

The Phases of U.S. Monetary Policy: 1987 to 2001

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Inflation was relatively well behaved in the 1990s in comparison with preceding decades, yet Federal Reserve monetary policy was no less challenging. The Fed took painful actions in the late 1970s and early 1980s to reverse rising inflation and bring it down, and inflation fell from over 10 percent to around 4 percent by the mid-1980s. The worst economic ills stemming from high and unstable inflation were put behind us. Yet central bankers and monetary economists recognized that more disinflation was needed to achieve price stability. The transition to price stability was expected to be comparatively straightforward. Monetary policy promised to become more routine. Although the 1990s saw the longest cyclical expansion in U.S. history, the promised tranquility did not materialize. In many ways the period to be chronicled here proved to be about as difficult for monetary policy as the preceding inflationary period.

My account of Fed monetary policy divides the period since 1987 into six distinct phases. This division is natural because in each phase the Fed was confronted with a different policy problem. Phase 1 begins with rising inflation in the aftermath of the October 1987 stock market crash and ends with the start of the Gulf War in August 1990. Phase 2 covers the 1990–1991 recession, the slow recovery, and the disinflation to the end of 1993. Phase 3 tells the story of the Fed’s preemptive tightening against inflation in 1994–1995. Phase 4 deals with the long boom to 1999, the near full credibility

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for low inflation, and rising trend productivity growth. Phase 5 addresses the tightening of monetary policy to slow the growth of aggregate demand in 1999 and 2000. The sixth phase chronicles the collapse of investment in late 2000 and the recession in 2001.

The article presents a relatively compact account of the interaction between interest rate policy and the economy since 1987. It provides the minimum of descriptive detail needed to understand monetary policy during the period. The situations that confronted the Fed were remarkably varied. Nevertheless, the Fed's policy actions can be understood and interpreted as supporting the primary objectives of monetary policy, which were the same throughout. First of all, the Fed aimed to achieve and maintain credibility for low inflation. Second, the Fed managed interest rate policy so that the economy could attain the full benefits of rising trend productivity growth. Third, the alleviation of financial market distress dictated interest rate policy actions on occasion. Fourth, the Fed steered real short-term interest rates sharply lower when economic stimulus was needed. The story of how monetary policy pursued these objectives follows.

1. OCTOBER 1987–JULY 1990: RISING INFLATION AND THE STOCK MARKET CRASH

From Wednesday, 14 October 1987, through the close of trading on Monday, 19 October, the Dow Jones Industrial Average lost about 30 percent of its value. On Monday alone, the Dow lost 23 percent. Not since October 1929, when the Dow lost around 25 percent in two consecutive days, had a sudden collapse of equity values been so great.¹

The Fed responded to the October 1987 stock market crash in a number of ways. For our purposes, its most important responses were these. The Fed accommodated the increased demand for currency and bank reserves with extensive open market purchases. It also dropped its federal funds rate target from around 7.5 percent to about 6.75 percent.

Central bankers now know that sufficiently stimulative monetary policy might well have averted the deflation and depression of the 1930s. The Fed made sure that monetary policy was sufficiently stimulative to avert another catastrophe. The Fed was concerned about the resulting risks to price stability, noting that its actions should not be seen as inflationary.²

As it turned out, inflation rose in 1988, 1989, and 1990 in spite of the fact that the Fed had put the economy through a severe recession in the early 1980s to restore price stability. Core CPI inflation rose from around 3.8 percent in 1986 to 5.3 percent in 1990. Employment cost inflation rose from around

¹ This paragraph is heavily paraphrased from the Brady Report (1988, 1).

² Greenspan (1988, 218).

3 percent in 1986 to over 5 percent in 1989, even as productivity growth averaged less than 1 percent from 1986 to 1990. The unemployment rate fell from around 7 percent in 1986 to 5.3 percent in 1989. Annual average unemployment below 5.5 percent had not been seen since 1973.

Part of the problem was that inflationary pressures began to build well before October 1987. Rising inflation expectations were already evident in the 30-year bond rate, which rose by 2 full percentage points from around 7.5 percent to 9.6 percent between March and October of 1987.³ Surprisingly, the Fed reacted relatively little to the 1987 inflation scare. The Fed's failure to respond created doubts that it would hold the line on inflation, much less push on to price stability. The bond rate did not fall back to the 7.5 percent range until late 1992, reflecting the slow restoration of credibility for low inflation that was lost in the second half of the 1980s.

