event by the curves through the point E where all gold is held in private uses. Of course, official intervention may end earlier at some positive level of official gold reserves.

The dynamics of events at the time of the end of a fixed exchange rate regime have been studied in a series of papers starting with Krugman (1979). Flood and Garber (1984) studied the dynamics of the collapse of a gold standard struck with a sudden internal drain. In the context of this literature, figure 9.13 must be altered somewhat to assure continuity of prices and eliminate unusual expected speculative profits at the time of the collapse.

In figure 9.14, I depict a situation in which a marginal increment in liquid dollar claims (the movement of the origin from O' to O'') collapses the gold standard through a simultaneous downward shift in demand for liquid claims and upward shift in the demand for private gold. The guiding principle of the speculative attack literature is that the shifts in these demands will be timed correctly and be of the correct magnitude to preclude a foreseeable relative price jump in gold and a price level discontinuity.

What drives these shifts? In the case of the private demand for gold, speculators may bet on a future devaluation of gold after a period of floating, with

13. Of course, by the time the SDR was implemented with the first allocation in 1970, the connection between the official and the private gold markets had been severed. Nevertheless, if the extensive discussion about the creation of an SDR signaled a future increase in the rate of creation of liquid claims reserves, it may have advanced the date of a speculative attack on monetary gold by increasing the postattack anticipated rate of liquid dollar creation.

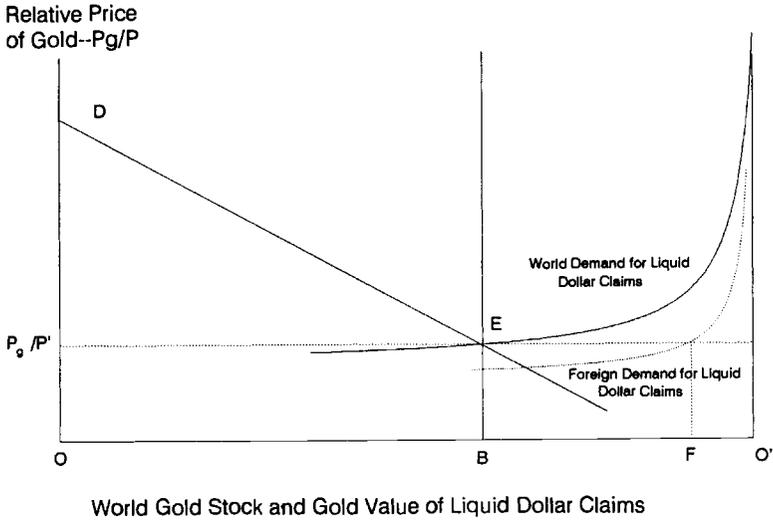


Fig. 9.13 Official gold reserves run out

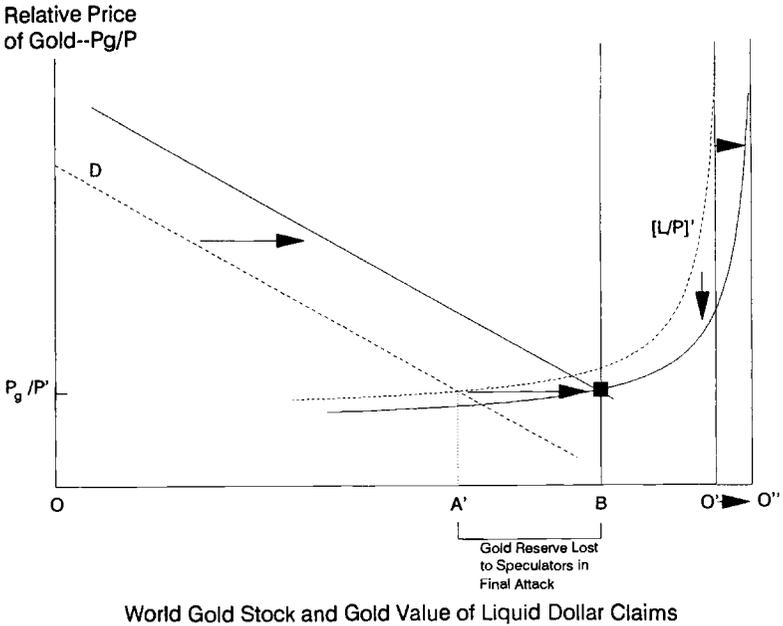


Fig. 9.14 Collapse of dollar convertibility of gold

gold eventually convertible to dollars once again. Suddenly, then, they expect the real price of gold to shift from a depreciation to a steady appreciation, making it profitable for them to hoard gold. As in Obstfeld (1984), this shift in return will cause speculators to run the gold in official reserves.¹⁴

