

This PDF is a selection from an out-of-print volume from the National Bureau of Economic Research

Volume Title: Financial Markets and Financial Crises

Volume Author/Editor: R. Glenn Hubbard, editor

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-35588-8

Volume URL: <http://www.nber.org/books/glen91-1>

Conference Date: March 22-24,1990

Publication Date: January 1991

Chapter Title: Before the Accord: U.S. Monetary-Financial Policy, 1945-51

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Chapter URL: <http://www.nber.org/chapters/c11485>

Chapter pages in book: (p. 175 - 206)

5 Before the Accord: U.S. Monetary-Financial Policy, 1945–51

Barry Eichengreen and Peter M. Garber

5.1 Introduction

The 1951 Treasury–Federal Reserve Accord brought to a close an extraordinary period in the monetary and financial history of the United States. For nearly a decade, U.S. Treasury bond yields never rose above $2\frac{1}{2}$ per cent (see fig. 5.1). Long-term interest rates may have been low, but short-term rates were lower still: those on 12-month certificates of indebtedness were capped at $\frac{7}{8}$ of 1 per cent to $1\frac{1}{4}$ per cent; for the first half of the period, 90-day Treasury bill rates never exceeded $\frac{3}{8}$ of 1 per cent. Interest rates were low despite an inflation rate that reached 25 per cent in the year ending July 1947 (see fig. 5.2). They were stable despite swings from 25 per cent inflation in 1946–47 to 3 per cent deflation in the year July 1948–July 1949, to 10 per cent inflation in the year March 1950–March 1951. These pronounced fluctuations in *ex post* real interest rates did not undermine the stability of financial institutions: there were only five bank suspensions between the end of 1945 and the middle of 1950. The stability of interest rates and the absence of bank failures in the turbulent aftermath of World War II seems all the more remarkable following a decade like the 1980s when the volatility of asset prices was so pronounced and the difficulties of financial institutions were so prevalent.¹

We analyze in this paper U.S. monetary-financial policy in the period leading up to the March 1951 Treasury-Fed Accord. Our point of departure is Friedman and Schwartz's (1963) notion that policy in this period was formu-

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The authors thank Alex Mackler, Carolyn Werley, and Lauren Auchincloss for research assistance, and Glenn Hubbard and Rick Mishkin for helpful comments.

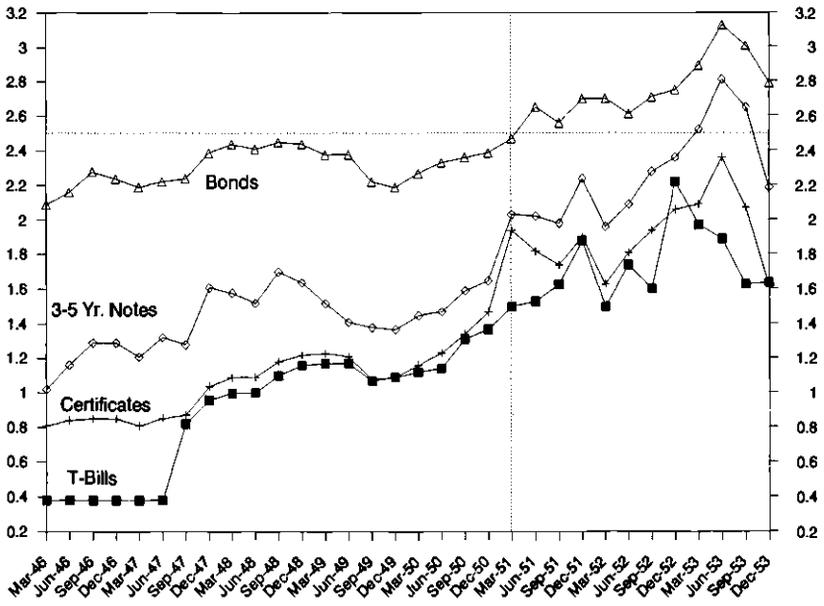


Fig. 5.1 Yields of maturities (%)

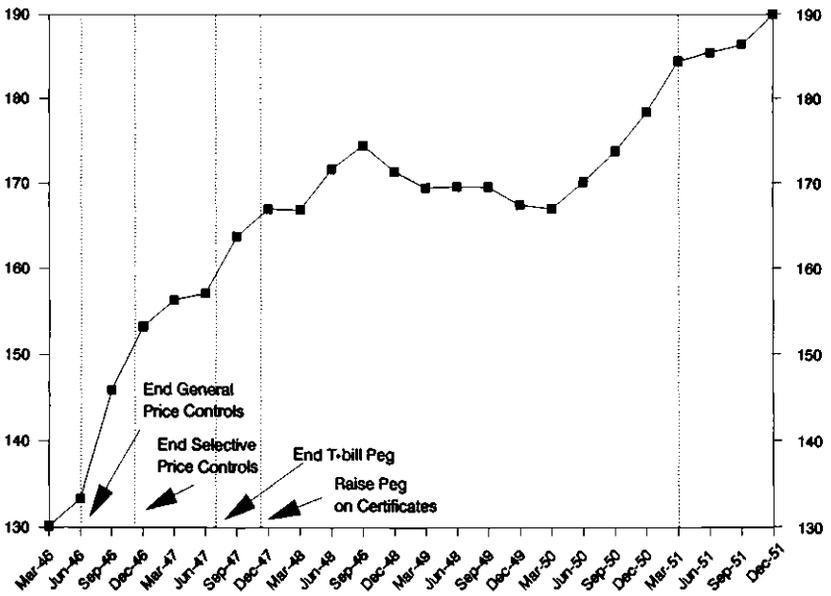


Fig. 5.2 Consumer price index

lated with reference to a price-level target. As soon as the price level deviated sufficiently from its target range, policymakers were expected to intervene to prevent it from straying further. We draw on the recent literature on exchange rate target zones and collapsing exchange rate regimes to formalize this notion and to show how its implications for interest rate behavior can be derived. We model policy in the period as a target zone for the price level, and the mounting difficulties on the eve of the Accord as an incipient run on a collapsing target-zone regime. In the framework we employ, a target zone for the price level plus an intervention rule imply a target zone for the interest rate. Thus, the model provides a framework for analyzing Federal Reserve intervention and an approach to understanding the singular behavior of interest rates.

The model also helps one to understand the economic policies and conditions that rendered the policy of capping interest rates sustainable through 1949 but set the stage for its collapse in 1951. In particular, it directs attention to the financial and monetary objectives of the authorities and the evolution of the real economy. The absence of dramatic real shocks before 1950 minimized the burden on the monetary authorities, while their credible commitment to the price-level target zone enhanced their capacity to absorb those shocks that occurred. Subsequently, real interest rates rose dramatically, intensifying the pressure for monetary policymakers to intervene, while the advent of the Korean War increased the perceived costs of continued adherence to the target-zone regime.

To understand pre-Accord policy—specifically, policymakers' commitment to a regime that entailed an explicit target zone for interest rates and an implicit target zone for prices—and the advent of the Accord in 1951, it is essential to appreciate the threats to financial stability perceived by the authorities and how those perceptions changed over time. Toward the beginning of the period the perceived threat to financial stability lay in the volatility of inflation and interest rates. Hence the authorities' commitment to stabilizing these variables. Toward the end of the period, these fears had receded and policymakers' concern had shifted toward mobilizing the nation's productive capacity for the Korean War. Hence the March 1951 Accord, under which the Fed could turn its attention from stabilizing interest rates to other objectives.

The rest of the paper is organized as follows. Section 5.2 sketches the background to the 1945-51 period and presents a chronology of the principal events. Section 5.3 presents the target-zone model that provides the framework for our subsequent analysis. Section 5.4 shows how the events of the period can be reinterpreted from a target-zone perspective. In section 5.5 we argue that concern for the stability of the U.S. banking system accounts for the Fed's commitment to a target-zone regime designed to stabilize prices and interest rates prior to 1951, and that shifts in the locus of concern associated with changes in commercial bank portfolios and the advent of the Korean War account for the collapse of the target-zone regime and the Accord of 1951. Section 5.6 concludes.

5.2 A Chronology of Events

In this section we sketch the background to postwar monetary policy in the United States and present a chronology of events affecting its formulation. This sketch provides the reader unfamiliar with the episode an overview of events. It also serves to indicate how the events of the period are characterized in the existing literature. In section 5.4 we present a rather different perspective and contrast it with the conventional interpretation given here.

This summary is also intended to bring out a limitation of existing accounts, namely their emphasis on the role of fortuitous events in sustaining the Fed and Treasury's low interest rate policy. The 1948–49 recession, for instance, is portrayed as a fortuitous event relieving inflationary pressure and demolishing inflationary expectations. There is remarkably little discussion of the underlying economic environment or policy regime that rendered the low interest rate policy viable. It is precisely such discussion that, in subsequent sections of the paper, we seek to add to the existing literature.

5.2.1 Precursors of Wartime Policy

The origins of pre-Accord monetary policy in the United States are conventionally traced to World War II. The low interest rate regime is portrayed as a logical extension of wartime debt-management policies. In fact, the origins of U.S. policy in the period 1945–50 go back further, specifically to the monetary policies and problems of the 1930s.

For the Fed to pursue a policy of stabilizing bond prices, it had to have the capacity to intervene in securities markets. That capacity was enhanced by the passage of the Glass-Steagall Act of 1932 (not the 1933 Banking Act of the same name). Glass-Steagall permitted the Federal Reserve System to count government bonds among the eligible securities required as backing for 60 per cent of Federal Reserve notes. This permitted the Federal Reserve to hold directly a much larger quantity of Treasury securities than had been possible before.

Two developments in the 1930s that encouraged the Fed to intervene to stabilize securities prices were rising interest rates and the problem of excess reserves. Both continued to mold the conduct of monetary policy in the 1940s.