In short, by mid-1987 there was sufficient reason for the Fed to tighten policy preemptively against inflation. And the Fed raised the discount rate from 5.5 percent to 6 percent in September soon after Alan Greenspan replaced Paul Volcker as Fed Chairman.⁴ But the October stock market crash intervened before policy could be tightened further.

All in all, it seems fair to say that monetary policy restraint was delayed by a couple of years because the Fed was reluctant to act against inflation both before and after the crash of October 1987. By the time the Fed felt it was safe to tighten monetary policy further, it needed to counteract inflationary forces that were already well entrenched. As had been the case in the inflationary go/stop era, the restoration of credibility for low inflation after it was compromised required the Fed to raise real short rates higher than otherwise, with a greater risk of recession.

Beginning in the spring of 1988, the Fed began to raise the funds rate from the 6 to 7 percent range to nearly 10 percent in March 1989. With core CPI inflation then running at about 4.5 percent, that sequence of policy actions increased real short rates by over 3 percentage points to more than 5 percent. Real GDP growth slowed from about 4 percent in 1988 to 2.5 percent in 1989. In response the Fed dropped the funds rate to around 7 percent by late 1990. However, by then core CPI inflation was running at 5.3 percent, well above its mid-1980s average.

³ Ireland (1996) shows quantitatively why a significant change in the long bond rate is likely to represent a change in inflation expectations rather than a change in the expected real rate. Goodfriend (1993) gives an account of inflation scares in the bond market during the 1980s.

⁴ The 1987 inflation scare may have reflected doubts about the credibility of Volcker's unknown successor.

2. AUGUST 1990–JANUARY 1994: WAR, RECESSION, AND DISINFLATION

The August 1990 Gulf War dealt a severe blow to the U.S. economy. It would take until March 1991 for U.S. ground forces to eject Iraqi troops from Kuwait and stabilize the region. The ground war went as well as could have been expected, lasting only 100 hours. But the outcome appeared to be in doubt until a few hours before the war was won. Consequently, uncertainty greatly affected the economy for nearly eight months. In August 1990 oil prices quickly spiked up from about \$15 per barrel to over \$35, falling back only gradually by early 1991. Households and businesses showed an inclination to postpone spending until the outcome of the war became clear. These supply and demand shocks caused economic activity to contract in the fall of 1990 through the first quarter of 1991. The National Bureau of Economic Research dates the 1990 recession from July 1990 to the trough in March 1991.

Monetary policy could do little to avert a recession during the Gulf War. Policy actions take time to act on the economy. Moreover, the war occurred at a time when the Fed's credibility for low inflation had been compromised. As mentioned above, core CPI inflation rose from 3.8 percent in 1986 to 5.3 percent in 1990. And the Fed risked an inflation scare in the bond market if it cut the federal funds rate too sharply. Even so, the Fed brought the federal funds rate down from just above 8 percent at the start of the Gulf War to just under 6 percent at its close in the spring of 1991.

As a result of the restrictive policy actions undertaken by the Fed prior to the Gulf War and the war-related recession itself, inflation began to recede. Core CPI inflation decreased to 4.4 percent in 1991. The recovery from the recession trough in March 1991 proved to be slow in part because the recession itself was mild. The unemployment rate rose only a little more than 1 percentage point during the recession itself, from 5.5 percent in July 1990 to 6.8 percent in March 1991. Even though real GDP growth snapped back to 4 percent in 1992 from 0.8 percent growth in 1991, the unemployment rate continued to climb, peaking at 7.8 percent in June 1992. This was known as the "jobless recovery."

The Fed reacted by steadily reducing the federal funds rate from 6 percent in mid-1991, to 4 percent by the end of 1991, to 3 percent by October 1992, where it stayed until February 1994. Inflation fell as well, to around 3 percent by 1992. The nominal federal funds rate cut partly reflected the 1 1/2 percentage point fall in inflation and partly represented a 1 1/2 percentage point cut in the real federal funds rate, bringing the real rate to approximately zero.