The shift downward in demand for liquid claims is more problematic. In standard speculative attack models, the analogue of this demand is a demand for a currency paying zero interest. A collapse of a scheme to fix the foreign currency value of the currency in the presence of steady increases in the currency suddenly shifts up the expected inflation rate and the nominal interest rate and discontinuously shifts down the demand for real currency. Currency is the most liquid claim in these models, so the public accepts a zero interest rate to use it. When the yields on less liquid claims rise because of the jump in inflation, however, demand shifts away from the more liquid to the less liquid claims. Alternatively stated, the spread between liquid and less liquid claims increases. In the present case, liquid dollar claims are wholesale liquid bank deposits or short-term securities whose market yields also jump up with nominal interest rates. Nevertheless, the shift down in real demand for liquid dollar claims emerges from the same upward shift in the spread between liquid and illiquid assets that will occur when the inflation rate shifts upward after the collapse.¹⁵ The increased spread reduces the demand for liquidity.

The second force that can cause a collapse of convertibility of gold into the dollar has nothing to do with monetary mismanagement. Rather, it is the potential for a continuing imbalance between growing private demand for gold and new gold supplies generally classified as “the vagaries of the gold standard.” Suppose now that the private demand for gold depends positively on the level of income. In figure 9.11, an increase in income will now shift both curves upward and be even more deflationary. A policy to increase liquid dollar claims to prevent deflation—that is, to fix the relative price of gold—will now require an even larger expansion than that in figure 9.12. Nevertheless, the convertibility of gold into dollars can be continued for a while as the two curves shift upward continually with real income growth.

Eventually, all the monetary gold will move into industrial uses, and the relative price of gold will begin to rise with the demand. But will the gold stocks run out smoothly or be suddenly attacked? The answer lies in Salant and Henderson (1978), who show that speculators will attack the remaining gold stock at exactly the moment that they expect to earn the real rate of return on the appreciation of the relative price of gold while not generating a discontinuity in the relative price. At that moment, the demand curve (industrial plus speculative demand) shifts discontinuously upward as in figure 9.14. The

14. For the operation of this concept in various gold standard and exchange rate models, see also Obstfeld (1986), Buitert (1987), Grilli (1990), Krugman and Rotemberg (1990), and Buitert and Grilli (1989).

15. For a full discussion about why the spread between liquid and less liquid claims rises, see Garber and Weisbrod (1992).

speculators will then gradually sell their hoard to satisfy the growing demands for gold. The monetary gold stock evaporates. Simultaneously, however, the policy to stabilize the price level causes a discontinuous increase in liquid dollar claims to offset the loss of gold reserves, shifting the origin O' rightward as in figure 9.14. Thus, the uncontrollability of the private demand for and the supply of gold, linked to an antideflationary policy, eventually eliminates gold from the list of liquid dollar claims.

9.2.4 Devaluation

The steady rise in liquid dollar claims in the face of constant or diminishing U.S. official gold holding framed the notion of the *confidence problem*. It was thought that a small gold cover might inevitably generate a run on gold. The *liquidity problem* was then only one of the horns of the Triffin dilemma—its solution might lead to a run on the system (see Triffin 1978, 2).

Alternatively, in the presence of expanded demand for reserves, the dollar could have been devalued, as the French wanted, an action that would have been taken under a gold exchange standard under extreme duress.¹⁶ In figure 9.11, the demand for real liquid dollar claims has shifted upward to $[L/P]'$, potentially leading to a deflation—that is, to a fall in the price level from P^* to P^{**} . In figure 9.15, I depict the effect of a sudden devaluation in the face of this demand shift. A devaluation of proper magnitude would raise P_g to P'_g without a change in the price level from P^* and reduce the gold value of liquid dollar claims, thereby shifting the origin O' leftward to O'' . The rise in the gold price, however, raises the relative price of gold and pushes gold from private uses into monetary reserves, increasing monetary reserves by $A''A'$. A devaluation of sufficient magnitude can maintain a stable price level even though the gold value of liquid dollar claims is reduced. The fraction of gold to liquid dollar claims increases.¹⁷

9.2.5 The Revelation of the Dollar Standard

The collapse of the dollar convertibility of gold exposed the monetary system as a dollar standard with foreign central banks responsible for maintaining fixed exchange rates. While the United States would still sell gold in official transactions, little gold was actually sold by the United States on net after 1968; and the promise crumbled when it was tested in 1971.