Economic recovery after 1933 placed gentle upward pressure on interest rates. Investors began to anticipate inflation. In early 1935, Treasury officials, concerned that rising interest rates might prevent them from attaining their debt-management objectives, inquired whether the Fed might intervene to stabilize bond prices before the Treasury engaged in its March financing operation. System officials resisted pressure to peg government bond prices but acceded to requests that they at least help to dampen fluctuations in the market. In the spring of 1935, to moderate the rise in interest rates, the Fed, for one of the first times in its history, purchased long-term government bonds.

If the Treasury was worried about debt management, the Fed was preoccupied by excess reserves. By late 1933 these had reached \$800 million, or more than 40 percent of required reserves. By the end of 1935 they had soared to more than \$3 billion, or 115 per cent of required reserves.

The Federal Open Market Committee's (FOMC) concern was that the growth of excess reserves weakened monetary control. Because few member banks had occasion to borrow from the Fed, an increase in reserve bank discount rates would be incapable of reining in inflationary pressure. At the end of 1935, System holdings of securities were only about \$2.5 billion. Even if the FOMC sold off the System's entire portfolio, it could not mop up the banks' excess reserves. This concern led ultimately to three controversial increases in reserve requirements in August of 1936, and March and May of 1937.

These increases were not universally supported. Though mopping up excess reserves might enhance monetary control, the higher interest rates it produced might prompt a recession. To acquire reserves, banks would liquidate a portion of their bond portfolios, and the consequent rise in long-term interest rates might abort the recovery. If the fall in bond prices was sufficiently severe, the solvency of banks which had invested heavily in bonds might be threatened.²

Hence on 4 April 1937 the FOMC agreed to purchase \$25 million of government securities in the coming week as "may be necessary with a view to preserving an orderly market."³ Interest rates rose, and the Fed continued purchasing long-term government bonds. In pursuit of this "flexible portfolio policy," it acquired \$200 million of long-term bonds in exchange for \$150 million of short-term bills and notes and \$50 million of cash.⁴

To some, such as George Harrison, president of the Federal Reserve Bank of New York, open market purchases were counterproductive. The object of increased reserve requirements was to reduce excess reserves; bond purchases, by replenishing reserves, defeated the purpose. Harrison favored no open market intervention to limit the fall in bond prices. Others, notably Marriner Eccles, chairman of the FOMC, favored large-scale bond purchases to "stabilize the market."⁵ The policy adopted was a compromise between the two positions (Friedman and Schwartz 1963, 527). Long-term interest rates were allowed to rise, but only moderately. Excess reserves were allowed to fall, but only moderately.

Long-term rates rose from 2½ to 2¾ per cent before peaking in April 1937. Excess reserves were reduced, temporarily, to less than half of System holdings of government securities. The policy continued into 1939, although it was not necessary for the Fed to conduct purchases on a significant scale.

The importance of the flexible portfolio policy lay in the Fed's acknowledgment of responsibility for what it came to refer to as "orderly conditions in the government securities market." The phrase became commonplace in the resolutions of the FOMC starting in the spring of 1938. In effect, the Fed had

assumed responsibility for preventing changes in bond prices that might endanger financial and economic stability. In addition, as a result of this experience, changes in reserve requirements had become one of the leading instruments of monetary control. They would be relied upon heavily in the 1940s.

5.2.2 Wartime Changes

In September 1938 a conference of presidents of Federal Reserve banks met to consider options for wartime policy. By 1939 a consensus had emerged that steps should be taken to stabilize the government securities market. There was a desire to avoid a problem that had plagued European finance during World War I—continually rising rates that induced investors to defer purchases of government securities in anticipation of still higher yields. In April and June the FOMC was authorized to buy government securities to prevent their prices from falling.

Following the outbreak of war in Europe on 1 September 1939, the System purchased \$500 million of bonds in the open market.⁶ No additional support by the Federal Reserve System was required, however. The outbreak of hostilities in Europe was not accompanied by a financial crisis comparable to the worldwide collapse of securities markets in 1914. The Munich crisis in 1938 provoked more of a security price decline in New York and London than did the outbreak of fighting in 1939. The advent of war came as no surprise. The autarchical policies of the 1930s were ideal precautions against the financial interconnections among belligerents that would have created a financial crisis.

The gross public debt of the United States increased by 33 per cent between 30 June 1939 and 30 November 1941 (Murphy 1950, 30). But the only instance in this period, other than September 1939, when the Fed was forced to purchase Treasury bonds was the spring of 1940, following the invasion of Norway, Denmark, and the Low Countries. Compared to European securities, U.S. Treasury bonds were regarded as safe and attractive assets. The trade balance moved into strong surplus and gold surged toward the United States, augmenting the liquidity of the market. Pearl Harbor, which augered budget deficits and inflation, transformed this situation. Securities prices fell, impelling the Fed to purchase \$50 million of bonds and \$10 million of bills. Within two weeks of the Japanese attack, Treasury and Federal Reserve officials had agreed to stabilize interest rates.

Though the Fed, compared to the Treasury, preferred higher interest rates, neither agency disputed the desirability of stabilization. Following negotiations, the Fed agreed in March 1942 to support Treasury bill prices once short-term rates reached $\frac{3}{8}$ per cent. Reserve banks were ordered by the FOMC to purchase all Treasury bills offered them at this price.⁷ No such formal instruction was issued regarding Treasury bonds, but it was understood that long rates would not be permitted to rise above $2\frac{1}{2}$ per cent.⁸ Wage and price controls were relied on to prevent the ready availability of credit from generating undue inflation.

A 2-percentage-point differential between short and long rates was almost exactly the differential established previously by the market. Treasury officials regarded it as a necessary premium to induce investors to hold long-term bonds. Pegging short rates at less than $\frac{1}{2}$ per cent was essential, in their view, to prevent long rates from rising above $2\frac{1}{2}$ per cent. What they neglected was the effect of intervention on portfolio preferences. As soon as the Fed's policy was regarded as credible and interest-rate risk vanished, investors came to regard Treasury bills and bonds as virtually perfect substitutes. Investors sold bills for higher yielding bonds, forcing the Fed to do the converse (as indicated by figs. 5.3 and 5.4). By the end of the war, the Federal Reserve System held virtually the entire supply of Treasury bills. Prior to the end of 1947, it held negligible amounts of bonds, though bond yields remained at their ceiling from 1942 until the beginning of 1945.

5.2.3 1945-1947: Inflation

The cap on long-term interest rates did not bind immediately after the war. Massive bond issues might have exhausted the Fed's willingness or ability to peg long-term rates. But with the end of fighting, fresh sales of government securities were almost immediately limited to funding operations. The Victory Loan issued in December 1945 virtually ended Treasury borrowing. The federal budget was balanced in 1946 and in strong surplus in 1947-48. With