Four factors account for the highly stimulative policy stance. First, the high and rising unemployment rate was a concern. Second, the banking system was undercapitalized in many areas of the country. Bank loans were expensive and somewhat more restricted than usual. Third, inflation had been brought down to around 3 percent, 2 percentage points below where it was in 1990, and

about 1 percentage point below where it had been in the mid-1980s. Fourth, the gains against inflation restored the Fed's credibility enough that it could comfortably risk moving to a zero real federal funds rate to stimulate aggregate demand and job growth.

The zero real short rate remained in place for about 18 months, until February 1994. During that time the unemployment rate fell from 7.8 percent to 6.6 percent. The inflation rate fell slightly. The long bond rate fell from around 7.5 percent in October 1992 to around 6 percent at the end of 1993. The lower bond rate may have been the result of a weak economic expansion and progress against the Federal budget deficit made at the time. The bond rate also probably reflected the acquisition of credibility for low inflation won by the Fed as a consequence of disinflationary policy actions taken since 1988.

3. FEBRUARY 1994–FEBRUARY 1995: PREEMPTING RISING INFLATION

The economic expansion gathered strength in late 1993. The zero real federal funds rate was no longer needed and would become inflationary if left in place. The Fed began to raise the federal funds rate in February 1994, taking it in seven steps from 3 percent to 6 percent by February 1995. Inflation showed little tendency to accelerate and remained between 2.5 percent and 3 percent. Thus, the Fed's policy actions took the real federal funds rate from zero to a little more than 3 percent. The move raised real short-term interest rates to a range that could be considered neutral to mildly restrictive. In spite of the policy tightening, real GDP grew by 4 percent in 1994, up from 2.6 percent in 1993, and the unemployment rate fell from 6.6 percent to 5.6 percent from January to December 1994.

The policy tightening in 1994 succeeded in its main purpose: to hold the line on inflation without creating unemployment. The unemployment rate moved up only slightly to 5.8 percent in April 1995 and then began to fall again. The 1994 tightening demonstrated that a well-timed preemptive increase in real short-term interest rates is nothing to be feared. In this case, it was needed to slow the growth of aggregate demand relative to aggregate supply to avert a build up of inflationary pressures. By holding the line on inflation in 1994, preemptive policy actions laid the foundation for the boom that followed.

Preemptive policy in 1994 was motivated in part by the large increase in the bond rate beginning in October 1993. Starting from a low of 5.9 percent, the 30-year bond rate rose through 1994 to peak at 8.2 percent just before election day in November. The nearly 2 1/2 percentage point increase in the bond rate indicated that the Fed's credibility for low inflation was far from

secure in 1994. By January 1996 the bond rate had returned to around 6 percent and journalists were talking about the “death of inflation.”⁵

Talk of the death of inflation was reassuring. It indicated that the Fed’s preemptive actions had anchored inflation and inflation expectations more securely than ever before. This helps to explain why later in the decade the unemployment rate could fall to 4 percent with little inflationary wage and price pressure. However, the death-of-inflation talk was also disappointing because it tended to undervalue the role played by the Fed in “killing” inflation. The actions taken in 1994 were a textbook example of a successful preemptive campaign against inflation. It is discouraging that even then, the public should misunderstand the crucial role played by the central bank in containing inflation. If inflation is to be contained permanently, the idea that inflation doesn’t just “die” but must be periodically vanquished by proactive interest rate policy is one that the public must appreciate more fully.

The preemptive tightening in 1994 was difficult for the Fed even though it was clearly needed. Beginning with the 25 basis point increase in the federal funds rate in February 1994, the Fed started to announce its current intended federal funds rate target immediately after each FOMC meeting. This new practice made Fed policy more visible than ever. Every increase in the federal funds rate target since then has attracted considerable attention.

Transparency of the Fed’s interest rate target is a good thing because it improves the public’s understanding of monetary policy. However, since 1994 the Fed has operated with a transparent federal funds rate target and somewhat opaque medium- and longer-term goals.⁶ The Federal Reserve Act does not specify how the Fed is to balance medium- or longer-term objectives for inflation, economic growth, and employment. And the Fed does not clarify its medium- or long-term objectives as well as it could. Its interest rate policy actions are scrutinized more than they would be if the Fed were more forthcoming about its objectives.