Thus, we move from the problem of a speculative attack on a gold standard to the more straightforward problem of a speculative attack on a fixed exchange rate system. A fixed exchange rate system might be quite stable, of course, provided that the authorities give high priority to its maintenance.

16. See Rueff and Hirsch (1965, 5–6). Solomon (1982, 55–57) describes internal French debates on the desirability of devaluation.

17. A devaluation would reward those countries that held mostly gold for their official reserves by increasing the relative price of gold.

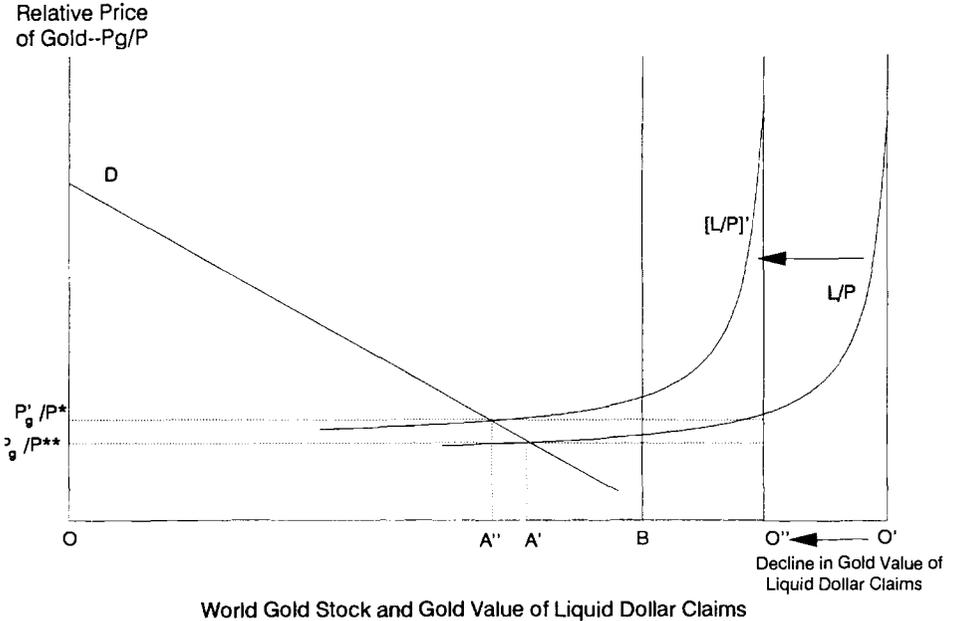


Fig. 9.15 A dollar devaluation maintains the price level

Given the amounts of dollar claims that other countries absorbed in their official reserves in the two attacks on the system in 1971 and 1973, foreign monetary authorities obviously attached great value to the preservation of the system. Nevertheless, there was a limit to how much they would absorb.

Given this limit and the increases in the growth rate of U.S. domestic credit indicated in figure 9.8, it was inevitable that eventually there would be a speculative selling attack on foreign currencies.¹⁸ After the first attack in the third quarter of 1971, the growth rate of the U.S. money stock receded. Within a year after the Smithsonian realignments, the growth rate jumped yet again, triggering the selling attack that finally ended the system in March 1973.