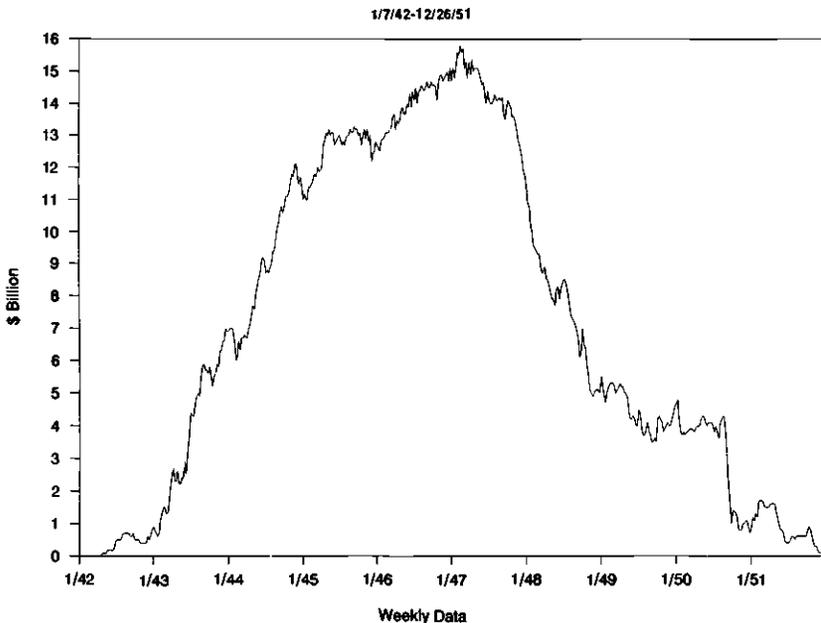


Fig. 5.3 Federal Reserve T-bill holdings

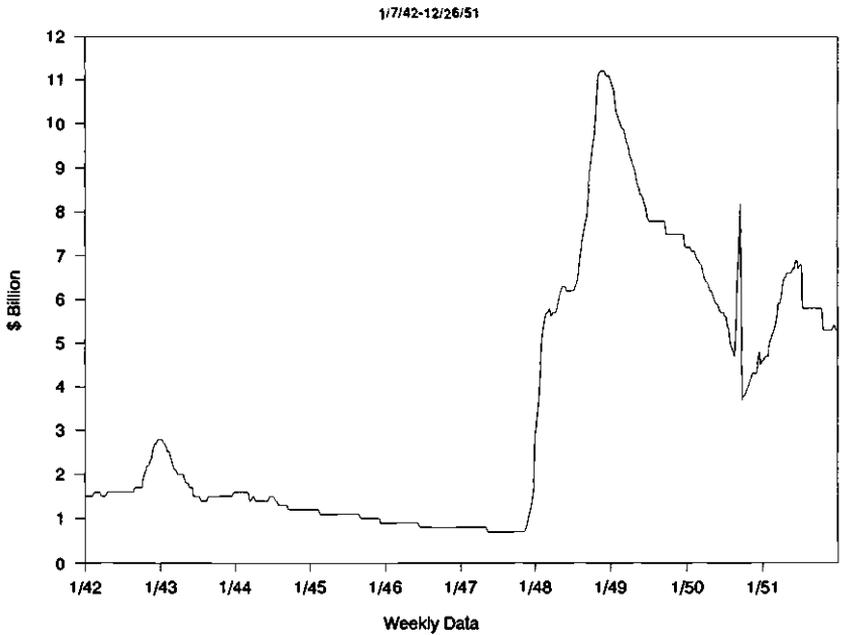


Fig. 5.4 Federal Reserve bond holdings

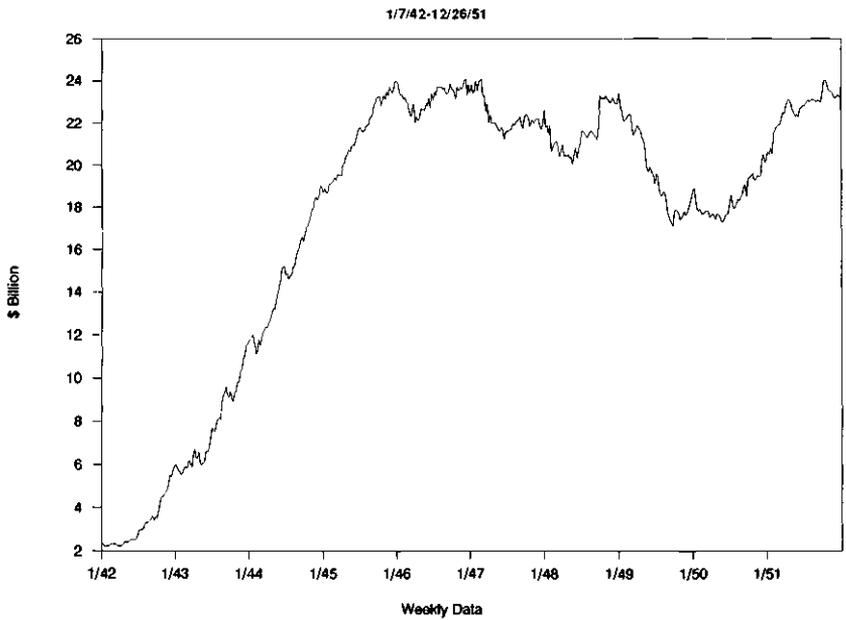


Fig. 5.5 Total Federal Reserve security holdings

the danger of capital losses removed, the two-point yield differential between short- and long-term bonds rendered the latter increasingly attractive. At the end of 1945 the yield on long-term government bonds was slightly more than 2.3 per cent. By the following April it had fallen to less than 2.1 per cent.

Starting in July 1946, the price level began to rise. The end of price control, in conjunction with European demands for American exports, pushed up U.S. wholesale prices by 25 per cent over the succeeding twelve months. In July of 1947, concern over inflation led the Fed, with the concurrence of the Treasury, to abolish the buying rate for Treasury bills. Bowing to Treasury pressure, it continued to support the rate on 9- to 12-month certificates at slightly more than $\frac{3}{4}$ per cent and bond yields at $2\frac{1}{2}$ per cent. Later in the year, it gradually increased its buying rate for certificates to 1 per cent. Bill rates fluctuated below this level. (Fig. 5.1 plots these rate movements.)

Inflation moderated temporarily, stimulating the demand for government securities. It was mainly the demand for Treasury bills that rose. The gap between bond and bill rates was narrower than two years before, since the Fed no longer supported Treasury bill prices. In addition, since May the Treasury had sold \$1.8 billion of bonds from its investment accounts. Treasury bond yields rose from 2.24 per cent in September to 2.39 per cent in December. The Fed was forced to intervene with \$2 billion of bond purchases in November and December to limit the rise in yields (Chandler 1949, 12). It purchased an additional \$3 billion of bonds in the first quarter of 1948. But the demand for Treasury bills was sufficiently strong that the Fed was able to reduce its overall portfolio of Treasury securities by \$1 billion over the period (see figs. 5.3-5.5) (Friedman and Schwartz 1963, 580).

By the second quarter of 1948, inflation had again become the dominant fear. The Fed was forced to purchase bonds with cash. System holdings of Treasury securities (the sum of bonds, bills, and certificates) began to rise. The Treasury resisted any measure to increase short-term rates. Only in August 1948 did it finally accede to an increase in the 12-month rate to $1\frac{1}{4}$ per cent.

5.2.4 1948-1949: Deflation

Increasingly, price stability and the prevailing level of interest rates seemed at odds. Reserve requirements were raised in February and June to the legal maximum of 24 per cent. In August a special session of Congress called by President Truman to consider anti-inflation legislation passed a bill authorizing further increases in reserve requirements. The September increase in reserve requirements to 26 per cent led the banks to sell \$2 billion of government bonds, which the Fed purchased, increasing the supply of high-powered money commensurately (Friedman and Schwartz 1963, 604-5).

The 1948-49 recession brought a fortuitous respite. Wholesale prices stopped rising in August 1948. Industrial production stopped rising in No-

vember. As the demand for commercial and mortgage loans softened, banks and insurance companies once again began to purchase Treasury bonds.

Monetary policymakers' dissatisfaction with interest-rate pegging was compounded by the perceived need to sell government bonds during the recession. The Fed had never formally committed itself to prevent interest rates from falling. Nonetheless, the System sold \$3 billion of bonds in the first half of 1949, the majority in exchange for cash. The action was widely criticized for aggravating the recession.

This unsatisfactory experience led the Fed to affirm that its primary commitment was to price and income stability, not to the stability of interest rates. Thus, in the *Federal Reserve Bulletin* for July 1949, the FOMC announced its intention "to direct purchases, sales and exchange of Government securities by the Federal Reserve Banks with primary regard to the general business and credit situation" (776). The question was whether the Treasury would go along. This question acquired new urgency once industrial production began to recover in July 1949.

5.2.5 1950–1951: Inflation

Consumer prices resumed their rise in the second quarter of 1950. Long-term bond yields anticipated the trend, bottoming out at the end of 1949. The resurgence of inflationary pressure had an immediate impact on Federal Reserve operations. In the second quarter of 1950, Federal Reserve holdings of U.S. Treasury securities began to rise steadily. By June, fighting in Korea was underway. With market interest rates rising, System purchases of Treasury securities continued at an accelerating pace. The Federal Reserve Board and the FOMC continued to mouth their commitment to the maintenance of orderly conditions in the government securities market but also reaffirmed the priority attached to curbing inflation.⁹ In private they pressed the Treasury for higher interest rates. Treasury Secretary John W. Snyder resisted; the Treasury's autumn refunding loan was issued at 1¼ per cent. The Federal Reserve System was forced to purchase the majority of it.

By this time the public had grown concerned over inflation. Congressional criticism of Treasury policy had become increasingly common. The Douglas Committee, which reported in January 1950, criticized the Treasury's insistence on pegging interest rates.¹⁰ In February, Senator Paul H. Douglas made a famous speech critical of the Treasury. The specter of an inflationary crisis prompted a series of staff-level conferences between the Treasury and the Fed. On the last day of February, Secretary Snyder gave in. The Accord between the two organizations was couched in general terms: "The Treasury and the Federal Reserve system have reached full accord with respect to debt-management and monetary policies to be pursued in furthering their common purpose to assure the successful financing of the Government's requirements and, at the same time, to minimize monetization of the public debt."¹¹

The exact provisions of the agreement between the Federal Reserve Board

and the Treasury were never published. Its essence limited the Fed's commitment to support the 2½ per cent Treasury bonds to \$400 million. Other government bond prices fell immediately. By March 13 the funds to support the 2½'s were exhausted, and for the first time their prices were permitted to fall below par. By the end of the year their yield had risen to 2¾ per cent.

5.2.6 Recapitulation

This review of events as they are portrayed in the literature brings out several important points. First, concern over the stability of the banking system figured in the Federal Reserve System's decision to intervene in the bond market at various junctures in the 1930s; this experience laid the groundwork for similar intervention in the 1940s. Second, changes in reserve requirements emerged as one of the principal instruments of monetary control in the 1930s; once again, as a result of this experience the instrument was relied upon heavily in the 1940s. Third, and most importantly from our perspective, the existing literature does not provide a systematic analysis of the policy regime that rendered the Fed's program of bond-market intervention sustainable; it is unclear why investors willingly held Treasury securities at such low interest rates in the 1940s or why this willingness apparently evaporated at the decade's end.

5.3 The Analytical Framework

One way to appreciate the problem this poses for analysis is in terms of the implications of conventional models of interest-rate pegging. Assume that the Fed simply commits to pegging nominal rates at a certain level. Assume next that the rate demanded by investors rises relative to the rate maintained by the Fed. Since bonds are yielding less than the required rate, investors begin to sell them off. The Fed is forced to purchase them for cash. The increase in money supply fuels inflation which places additional upward pressure on nominal interest rates, leading to more bond sales, more monetary expansion, and an explosive inflationary spiral. Analogously, if market rates fall relative to the interest-rate peg, investors purchase bonds from the Fed. This reduces the money supply, creates expectations of deflation, lowers nominal rates, and provokes additional bond purchases, in an implosive spiral. Again, there is nothing to stabilize the financial system until the authorities have sold off their entire bond portfolio and abandoned their interest-rate pegging policy.

The conventional framework suggests that an interest-rate pegging policy will be highly unstable, not remarkably stable, as was the case from 1946 to 1950. Clearly, an alternative framework is required. The framework we propose builds on a previous analysis of the period by Friedman and Schwartz (1963). When describing the Treasury-Fed bond-price support program of 1945-51, Friedman and Schwartz asked why the public did not attack the scheme in 1947-48, when inflation was relatively high, by reducing its holdings of liquid balances, but did attack in similar circumstances in 1951. They

emphasized price expectations as the crucial factor supporting the Fed's ability to maintain the program.

That factor was a continued fear of a major contraction and a continued belief that prices were destined to fall. A rise in prices can have diametrically opposite effects on desired money balances depending on its effect on expectations. If it is interpreted as a harbinger of further rises, it raises the anticipated cost of holding money and leads people to desire lower balances relative to income than they otherwise would. In our view, that was the effect of price rises in 1950. . . . On the other hand, if a rise in prices is interpreted as a temporary rise due to be reversed, as a harbinger of a likely subsequent decline, it lowers the anticipated cost of holding money and leads people to desire higher balances relative to income than they otherwise would. In our view, that was the effect of price rises in 1946 to 1948. . . .