9.3 Conclusion

By the early 1960s, analysts had pinpointed structural problems in the Bretton Woods system. One of these—the attempt to place a ceiling on the relative price of gold—indeed had the potential to terminate the convertibility of gold into the dollar at official rates in private markets. This potential problem would bind if private demand for gold grew faster than new supply, the classic

18. Grilli (1986) provides the technical framework to determine the timing and magnitude of a selling attack.

problem of internal drain of a gold standard. In the event, however, it was ironically the French passion for gold that evicted gold from the monetary system. Nevertheless, the strongly and correctly perceived conclusion that liquid dollar claims held by foreigners relative to monetary gold would inevitably grow did not prove to be the deal breaker for the fixed exchange rate system. After 1968, the system was, as it was before 1968, fundamentally a dollar standard, with little chance that foreign official claimants would ever get their hands on the remaining U.S. gold stock. Yet foreign monetary authorities valued the system to the extent of absorbing up to \$70 billion in dollar claims, most of which was subject to exchange risk, to defend it. They had to go to these lengths because the inflationary policy of the U.S. administration made a speculative attack inevitable. If the administration had been committed to less inflationary monetary policies, the basic Bretton Woods system would have remained intact. In the end, Bretton Woods succumbed to the very policies that the Europeans had unjustifiably attributed to the United States in the mid-1960s.

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Comment Willem H. Buiter

I enjoyed this paper very much. It blends historical narrative and informal but informed tests of the theoretical models of speculative attacks on fixed exchange rate regimes. Garber has of course made important contributions to this literature, which was initiated by Salant and Henderson (1978) and by Krugman (1979). His joint work with Bob Flood (Flood and Garber 1983, 1984a, 1984b, 1989), together with the original contribution by Krugman (1979), Obstfeld's analysis of the possibility of multiple equilibria (Obstfeld 1986), and the elegant resolution of the "gold standard paradox" by Krugman and Rotemberg (1990), greatly advanced our theoretical understanding of the nature and causes of rational speculative attacks.

From a technical point of view, any commodity-based monetary standard, whether domestic or international, is a limiting case of a commodity price

stabilization scheme. The same holds, subject to one important qualification, for any fixed (or, indeed, any managed) exchange rate regime. Thus, the pre-World War I gold standard, the interwar gold exchange standard, the Bretton Woods gold-dollar standard, and its successor the dollar-U.S. monetary restraint standard can all be studied as examples of commodity price stabilization or buffer stock schemes.

An ideal-type two-sided commodity stabilization scheme consists of an intervention authority (or a set of intervention authorities, acting anywhere on the spectrum from cooperatively to noncooperatively) that aims to keep the price of the commodity between preannounced upper and lower limits, p^U and p^L , respectively. The instrument is interventions by the authority whenever the price threatens to rise above the upper limit or to fall below the lower limit. The simplest case is where interventions occur at the two margins or boundaries only. Inframarginal interventions modify the analysis somewhat but, for our purposes, not in essential ways. Let X denote the excess demand for the commodity, excluding any sales or purchases by the authority; X^A denotes the excess demand (net purchases, which can of course be negative) by the authority. With interventions at the boundaries only, the authority stands ready to act as a residual buyer of the commodity whenever (a) $p = p^L$, (b) there is excess supply of the commodity ($X < 0$) at the lower intervention price, and (c) its reserves S^A (its buffer stock of the commodity) do not exceed some upper threshold \bar{S}^A . Similarly, the authority stands ready to act as the residual seller of the commodity whenever (a) $p = p^U$, (b) there is excess demand for the commodity ($X > 0$) at the upper intervention price, and (c) its stock of reserves S^A does not fall below some lower threshold \underline{S}^A . Schematically, for as long as the stabilization scheme survives (i.e., for as long as $\underline{S}^A \leq S^A \leq \bar{S}^A$), equation (1) is in effect:

$$(1) \quad \begin{aligned} X^A &= 0, & p^L < p < p^U, \\ X^A &= \max[0, -X], & p = p^L, \\ X^A &= \min[0, -X], & p = p^U. \end{aligned}$$

The gold standard, the gold exchange standard, the gold-dollar standard, and more recent fixed exchange rate systems are examples of commodity price stabilization schemes for which the upper and lower support prices are very close together. Formal analysis is indeed often simplified by looking at the limiting case where $p^U = p^L$ and $X = -X^A$ as long as $\underline{S}^A \leq S^A \leq \bar{S}^A$. Target zones systems such as the exchange rate arrangements of the European Monetary System (EMS) are examples of commodity price stabilization schemes with a wider band between floor and ceiling prices.