Despite the extent to which the public and government were exercised about inflation, the public acted from 1946 to 1948 as if it expected deflation. There is no real conflict. The major source of concern about inflation at that time was not the evils of inflation per se . . . but the widespread belief that what goes up must come down and that the higher the price rise now the larger the subsequent price fall. In our view, this fear or expectation of subsequent contraction and price decline reconciled the public to only a mild reduction in its liquid asset holdings relative to its income and induced it to hold larger real money balances than it otherwise would have been willing to. In this way, it made the postwar rise more moderate. (1963, 583–84)

We can formalize Friedman and Schwartz's account by applying recent research from the exchange rate target-zone literature.¹² A simple amendment to these models converts them into a model of a price-level target zone. Thus, we interpret Friedman and Schwartz's description of the situation in 1948 in terms of an implicit target-zone model.

Imagine that forces in the economy placed upward pressure on the price level. Below the upper bound of the target zone, prices would be allowed to rise. But once the upper bound of the zone was reached, a change in either underlying real variables or policy would reverse the movement in prices. We focus on the case in which reaching the upper bound triggers intervention by the Fed. Given this policy regime, it was rational to anticipate deflation in the midst of rapid inflation. Similarly, there might be a lower bound on the price level which would prompt intervention as it was approached. This regime decouples inflation from inflationary expectations and nominal interest rates, reconciling a volatile inflation rate with stable bond yields.

5.3.1 The Basic Framework

This target-zone interpretation can be formalized using a straightforward monetary model of the price level. We take real variables as exogenous and

concentrate on the relation between money and prices.¹³ The central relationship is the standard money equilibrium equation:

$$m - p = ay - b(r + E dp/dt)$$

or

$$p = k + bE dp/dt$$

where $k = m - ay + br$.

The variables m , p , and y represent the logarithms of the money stock, the price level, and real income, respectively; r is the real interest rate; $E dp/dt$ is the expected *change* in p ; a and b are parameters.

The problem is to determine the price level. Since real income and the real interest rate are determined in the real economy alone and the money supply is determined by policy, k is a forcing variable. The variable k may be controlled by intervention either at the boundaries or, more generally, inside the boundaries of the target zone whose upper bound is p^u and whose lower bound is p^l . In general, while the price level remains inside the target zone, the variables m , y , and r can evolve randomly with no control exerted over the price level. Once k reaches some critical value, however, it is controlled through monetary intervention. At this moment, changes in the money supply are directed at maintaining the price-level zone.

We assume for simplicity that only the real interest rate r drives k inside the boundary, and that r is a Brownian motion process with no drift.¹⁴ Formally,

$$dr = sz$$

where z is a Brownian motion process and s is the standard deviation of dr .

This scenario is exactly that developed in Krugman's (1989) study of the collapse of an exchange-rate target zone defended with a limited amount of reserves. The process of collapse, which we study below, is also the same as in Krugman.

If p rises toward its maximum p^u because the real interest rate rises, an intervention involving a decline in the money supply will occur. The decline might be infinitesimal, aimed at offsetting infinitesimal increases in r . Alternatively, the decline in money supply may be discrete and large. If the price level tends to its minimum value p^l because the real interest rate is falling, the intervention would entail an increase in money supply.

Given these assumptions, it is standard to write the solution for the price level as a nonlinear function of the forcing variable r . Since a large literature now exists which presents this solution, we do not develop it here. We simply depict it in figure 5.6. The figure applies to a broad range of intervention policies. For a given money supply, curve I represents the price level as a function of r , and r is permitted to reach an upper bound r^u before intervention

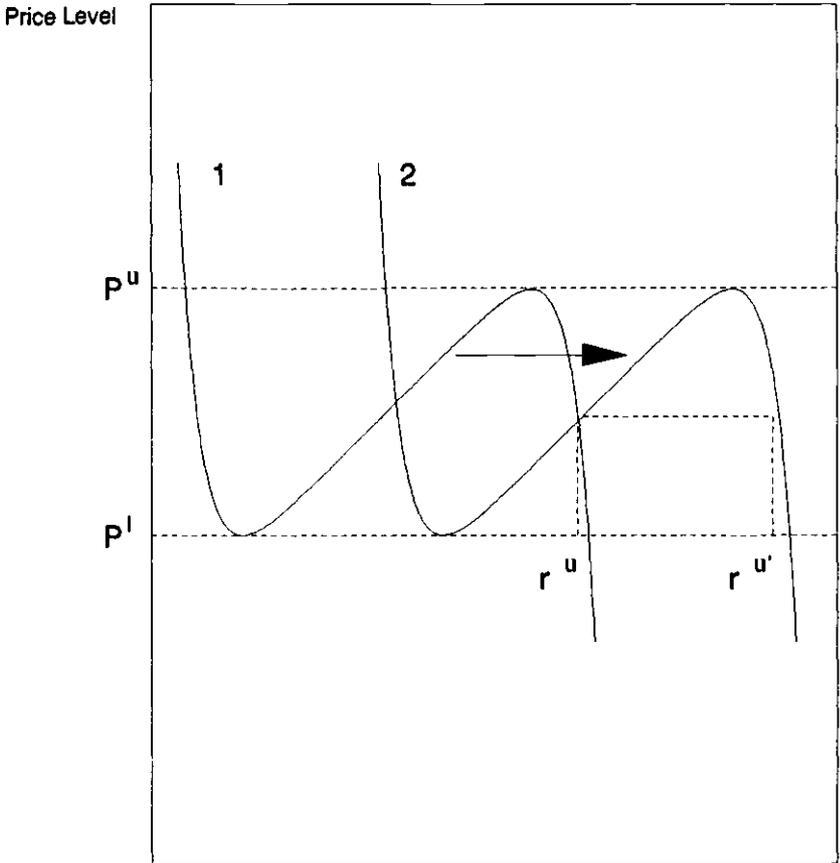


Fig. 5.6 Price-level zone

aimed at maintaining the zone occurs. Thus, as r rises, the price level rises and then falls before intervention occurs. Intervention in this case involves reducing the money supply discretely. Since this is a credible policy, intervention comes as no surprise; there is no jump in the price level at the moment it occurs. Since r is exogenous, it does not change from r^u as a result of the intervention. The monetary contraction has the effect of shifting the price-level function rightward from the curve labelled 1 to the curve labelled 2. The shift occurs by an amount which maintains price-level continuity when the new solution is evaluated at r^u . If r again moves up to $r^{u'}$, then another contractionary intervention occurs and the process repeats.

Alternatively, the intervention may be infinitesimal. Such an intervention can be depicted in figure 5.6 by setting r^u equal to r^{max} , the argument at which the price-level function represented by curve 1 is flat. Repeated infinitesimal interventions then slide the solution curve continuously rightward in the zone.

5.3.2 A Range on Nominal Interest Rates

As developed so far, the size of the intervention is arbitrary. Associated with any specified zone on the price level, however, is a range of nominal interest rates that depends on the size of interventions. If an additional limit is placed on the range of the instantaneous interest rate, the intervention rule becomes unique.

The expected inflation rate can be depicted in figure 5.7 as a function of r . The expected inflation rate associated with the price-level zone is a monoton-

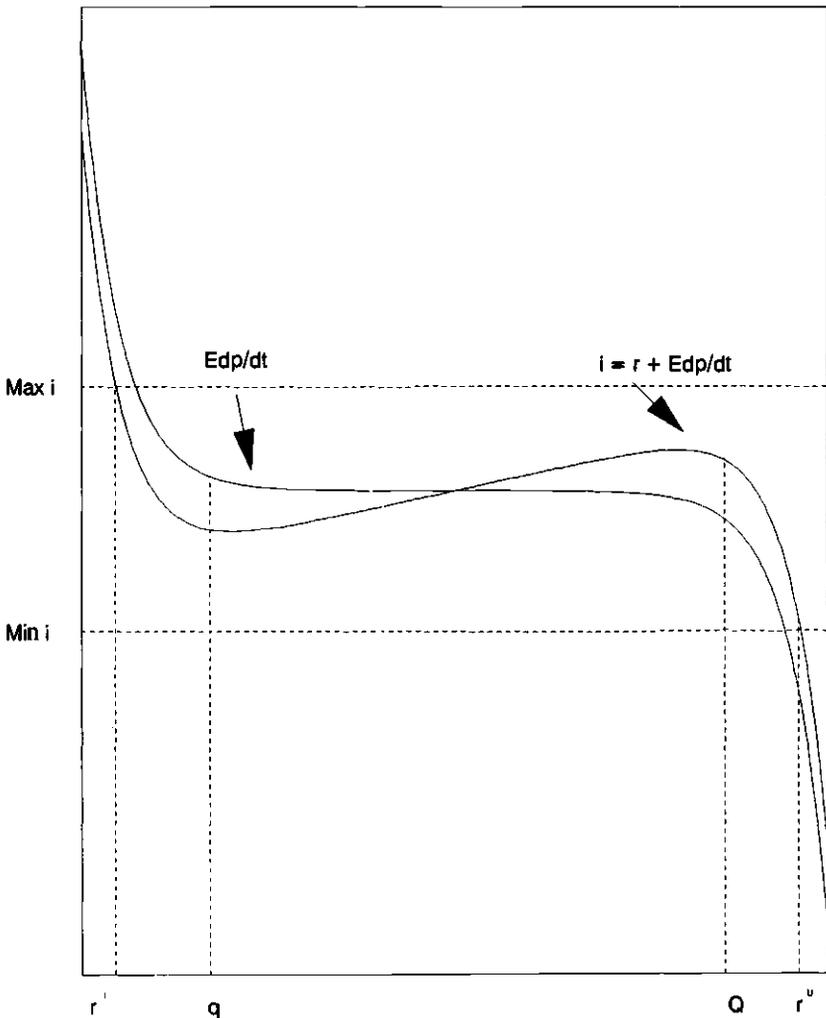


Fig. 5.7 Nominal interest rates and expected inflation rates

ically decreasing function of r , flat in the middle range of r but highly nonlinear near the intervention trigger points. When r approaches its maximum level, a situation which would normally be associated with rising price levels, expected inflation is in fact at its lowest negative value. This is because, as r rises, intervention to reverse the movement of the price level becomes increasingly likely.