Ignoring physical depreciation of the commodity, the behavior of the buffer stock is governed by

$$(2) \quad S_{t+1}^A = S_t^A + X_t^A.$$

What determines these upper and lower thresholds for the stock of reserves? First, when gold is the intervention and buffer stock commodity, there is a self-evident lower limit below which the holdings of gold by the authority cannot fall. For a solvent authority capable of credible commitments and facing international financial markets characterized by perfect capital mobility, this lower limit is given by its ability to borrow gold. With solvency, credibility, and perfect capital mobility, that limit is the entire stock of gold in the system. Without solvency, credibility, or perfect capital mobility (the last of these will of course not be independent of the first two), the lower limit \underline{S}^A could be zero, some positive number, or, if the authority has limited borrowing powers, some negative number. In a system with fiat or fiduciary reserves, a key issue for the viability of the stabilization scheme is what determines the limits on the ability of the authority to borrow reserves.

Elsewhere (Buiter 1986, 1987, 1989) I have argued that, for a government that is solvent and capable of making credible binding commitments, there should be no bound on the ability to borrow reserves. Given credibility (or willingness to pay when there is ability to pay), a reserve crisis is therefore always a fiscal or solvency crisis in disguise. For there to be a reserve crisis that is not also a solvency crisis, there must be doubt about the credibility of a government's commitment not to repudiate (formally or de facto, i.e., through a devaluation or fiscal sleight of hand) the liabilities that it would incur in exchange for an increase in borrowed reserves (as with a swap). In what follows, I maintain the assumption that there is some finite lower bound on the stock of reserves.

The upper limit \bar{S}^A on the amount of the commodity that the authority can hold may reflect limits to physical storage capacity in the case of a physical commodity (witness the butter mountains and wine lakes of the common agricultural policy [CAP] of the European Community). Alternatively (or in addition), there is likely to be a financial opportunity cost to holding the commodity. In the case of gold and a strict gold standard with $p^U = p^L$ (give or take a couple of gold points), non-interest-bearing gold is rate-of-return dominated by riskless assets denominated in the currencies of the participating gold standard countries as long as these assets have positive nominal returns. Only the possibility of one or more participating countries going off the gold standard could cause gold not to be dominated as a store of value by fixed nominal market value, positive nominal interest rate assets denominated in any participating currency. Even then, gold would be dominated as a store of value by fixed nominal market value, positive nominal interest rate assets denominated in the currency of any continuing gold standard participant. By adversely affecting solvency, positive financial opportunity costs would provide an upper limit on the size of official buffer stocks (again witness the butter mountains and wine lakes of the CAP).

As long as the official buffer stock remains within its upper and lower limits

($S^A \leq S^A \leq \bar{S}^A$), the intervention rule given in (1) applies. When either limit is breached, the commodity price stabilization scheme collapses. The literature on collapsing fixed exchange rate regimes is full of alternative successor arrangements. The simplest scheme assumes that intervention ceases forever: a free float of indefinite duration commences. Formally,

$$\text{If } S_t^A \leq \underline{S}^A \text{ or } S_t^A \geq \bar{S}^A, \text{ then } X_{t+i}^A \equiv 0 \text{ for all } i \geq 0.$$

Richer, more interesting, and more realistic postcollapse scenarios can and have been thought of and analyzed. Krugman and Rotemberg (1990) analyze a continuous time version of the model sketched here with an interesting twist on the postcollapse scenario. Collapse and the abandonment of intervention that it entails are not forever. Consider the case where the price breaches the upper bound p^u because reserves have fallen below \underline{S}^A . Intervention ceases as long as p remains above p^l . If and when the price again comes down and enters the old target zone, the authority stands ready to resume purchases of the commodity when it reaches the lower bound p^l of the reinvigorated target zone. The likelihood and timing of a collapse (and the magnitude of the speculative attack that triggers the collapse) will of course be functions of the (expected) postcollapse behavior of the authority.

The excess demand for the commodity can be written as follows:

$$(3) \quad X_t \equiv S_{t+1} + C_t - (Q_t + S_t),$$

where S_t is the stock held at the beginning of t , excluding the holdings of the authority; C_t is consumption demand for the commodity; and Q_t is the current production of the commodity. Consider the following simple model of demand and supply found in Muth (1961):

$$(4) \quad C_t = -\beta p_t + u_t^c, \quad \beta > 0,$$

$$(5) \quad Q_t = \gamma p_t + u_t^q, \quad \gamma > 0,$$

$$(6) \quad I_t \equiv S_{t+1} - S_t = \alpha(p_{t+1}^e - p_t) + u_t^i, \quad \alpha > 0.$$

All influences on consumption, investment, and inventory demand other than those operating through current and anticipated future prices are lumped together in the three random disturbances u^c , u^q , and u^i , which for simplicity can be taken to be zero mean i.i.d. random variates. No special attention is paid, for reasons of space, to the fact that gold is an extractive commodity with its own peculiar production technology. In the case of the gold exchange standard, inventory demand would include purchases and sales by monetary authorities other than those of the United States: Jacques Rueff and Charles de Gaulle are buried in u^i .