From the Fisher equation, the instantaneous nominal interest rate is:

$$i = r + Edp / dt$$

The nominal interest rate as a function of r also appears in figure 5.7. As r rises linearly to r'' , Edp / dt declines more rapidly. For a given real interest rate, the instantaneous nominal interest rate will be at its lowest possible value when r reaches its maximum value.

Suppose that a policy consists of specifying bounds on both the price level and the nominal interest rate. The lower bound on the instantaneous interest rate occurs when r reaches r'' . The upper bound occurs when r reaches r' . A specified ceiling for longer-term interest rates can be consistent with limiting the movement of the shorter rates. Again, that range is predetermined once r'' and r' are specified. When r'' is reached, the instantaneous nominal interest rate reaches its lowest level, and future interest rates would be expected to exceed the current instantaneous rate. We would expect to have a rising term structure. If longer rates are an average of instantaneous rates, they are controlled within the upper and lower bounds given in figure 5.7.

Thus, we can model interest rate policy prior to 1951 as a price-level target zone and a specific intervention rule. Events associated with maintaining the interest rate cap can be interpreted in terms of this target-zone framework.¹⁵

5.3.3 Collapse of the Target Zone

We have based our discussion of this regime on the assumption that the Federal Reserve is willing to contract the money supply to whatever extent is necessary to maintain the zone. We now presume that there is some minimum value of the nominal money stock below which the Fed is unwilling to go. As the real interest rate rises, further contractionary interventions are required to maintain the target zone. As these interventions cumulate, the money supply declines toward its minimum value. Eventually, everyone realizes that the target-zone regime will be abandoned.

We utilize Krugman's (1989) analysis of how an exchange-rate target zone collapses to describe the events of 1951. Suppose that, as in figure 5.8, r rises to r'' , triggering a decline in the money stock. Since r is exogenous, intervention has the effect of sliding the price-level function rightward in the zone. This is depicted in figure 5.8 as a shift from curve 1 to curve 2. If the intervention policy is maintained, there is a shift in the upper bound on r at which the intervention is triggered, from r'' to r''' . Without a lower bound on the money stock, this process can continue indefinitely.

Imagine, however, that there exists such a lower bound. Suppose that when

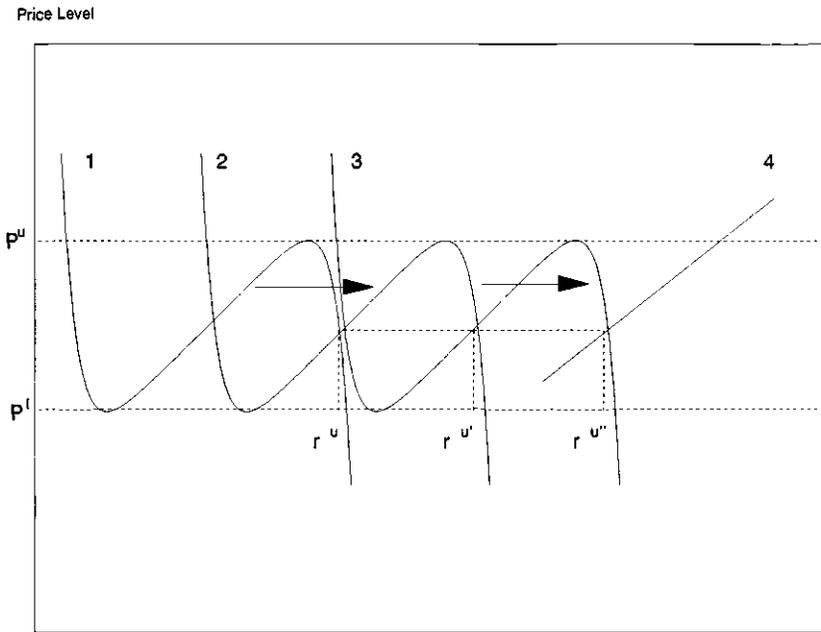


Fig. 5.8 Collapsing price-level zone

r reaches $r^{u'}$, the money stock has declined to such a level that one more intervention will push it exactly to its lower bound. The intervention policy is still credible for one last time, so the price level will move along the new target-zone solution path indicated by curve 3. If r continues to rise to $r^{u''}$, intervention will occur as promised but thereafter further intervention is no longer credible. The price-level solution will follow curve 4, the usual linear function of fundamentals. Note that price-level continuity will be maintained at $r^{u''}$, the real interest rate associated with the regime shift.

We can use this framework to explain the termination of interest rate pegging in 1951. The outbreak of the Korean War drove real interest rates upward, requiring monetary contraction to maintain the price-level zone. The 1949 contraction had already pushed the system toward its limit. Moreover, the perceived costs of further monetary contraction had risen in 1951, given the need to mobilize resources for the Korean War. Thus, the target-zone regime was abandoned, leading to negotiation of the Accord.

5.4 Applying the Target-Zone Framework

Our target-zone framework can be used to analyze the evolution of U.S. monetary-financial policy between 1946 and 1950 and to understand the coming of the Accord in 1951.

Given the focus of the theoretical model, we emphasize Federal Reserve

intervention designed to alter the money supply. The principal way in which the Fed altered the money supply in this period was by changing reserve requirements. Increasing required reserves reduced loans, among other bank investments, lowering the money multiplier. From February 1948 through August 1949, however, the required reserve ratio was changed five times. It was altered again at the end of 1950 and the beginning of 1951. This reliance on changes in reserve requirements can be seen as a logical outgrowth of the policy developed in the 1930s in response to the problem of excess reserves.¹⁶

This is a change in focus from the conventional literature, which emphasizes bond-market intervention. There the Fed is described as purchasing bonds to limit the rise in yields when inflation accelerates. In our account, the Fed raises reserve requirements. There is no inconsistency. Higher reserve requirements induced the banks to sell bonds along with other investments in order to acquire reserves. The Fed purchased bonds for cash which the banks used as the basis for reserves.¹⁷ Although the monetary base rose, broader measures, such as M1, declined owing to the fall in the money multiplier.

We can use this approach to describe the course of events starting in 1946, when serious inflation pressures first surfaced.¹⁸ These pressures reflected the interplay of several factors. First, the failure of the anticipated postwar recession to materialize can be interpreted as a rise in the real interest rate. Investment demand remained strong throughout 1946. Managers attempted to add to capacity, given the exceptional buoyancy of sales. Automobiles, meat, and other consumer goods in short supply were rationed by higher real interest rates which encouraged consumers to defer expenditure (Fforde 1954, 150). Higher real interest rates reduced the demand for money and placed upward pressure on prices. Second, the supply of money expanded steadily during 1946. This reflected gold inflows and the rapid growth of virtually all categories of bank loans. (Both gold inflows and changes in the lending behavior of the banks are exogenous to our model.) Third, the Treasury retired a considerable quantity of debt over the course of the year (see fig. 5.9). This decline in private financial wealth can be thought of as reducing the demand for money, with further inflationary effects.¹⁹

Though concern over inflation mounted over the course of the year, it never reached the point where the Fed felt compelled to intervene. Investors apparently anticipated a deflation like that which had followed World War I; they did not question the Fed's ability to maintain the current low level of nominal short-term rates. As Goldenweiser characterizes the year, "Federal Reserve policy was essentially static with little done to counteract inflationary forces and little occasion to support the government security market" (1951, 199). In other words, prices had not yet risen to the point where they threatened to violate the upper bound of the implicit price-level target zone.

Worries mounted in 1947, however, as prices continued to rise. Various measures were proposed to restrain inflation. In the autumn, President Truman sent Congress a special message requesting the reimposition of price and wage

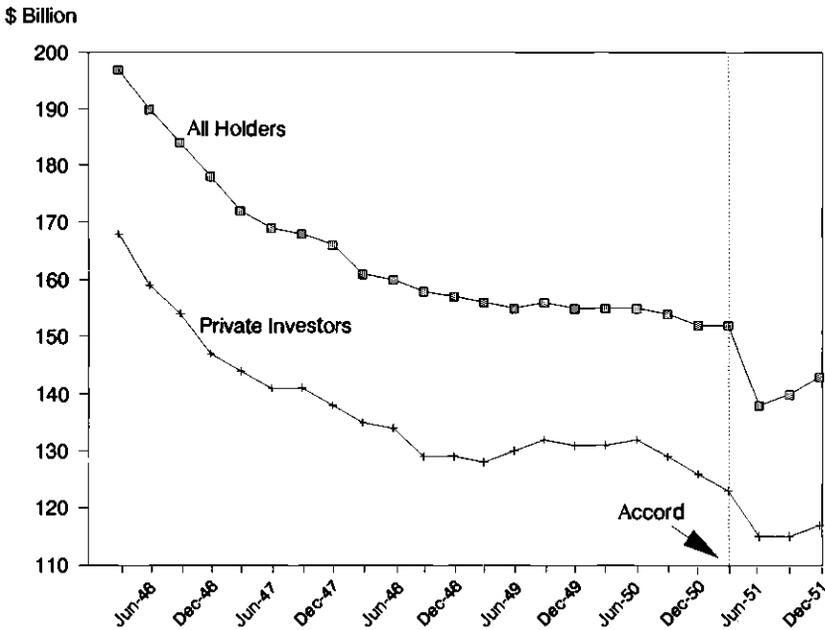


Fig. 5.9 Ownership of U.S. Government marketable securities, 1946-51

Source: Banking and Monetary Statistics (1971, 884, 887)

controls. Marriner Eccles, now chairman of the Federal Reserve Board, proposed a Special Reserves Plan that would have required commercial banks, members and nonmembers alike, to hold large new secondary reserves of Treasury bills.²⁰ Neither program was adopted. Congress found Truman's controls unpalatable. Others within the Fed, such as Allan Sproul, president of the Federal Reserve Bank of New York, thought that Eccles's plan to discourage bank lending risked initiating a recession.²¹ As in the previous year, there was little Fed intervention. According to Goldenweiser, "the Federal Reserve was still acting with great moderation" (1951, 199). Again, the implication was that the price level did not yet threaten to breach the upper bound of the zone.