The historical record of commodity stabilization schemes is one of uniform failure and unmitigated disaster. The gold standard was probably the most successful commodity stabilization scheme ever, and even it bit the dust.

There are good theoretical reasons for the failure of buffer stock schemes,

all of which can be found in the classic paper by Townsend (1977) (see also Salant and Henderson 1978; Salant 1983; and Buitier 1989). For a wide class of exogenous stochastic processes (u^l , u^c and u^o in our baby model) driving the fundamentals, and for a wide class of postcollapse scenarios, the commodity stabilization scheme will *with certainty* (almost surely, for those who crave precision) fail *in finite time*. Boldly put, commodity stabilization schemes are bound to fail. Therefore, the gold standard, the gold exchange standard, and the gold-dollar standard were bound to fail, and, indeed, any fixed exchange rate scheme short of full monetary unification is bound to fail.

This pessimistic conclusion emerges in the absence of speculative bubbles and with rational expectations by all market participants engaged in intertemporal speculation (those whose behavior is governed by the inventory accumulation function given in eq. [6]). It does not require the perverse behavior of French or other politicians with memories and delusions of imperial grandeur. The proposition is driven by the same laws of probability that cause a gambler's ruin: any finite stock of reserves will eventually be exhausted by the cumulative effect of even small exogenous shocks to the nonspeculative components of demand (u^c and/or u^o ; we do not need u^l). Similarly, any finite upper reserve threshold will eventually be exceeded.

The only way out of this box is for the authority to control directly, or to offset directly, the nonspeculative sources of demand (consumption and production) and the speculative demands by noise traders. Strictly enforced production and consumption quotas, or some similar mechanism, are required. Killing off all private inventory demand or speculative demand, even if feasible, would not do the job. Rational speculation will merely bring forward the date of the collapse through a speculative attack that depletes the remaining stock of reserves or causes reserves to burst through the ceiling. Even without the help of rational speculators, a "natural" collapse will eventually occur through the cumulative effect of exogenous production and consumption shocks.

Nobody should therefore be surprised at the collapse of the Bretton Woods gold-dollar standard, of the earlier versions of the gold standard and gold exchange standard, and of subsequent fixed exchange rate schemes (other than those that lead reasonably swiftly to monetary unification).

What may be surprising is that any nation or group of nations whose monetary and financial leadership had the unique opportunity in 1944 of consciously designing an international monetary system from scratch would mortgage its monetary and fiscal policies to the frivolous irrelevancy of the running and survival of a two-tiered commodity price stabilization scheme, in which the non-U.S. participants fixed the dollar prices of their own currencies using dollar reserves (and to a lesser extent gold reserves) as buffer stocks and the United States fixed the dollar price of gold using gold as a buffer stock. Even if the conclusions and reasoning of Townsend's (1977) article were not rationally anticipated by our forebears, it seems an extraordinary institutional

arrangement. Lest I be accused of ahistorical philistinism, I am happy to grant that the hysteretic hand of history can explain the survival of many quaint customs, habits, folk ways, myths, institutions, and modes of behavior. Bretton Woods, however, is part of the modern era, and it is hard to understand why, given the immediately preceding major historical discontinuities in most dimensions of social, political, and economic life, the international monetary standard continued to be tied to a not very interesting metal. The only explanation that I can think of is that the central bankers and international financial officials involved in setting up the Bretton Woods system were then (as now) among the world's more conservative and less imaginative denizens. They grasped instinctively for a system with which they were familiar, that was not directly and obviously associated with the economic disasters of the interwar period, and that had survived for a considerable period of time. This inertia smothered the more rational designs offered by Keynes and others.

Garber argues, quite convincingly, that the key forces driving the collapse of Bretton Woods and the attempts to forestall it can be conveniently captured by the speculative attack framework, that is, by something like the little model given above. Most of the defensive measures took the form of attempts to lower \bar{S}^A or to control those components of inventory accumulation or speculative behavior representing the behavior of the foreign monetary authorities. After 1972, or, as Garber argues convincingly, after 1968, the gold-dollar standard, with the United States as the manager of the gold buffer stock and the rest of the participants managing their dollar buffer stocks, was replaced de facto by a fixed exchange rate regime based on the dollar as the reserve asset (the dollar–U.S. monetary restraint standard). The buffer stock management role passed to a new decentralized authority, the foreign (non–U.S.) monetary authorities, who collectively (if not in coordination) managed the dollar buffer stock in order to fix the price of the dollar.

The collapse of the fixed exchange rate dollar standard between 1971 and 1973 occurred as the result of a speculative buying attack on the foreign currencies. Under the dollar standard, there was of course no physical storage capacity limit on the ability of the foreign authorities to accumulate dollar reserves. It was the opportunity cost, broadly defined, of holding these reserves that killed the fixed exchange rate dollar standard. This opportunity cost was not primarily the rate of interest received on the dollar reserves, which was not all that much below the best available alternative. The expected capital loss in the event of a collapse may have had some influence on the willingness to continue accumulating dollar reserves. With several foreign monetary authorities individually capable of abandoning the dollar standard (and thereby increasing the pressure on the remaining members), the dollar standard looked increasingly fragile. French resentment at what was viewed as the continued American extraction of international seigniorage added to the pressure. Unwillingness or reluctance to import U.S. inflation rates may have influenced others, especially the German monetary authorities.

What about the possibility of controlling directly the analogues of C and Q in the case of the dollar standard? There are effectively two approaches. The first starts from the balance of payments identity expressing the inflow of reserves as the sum of the capital account and current account surpluses. The authority attempts to control directly the various components of the balance of payments. Capital controls were of course still the norm during the Bretton Woods era. Full convertibility (since 1959) applied only to current account transactions. Countries in balance of payments difficulties routinely tightened capital controls (both regulatory and fiscal). Even resorting to restrictions on current account transactions was in fact not an uncommon occurrence.

Looking at the flow of reserves from the side of the monetary identity (money \equiv domestic credit plus international reserves), the analogue of $Q - C$ from the point of view of the foreign monetary authorities is the excess of their own domestic credit expansion (DCE) over DCE in the United States minus the excess of the growth in demand for their own money (at a fixed exchange rate) over the growth in the demand for U.S. dollars. The only foreign instrument in that equation is the foreign monetary authorities' own DCE. With imperfect capital mobility, the non-U.S. authorities did face a reserve problem (this would not have been the case in a world with perfect capital mobility). They would therefore have to assign their DCE policy to the defense of the fixed parity. Earmarking DCE in this way will imply an eventual loss of control over the stock of public debt. (This will be true even if a policy of continuously balancing the budget is pursued [see Buiter 1989].) To control the stock of reserves *and* the stock of public debt, the primary (noninterest) public-sector deficit will have to be managed to offset the cumulative effect of shocks to relative money demands.

This loss of monetary and fiscal freedom to act implied by any policy aimed at controlling effectively the "nonspeculative" components of relative money demand (let alone to offset speculative actions of noise traders and other irrational speculators) is a high price to pay, for stabilization, allocative, and/or distributional reasons. The gold standard survived as long as it did because few if any demands were put on monetary policy other than the defense of the gold standard. Fiscal policy as we know it today simply did not exist: fiscal stabilization policy had not been invented; redistributive policies were but a twinkling in the eyes of the social reformers of the day; the financing of the very limited public goods was constrained by a balanced budget norm whose only exceptions were wartime expenditures. When Bretton Woods came along, the demands made by monetary and fiscal stabilization policy, redistribution, the financing of public goods, and Pigovian interventions soon made the claims of the fixed exchange rate regime seem excessive. The predictable and predicted collapse occurred rather swiftly.

After the collapse of the gold-dollar standard, the world moved to what may be called a "dollar-U.S. monetary restraint" standard. The degree of private capital mobility had increased steadily over the past dozen years, providing

the mechanism for larger and swifter speculative attacks, although it still fell far short of the textbook perfect capital mobility case. While, in principle, the United States could have been provided through swaps with unbounded reserves of convertible currencies such as the deutsche mark and the pound sterling, the French franc and the yen, the foreign monetary authorities clearly balked at this idea, although they were willing to absorb up to \$70 billion in dollar claims between 1968 and the final collapse of the system. Private market participants were likewise reluctant to assume ever-growing open dollar positions and exposure to exchange risk.