Nineteen hundred forty-eight provided the first test of the Fed's commitment to limiting the level of prices (Karunatilake 1963, 108). Continued inflation provoked criticism of policy both within and outside the Federal Reserve System.²² The Fed then reduced the money supply by raising reserve requirements. In January, reserve requirements for banks in central-reserve cities were raised from 20 to 22 per cent of net demand deposits. Toward the middle of the year they were raised to 24 per cent. In August the Board was given permission by Congress to raise reserve requirements still further, which it did in September. Its press releases declared that, as on the previous two occa-

sions, the change was designed to combat inflation.²³ M1 declined sharply between 1948-I and 1948-II, and again between 1948-II and 1948-III (see fig. 5.10). This intervention can be thought of as keeping prices below the implicit upper bound of the zone.

The tightness of money owing to the Fed's intervention is widely credited with provoking or at least magnifying the recession that followed. The supply of liquidity made available through the banking system declined abruptly. Inflationary pressure subsided.

Through most of 1949, prices continued to fall. The Fed continued to sell bonds despite the decline of prices and interest rates. It is not clear why it did so. Karunatilake suggests that at the beginning of 1949 "the authorities were not keen to give up their policy of restraining inflation unless a major recession occurred" (1963, 111). In terms of the target-zone framework, one can view them as intervening to push the price level well below the upper bound of the zone.

Eventually the Fed began to intervene as if the price level was approaching the lower bound of its implicit target zone. Reserve requirements were reduced in early May and again at the end of the fiscal year when the temporary powers to increase required reserves granted in the autumn of 1948 expired. Margin requirements on security loans were reduced to 50 per cent and consumer credit regulation was relaxed. These initiatives stabilized M1 despite

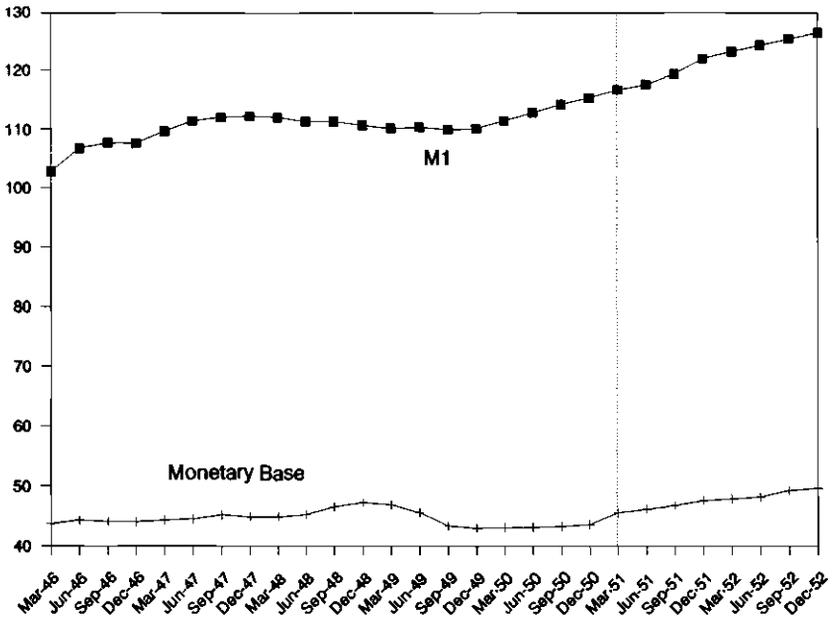


Fig. 5.10 M1 and monetary base

the continued decline of the monetary base. By the final quarter of 1949, M1 had once again begun to rise. (Again, see fig. 5.10.)

M1 rose steadily through 1950 and into early 1951 as commercial banks expanded their loan portfolios. Growing government budget deficits associated with the approach of the Korean War then began putting upward pressure on real interest rates. Markets were characterized by "a boom psychology which was unsurpassed since the end of the war in 1945" (Karunatilake 1963, 117). It became obvious that military expenditures would increase, and a wave of precautionary buying ensued in anticipation of shortages of consumer goods. As James Tobin remarked, "To a nation so recently schooled in the economics of war, Korea foretold both inflation and the eventual rationing, official or unofficial, of civilian goods" (1951, 197). All this implies rising real interest rates. As the demand for money fell, the consumer price index began to rise more rapidly than it had at any time since the end of 1947.

The Fed affirmed its support for "the Government decision to rely in major degree for the immediate future upon fiscal and credit measures to curb inflation."²⁴ It took steps to limit the rise in prices. It joined with other federal and state supervisory agencies, such as the Home Loan Bank Board, issuing a statement requesting banks to restrict their lending activities. In September it again placed restrictions on consumer installment credit. Finally, after some hesitation, it raised reserve requirements to 24 per cent. Once again the banks obtained the additional reserves by selling \$2 billion of government securities, most of which the System purchased.

Owing in part to this hesitancy, doubts arose about the Fed's commitment to maintain the price level within an implicit zone. Previously, when prices had risen, the market was dominated by expectations that the Fed would adopt measures to reduce them. These expectations of deflation, or at least of price stability, stabilized nominal interest rates. Now there was the fear that the imperative of mobilizing resources for the Korean War would preclude deflationary initiatives. "On balance, the scale is tipped heavily toward continued rapid inflation," commented *Business Week* in the first week of 1951 (6 January 1951, 28). Interest rates rose with inflationary expectations. The cap on interest rates was rendered inconsistent with foreign policy imperatives and their fiscal implications. Hence the negotiation of the Accord in 1951, which allowed the Fed to drop its interest-rate target.

5.5 Why Was the Fed Committed to a Price-Level Target Zone?

At the core of our analysis is the notion that the Fed was committed to limiting variations in the price level and, by preventing the emergence of persistent inflation, to stabilizing interest rates. But why should the Fed have been more concerned about price and interest-rate stability in the aftermath of World War II than in other periods?

A common answer, advanced at the time, was that the Federal Reserve Sys-

tem was forced by the Treasury to pursue policies consistent with low interest rates to minimize debt-service costs. This accusation was vehemently denied by System officials. They repeatedly asserted that they themselves were strong supporters of the policy of stabilizing prices and interest rates.²⁵

An alternative explanation is that the monetary authorities feared that a rise in interest rates would cause capital losses on commercial bank bond portfolios, undermining the stability of the banking system. System officials recalled the drastic decline of bond prices in 1920 and the difficulties this had created for the banks. They recalled also the deterioration of bond portfolios, especially those heavily weighted toward low-grade issues, in the 1930s, and their contribution to the 1930, 1931, and 1933 banking crises. They envisaged a crisis scenario in which a sudden rise in rates and decline in bond prices would lead panicky investors to throw their holdings on the market.²⁶ As the point was put in the Board of Governors' *Annual Report* for 1945:

A major consequence [of] increasing the general level of interest rates would be a fall in the market values of outstanding Government securities. These price declines would create difficult market problems for the Treasury in refunding its maturing and called securities. If the price declines were sharp they could have highly unfavorable repercussions on the functioning of financial institutions and if carried far enough might even weaken public confidence in such institutions.²⁷

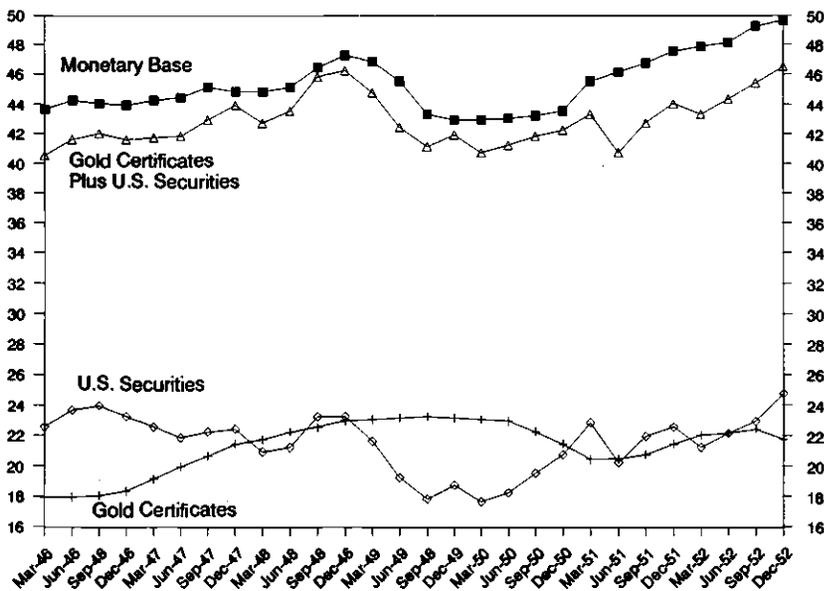


Fig. 5.11 Monetary base and Federal Reserve assets (in \$billion)

Or, as Whittlesey put the point, "The Reserve authorities would hardly dare to sell heavily in the open market or force up interest rates, for fear of depressing securities of the types held by member banks to such an extent as either to weaken the banks or to create undue alarm" (1946, 343-44).²⁸ Others warned against even moderate sales: "The impact effects of a falling bond market . . . could well be dangerous. Even a moderate fall would be unsettling to banks and might set off disorderly selling" (Seltzer 1945, 73).

Concern over capital losses on bond portfolios was no new phenomenon. The Fed had invoked this concern to help justify its bond-market intervention in the 1930s. But the banking system had grown increasingly vulnerable to declining bond prices as a result of its massive investments in government securities over the course of World War II. Moral suasion had been used to induce the banks to absorb debt issued during the war, while wartime disruptions had limited the scope for alternative investments. On 30 June 1945, the banks' government securities holdings came to \$82 billion, of which \$27.7 billion consisted of maturities of over five years (see table 5.1 for end-year figures). Bank capital was only \$8.6 billion. Thus, even a relatively small rise in interest rates could wipe out the banks' capital funds.

Table 5.1 shows bank holdings of government securities at the end of each year between 1945 and 1950. It is evident that the banks reduced their vulnerability to this source of interest-rate risk as the period progressed. The value of insured commercial bank holdings of Treasury securities fell absolutely, from nearly \$90 billion at the end of 1945 to little more than \$60 billion at the end of 1950, and even more dramatically as a share of bank capital, which had risen to \$11.4 billion by the middle of the latter year.²⁹ This is likely to have reduced the weight the Fed and other bank regulators attached to stable long-term rates.

The question is by how much this risk had been reduced. Table 5.2 reports the market value of bank Treasury security portfolios (net of bills maturing in fewer than twelve months) as a share of two measures of bank capital, both their actual value and under the counterfactual that Treasury security yields at each date doubled relative to their historical values.³⁰ The comparison over time confirms that the impact of higher interest rates on the value of bond portfolios declined quite significantly. At the end of 1945 a doubling of yields would have led to the loss of nearly 60 per cent of total capital; by the end of 1951 the comparable figure had declined to 30 per cent. (When a narrower measure of bank capital, total stocks, is considered, the comparable figures are 172 and 98 per cent, respectively.) Thus, it was logical that with the passage of time the Fed should have attached less weight to this concern. The calculations also suggest that fears that higher interest rates would leave the banks insolvent were somewhat exaggerated. Many of the long-term bonds held by the banks had been acquired in the 1930s or at the beginning of the 1940s and were approaching maturity. A doubling of yields would nearly

Table 5.1 Maturities of U.S. Government Obligations Held by Insured Commercial Banks, 1945-1951

December 31	Direct Marketable Issues										Guaranteed Marketable Issues	Nonmarketable Issues ^c
	Total	Bills ^a	Certificates ^a	Notes ^a	Bonds Maturing in: ^b				Over 20 years			
					5 years or less	5-10 years	10-20 years	Over 20 years				
Panel A: Amount (in millions)												
1951	\$60,599	\$7,223	\$ 7,536	\$11,274	\$19,645	\$ 7,024	\$3,055	\$2,335	\$21	\$2,486		
1950	61,047	4,122	1,937	16,774	22,594	7,737	2,987	2,554	11	2,331		
1949	65,847	3,692	12,488	5,812	27,278	7,692	4,461	2,409	6	2,009		
1948	61,407	2,822	10,068	3,395	19,374	15,114	6,581	2,059	8	1,986		
1947	67,960	2,124	7,555	5,920	18,341	22,202	7,534	2,654	14	1,616		
1946	78,575	1,272	12,293	6,781	12,728	29,700	6,597	3,008	15	1,181		
1945	88,933	2,456	19,075	16,047	9,030	32,230	6,092	2,787	22	1,194		
Panel B: Percentage Distribution												
1951	100.0%	11.9%	12.4%	18.6%	32.4%	11.6%	5.1%	3.9%	<.05%	4.1%		
1950	100.0	6.7	3.2	27.5	37.0	12.7	4.9	4.2	<.05	3.8		
1949	100.0	5.6	19.0	8.8	41.4	11.7	6.8	3.6	<.05	3.1		
1948	100.0	4.6	16.4	5.5	31.6	24.6	10.7	3.4	<.05	3.2		
1947	100.0	3.1	11.1	8.7	27.0	32.7	11.1	3.9	<.05	2.4		
1946	100.0	1.7	16.7	9.2	17.8	40.4	9.0	4.1	<.05	1.6		
1945	100.0	2.8	21.5	18.0	10.2	36.2	6.9	3.1	<.05	1.3		

Source: Annual Report of the FDIC (1951, 6).

^aTreasury bills are generally issued with maturities of 91 days; certificates of indebtedness have maturities of approximately 1 year; and Treasury notes are issued with maturities of from 1 to 5 years.

^bBased upon number of years to final maturity.

^cU.S. savings bonds, Treasury bonds (investment series A-1965), and depositary bonds. Prior to 31 December 1947, this item included U.S. savings bonds only. Depositary bonds were included with other U.S. bonds according to maturity.

Table 5.2 Value of Public Marketable Securities of at Least One Year to Maturity as a Ratio of Bank Capital, 1945-1951: Actual and Counterfactual Values

End of:	Actual Market Value		Counterfactual Market Value	
	Share of Total Capital	Share of Total Stocks	Share of Total Capital	Share of Total Stocks
1945	10.71	31.34	10.12	29.61
1946	8.47	24.46	7.83	23.53
1947	6.99	21.66	6.46	20.04
1948	5.84	18.48	5.46	17.28
1949	6.15	19.55	5.84	18.56
1950	5.25	17.00	4.91	15.91
1951	4.53	14.74	4.22	13.73

Source: Authors' calculations based on data drawn from *Treasury Bulletin* (various issues) and *Annual Reports* of the Federal Deposit Insurance Corporation (various issues).

Notes: Not including Canal bonds and other issues for which no maturity/coupon information was available. Valuations are based on the assumption that calls are exercised on the first eligible date. Total stocks are the sum of common and preferred issues. Total capital is the sum of total stocks, surplus, reserves for contingencies, and undistributed profits. A figure of 10.71, for example, means that the market value of bonds was slightly more than ten times the value of capital.

halve the value of a portfolio of bonds running many years to maturity; compared to this, the effects shown in table 5.2 are relatively modest.

Though by 1951 the banking system's vulnerability to capital losses had been considerably attenuated, it is an indication of the depth of the authorities' concern that, at the time of the Accord, steps were taken to minimize the extent of such losses. Following the Accord, bond yields immediately rose above 2.5 per cent. The Treasury stepped into the breach; through a bond conversion, it absorbed part of the losses that would have accrued to bondholders.

The Treasury offered the conversion to holders of the various issues of long-term bonds marketed in 1945. The conversion offer did not apply to all long-term bonds, though \$19 billion in such bonds were eligible. Marketable long-term bonds could be exchanged at par for nonmarketable Treasury bonds with 2.75 per cent yields. This was a 29-year bond callable in 24 years, so its maturity approximately matched those of the bonds to be converted. Since the bond was nonmarketable, some loss in liquidity offset the capital gain associated with the higher yield. Since the new bonds would be removed from the markets, the maximum potential magnitude of any future intervention by the Fed aimed at stabilizing long-term yields was therefore reduced. The new bond, however, was convertible on demand of the holder into a marketable five-year note paying a yield of 1.5 per cent. This would tend to protect the holder against large rises in bond yields during the life of the bond and minimize the value loss arising from its lack of liquidity.

The bond conversion proceeded as of 1 April 1951, as announced in prior Treasury circulars. Since bond yields rose to the range of 2.75 per cent, bondholders did manage to avoid capital losses. The Treasury absorbed the loss rather than the Fed. Supposing that the holders avoided the entire capital loss of 9 per cent, the Treasury must have absorbed a \$1.2 billion loss to keep its creditors whole.³¹

Commercial banks were permitted to convert only one of the bond issues covered by the conversion and only if they had acquired these bonds on original issue or held them in trading accounts.³² Otherwise, banks could not engage in this transaction. Of course, since they could market their bonds to insurance companies, banks could capture any positive value of the conversion offer.

The transaction was also aimed at insurance companies. Its magnitude is indicated in figure 5.12, which shows a fall in the amount of marketable Treasury bonds, from March to April 1951, of \$13.6 billion (from \$43.6 billion to \$30 billion). Of course, this decline was offset by an increase in nonmarketable debt in that same period, of \$13.5 billion of new convertible bonds.³³

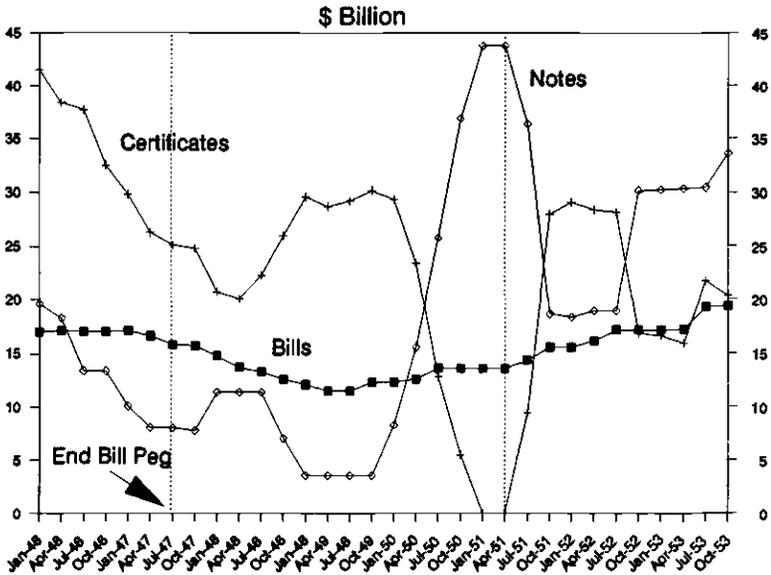
Insurance company holdings of long bonds dropped from March to June 1951, from \$11.2 billion to \$7.3 billion. Unspecified other private investors reduced their holdings from \$13.8 billion to \$10.5 billion. U.S. government agencies and trust funds reduced their holdings from \$5.5 billion to \$2.6 billion. Federal Reserve banks, which had been cumulating these long-term bonds, reduced their holdings from \$3.5 billion to \$1.4 billion.

5.6 Conclusions

In this paper we have analyzed U.S. monetary-financial policy in the turbulent aftermath of World War II. We have shown that the juxtaposition of periods of rapid inflation and deflation with stable nominal interest rates can be understood as a corollary of the Fed's implicit policy of maintaining a price-level target zone. Because the credible price-level target-zone regime decoupled inflation from inflationary expectations, interest rates were stabilized.