Garber rightly points to the fact that the stock of official U.S. dollar liabilities that could in principle be mobilized to attack the dollar included domestic U.S. holdings of base money and other dollar-denominated official liabilities as well as the foreign holdings of short-term dollar claims on which attention was focused at the time. Presumably, U.S. speculators at the time were not impervious to the perception of exchange risk.

In principle, also, new outside reserves such as the SDR could have been created continuously in just the right amount to satisfy the growing world demand for real money balances at a stable world price level without relying on U.S. financial intermediation and the perceived portfolio imbalance (growing long-term assets matched by growing short-term external liabilities) that this entailed.

A rational speculative attack reflects speculators' perception of the likely future behavior of the proximate fundamentals, relative rates of domestic credit expansion corrected for growth in relative money demands at the fixed exchange rate. These proximate monetary fundamentals are in turn functions of the underlying fiscal strategies pursued by the reserve country and the other major players. As it became steadily more apparent that U.S. policymakers were increasingly reluctant to exercise the monetary-fiscal restraint required for the long-term survival of the dollar-U.S. monetary restraint standard, it was only a matter of time until a reasonable approximation to the textbook speculative attack finished off the exchange rate arrangements of Bretton Woods.

The period over which the exchange rate arrangements of Bretton Woods survived was the only one since World War I during which the U.S. authorities were willing to grant international considerations priority over perceived domestic demands on monetary and fiscal policy. Ever since, the external value of the dollar has been seen and treated by U.S. policymakers as the ultimate residual in economic policy design. This may well have made sense from a U.S. national perspective, given the relative closedness to international trade of the U.S. economy and the large weight of the U.S. monetary and financial sector in the global financial system. It was, however, inconsistent with the survival of a fixed exchange rate regime with the U.S. dollar as the reserve currency.

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General Discussion

Fred Bergsten, Paul Krugman, and Robert Solomon took issue with the paper for focusing on the liquidity and confidence problems. Bergsten argued that the key problem of Bretton Woods was adjustment. Although the Triffin dilemma was a problem, the true factor precipitating the collapse of Bretton Woods was that the United States finally decided that it wanted to adjust—it wanted to strengthen its economy by reducing the trade imbalance. It was also felt that adjustment would head off growing protectionist pressure. The U.S. monetary authorities perceived that the Bretton Woods system precluded them from adjusting by devaluing the dollar, leaving only the option of breaking with gold. The authorities used the dollar overhang, threats of runs, and British requests for a gold value guarantee as excuses. *Paul Krugman* argued that

speculative attack models should be viewed only as parables that may be relevant for the recent experiences of capital flight in Latin America. These models, he stated, are not useful for the analysis of the collapse of Bretton Woods—which was driven by the adjustment problem, not liquidity issues.

Peter Garber replied that he did not view the adjustment problem and speculative attacks as inconsistent. The adjustment problem just means that there are many things to finance, including the fixed exchange rate. What leads to a speculative attack is that there is a limit on the amount of financing that the monetary authority is willing to use to maintain the fixed exchange rate system. *Maurice Obstfeld* pointed out that, in principle, there need not be a confidence problem, even if the outstanding stock of dollar liabilities grows very large relative to the U.S. monetary gold stock. A gold standard could operate on a very slim reserve as long as there is a limit on the amount of fiduciary money issued by the center country. He argued that, if the other G10 countries wanted to stage a run on the U.S. monetary gold stock, they could easily do so by borrowing reserves abroad and just buying gold. So where the critical threshold occurs in speculative attack models is not clear.

Alexander Swoboda disagreed with *Dale Henderson's* remark that the Gold Pool arrangement can be viewed as a commitment by the other major countries to share the burden of supplying gold to the rest of the world. The Gold Pool was only a temporary commitment because ultimately the members of the Gold Pool could correct outstanding dollar liabilities and recoup the gold sold. *Bennett McCallum* argued that the formation of the Gold Pool was an indication that the United States was unwilling to let its price level be dictated by the commitment to the \$35.00 fixed price of gold.