A deeper question is why the Fed adhered to this target-zone regime for prices and interest rates immediately after World War II but not in other periods. The explanation, we argue, lies in policymakers' perceptions of the threats to financial stability. In the aftermath of World War II, higher interest rates were perceived to pose a threat to the stability of the banking system. Only when the banks' exposure to bond-market risk had been reduced in the 1950s was policy reoriented to other targets. Our analysis of bank portfolios suggests that fears for the stability of the banking system may have been overdrawn. But it remains true that concern over financial stability, which originated in memories of widespread bank failures in the 1930s, provides the explanation for the singular policies pursued in the aftermath of World War II.

Treasury Bills, Certificates and Notes Outstanding



Treasury Bonds and Non-Marketable Debt Outstanding

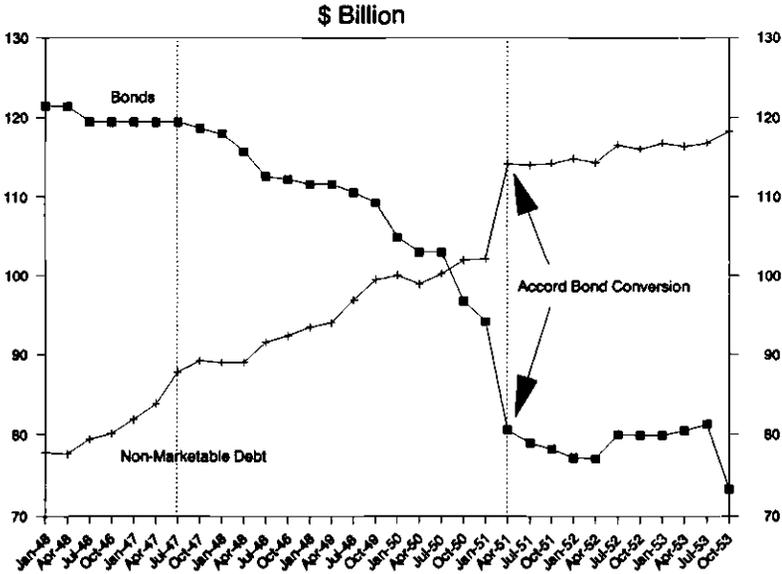


Fig. 5.12

Notes

1. Data on bank suspensions are provided by Simmons (1950, 12). Given the focus of the volume in which our paper appears, this may be thought of as an example of "the dog that didn't bark." But as shall be apparent momentarily, financial instability figures prominently in the analysis that follows.

2. *Annual Report of the Board of Governors Covering Operations for the Year 1937* (1938, 6).

3. *Ibid.*, 214.

4. *Ibid.*, 6–7.

5. These are the Board's words in its *Annual Report* for 1937 (1938, 7). The passage continued,

In recent years the bond market has become a much more important segment of the open money market, and banks, particularly money-market banks, to an increasing extent use their bond portfolios as a means of adjusting their cash position to meet demands made upon them. At times when the demands increase they tend to reduce their bond portfolios and at times when surplus funds are large they are likely to expand them. Since prices of long-term bonds are subject to wider fluctuations than those of short-term obligations, the increased importance of bonds as a medium of investment for idle bank funds makes the maintenance of stable conditions in the bond market an important concern of banking administration.

6. The Fed invoked both the need to exert a steadying influence on the capital market, which was necessary for economic recovery, and the need to safeguard the stability of the banking system. As the Board described its policy, "While the system has neither the obligation nor the power to assure any given level of prices or yields for Government securities, it has been its policy in so far as its powers permit to protect the market for these securities from violent fluctuations of a speculative, or panicky nature" (*Annual Report of the Board of Governors Covering Operations for the Year 1939* [1940, 5]).

7. Since sellers of Treasury bills to the Fed were also given the option to repurchase at a $\frac{3}{8}$ per cent yield, the bill yield was effectively pegged.

8. There is no convincing explanation of the decision to settle on $2\frac{1}{2}$ per cent. Britain had pegged consols at 3 per cent, and U.S. officials argued that superior U.S. credit justified somewhat lower rates. Two and a half per cent was close to the rate previously set by the market. It was an even rate, not a "hat size" like $2\frac{3}{8}$ or $2\frac{5}{8}$. One Treasury official later justified the rate as consistent with the yields required for solvency by life insurance companies. (Murphy 1950, chap. 8).

9. *Annual Report of the Board of Governors Covering Operations for the Year 1950* (1951, 2).

10. See Senate Subcommittee on Monetary, Credit, and Fiscal Policies (1950, 213–47 and *passim*).

11. Joint Committee on the Economic Report (1952, pt. 1, 74).

12. Krugman (1987, 1988, 1989) initiated this literature. Other papers include Miller and Weller (1988), Froot and Obstfeld (1989), Flood and Garber (1989), Svensson (1989) and Bertola and Caballero (1989).

13. This is the usual simplifying assumption in the target-zone literature. Feedback from nominal to real variables would greatly complicate the analysis of dynamics. Such a model would typically assume a relation between real variables and a sluggishly moving price level. In such a case, the price level becomes dependent on the path of the exogenous variable. Miller and Weller (1988) explore several such models but find

that closed-form solutions are not generally available. We do, however, allude to such feedback informally in section 5.4 below.

14. The change in r should be thought of as representing the evolution of not only real interest rates but also other variables, such as y , that affect the demand for money, and hence the price level.

15. An alternative hypothesis, which we do not explore here, is that the U.S. commitment to peg the price of gold at \$35 an ounce under the Bretton Woods System stabilized price expectations by placing implicit limits on the price level. While this hypothesis is readily incorporated into our target-zone framework, we do not believe that it is the essence of the matter. Given the ample gold reserves the United States possessed after World War II, a very wide range of price levels (and hence persistent expected inflation and highly variable interest rates) were consistent with the \$35 peg. This was less the case in the 1960s, when U.S. gold reserves had declined relative to foreign dollar liabilities. Evidence supporting our view may be found in the fact that interest rates became much more variable after February 1951, even though the same Bretton Woods System and \$35 gold price prevailed.

16. There were also other forms of intervention, as is clear from figure 5.9. We focus on changes in reserve requirements as the single most important form of intervention, an interpretation we hope to justify in the remainder of this section.

17. This combination of raising reserve requirements and buying bonds had the effect of swapping interest-yielding bank assets for reserves, thereby directly reducing bank income and raising the cost of liquidity across financial markets. Simultaneously, it benefited the Treasury; the Fed acquired relatively high yielding bonds either by expansion of its balance sheet or by partly sterilizing with sales of low-yielding bills and certificates.

18. Obviously, our analytical framework only applies to the period following the removal of general price controls in June 1946.

19. There is no contradiction with the standard logic that a reduction in the supply of debt places downward pressure on interest rates, since, as indicated in figure 5.7, as k rises and the price level increases, expected inflation and therefore nominal interest rates decline.

20. The amounts would have been 25 per cent against demand and 10 per cent against time deposits. See Joint Committee on the Economic Report (1948b, 139-44).

21. Treasury Secretary Snyder also opposed Eccles's plan. For Sproul's views, see Senate Committee on Banking and Currency (1947, 228-30).

22. See Senate Subcommittee on Monetary, Credit, and Fiscal Policies (1950, 40-108) for views on the question. Another source of concern was that nominal interest rates on long-term bonds rose to the cap established by the Fed and the Treasury. This is not a problem for our model, since immediately prior to an intervention to reduce the money supply, short-term rates should be low but long-term rates can be relatively high.

23. *Annual Report of the Board of Governors of the Federal Reserve System Covering Operations for the Year 1948* (1949, 85-86).

24. *Annual Report of the Board of Governors Covering Operations for the Year 1950* (1951, 2).

25. See, for example, the testimony of Thomas B. McCabe, chairman of the Board of Governors of the Federal Reserve System, in Senate Subcommittee on Monetary, Credit, and Fiscal Policies (1950, 21-90). Implicit in the bureaucratic model of the Fed developed by Toma (1982) is the view that the Fed was under pressure to compensate the Treasury for any increase in debt-service costs due to increases in interest rates. While this consideration may have figured in the particular 1947 episode with which Toma is concerned, we question whether it provided the Fed's dominant motivation over the entire period.

26. See, for example, Board of Governors, *Annual Report* for 1945 (1946, 7); *Federal Reserve Bulletin* (January 1948, 11); Joint Committee on the Economic Report (1948b, 140, 620); Joint Committee on the Economic Report (1948a, 101–2).

27. *Annual Report of the Board of Governors Covering Operations for the Year 1945* (1946, 7).

28. Sproul emphasized potential implications for credit supplies and economic activity: “A decline in prices of long-term Treasury bonds more than fractionally below par, under existing conditions, would throw the whole market for long-term securities—corporate and municipal, as well as federal—into confusion. . . . Flotations of long-term securities would be made very difficult if not impossible, until the market became stabilized at a new level” (Joint Committee on the Economic Report 1948a, 101).

29. Data are from *Banking and Monetary Statistics*, table 13.5 (Board of Governors 1971).

30. For example, if certificates were yielding 1.25 per cent while 20-year bonds were yielding 2.42 per cent, we assume that their yields rose to 2.50 and 4.84 per cent, respectively. Bills are omitted for lack of comparable information on coupons and yields. Given their short maturity, capital losses on bills should be of little consequence.

31. For a detailed description of these bonds, see Treasury Department Circular no. 883 (26 March 1951). If the conversion involved a transfer of this magnitude, it is unclear why the entire eligible issue was not converted. About \$5 billion of eligible long bonds remained outstanding after the conversion offer, but it is not clear from the evidence who held them.

32. These were bonds which matured on 15 December 1972, issued in November 1945.

33. See *Banking and Monetary Statistics*, vol. 3, table 13.3 (Board of Governors 1971).

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