Part of the problem is that the Fed is naturally unwilling to specify its objectives more clearly without direction from Congress. And Congress has been unable to agree on a mandate for the Fed that would result in clarification. The Fed has been operating without a clear mandate from Congress since the collapse of the gold standard and the Bretton Woods fixed exchange rate system in 1973. Under these circumstances, announcing the federal funds rate target increases the potential for counterproductive disputes between Congress and the Fed.

One such dispute broke into the open in 1994 when Congress objected to the Fed’s preemptive increase in interest rates and took the unprecedented step of inviting all 12 Reserve Bank presidents to explain their views before

⁵ See, for instance, Bootle (1996).

⁶ See Broadus (2001).

the House and Senate banking committees. Legislation that would remove the presidents from the FOMC was considered at the time on the grounds that the presidents were thought to favor excessively tight monetary policy. The net effect of this very public dispute was to create doubt about the Fed's ability and willingness to take the tightening actions necessary to hold the line on inflation. The public dispute between the Fed and Congress probably contributed to the severity of the 1994 inflation scare in the bond market.

4. JANUARY 1996–MAY 1999: THE LONG BOOM

In many ways managing interest rate policy was more difficult in the last half of the 1990s than in the first half. Two major factors complicated interest rate policy in the period from 1996 to 1999. First, the Fed had to learn to operate with near full credibility for low inflation, credibility it had secured with its successful preemptive policy actions in 1994. Second, the Fed had to deal with rising productivity growth. Both complications benefited the economy greatly. The Fed worked for almost two decades to achieve price stability. Economists had long hoped that advances in computer and information technology would bring an end to the productivity slowdown dating from the mid-1970s. Nevertheless, both developments challenged monetary policy in ways that were not anticipated. This section reviews the developments themselves and points out their complications for monetary policy. It concludes with an assessment of interest rate policy actions taken by the Fed during the period.

Near Full Credibility for Low Inflation

When near full credibility for low inflation is newly won, both the central bank and the public tend to overestimate the economy's noninflationary potential output. In other words, both are inclined to be fooled by the central bank's credibility for low inflation in a way that restrains interest rate policy actions that may be necessary to sustain that very credibility. Even if inflation and inflation expectations remain firmly anchored, there is a risk that interest rate policy actions will be insufficient to head off an unsustainable real boom followed by a painful period of adjustment.⁷ The nature of this risk is detailed below with reference to the long boom from 1996 to 1999.

When credibility for low inflation is secure, labor markets can get surprisingly tight without triggering inflationary wage pressures. Workers are less inclined to demand inflationary nominal wage increases because they have confidence that firms will not push product prices up. And firms are more inclined to hold the line on product price increases even if labor costs begin to

⁷ Goodfriend (2001) and Taylor (2000) explore this sort of logic.

rise. Firms and workers have confidence that any excess of aggregate demand over potential output will be temporary, reversed by sufficiently restrictive subsequent interest rate policy actions. Confidence in the central bank can enable the economy to operate above potential output for a while with little or no increase in inflation.

With inflation and inflation expectations firmly anchored, a central bank will be more inclined to delay monetary tightening when the economy moves above its presumed noninflationary potential level of output. It could take more time to discern whether an excess of aggregate demand is temporary or persistent before it responds with tighter monetary policy. When there is evidence of a rising trend in productivity growth, a central bank could explore the possibility that faster growth of aggregate demand might be accommodated without inflation.

The Fed's very success in anchoring inflation and inflation expectations meant that traditional indicators of excessive monetary stimulus became less reliable.⁸ Inflation as measured by the core CPI ranged between 2 percent and 3 percent for the remainder of the decade. Price stability was maintained even though real GDP grew at around 4.4 percent per year from 1996 through 1999, and the unemployment rate fell from 5.6 percent in January 1996 to 4 percent, a rate not seen since 1970.

Clearly, near full credibility for low inflation helped the economy to operate well beyond a level that would have created concerns about inflation in the past. Real indicators of incipient inflation such as the unemployment rate became less useful as guides for interest rate policy. Moreover, the bond market was less inclined to exhibit inflation scares. After having peaked at 8.2 percent in late 1994, the 30-year bond rate returned to levels below 7 percent and moved in a range between 5 percent and 6 percent in the last two years of the decade. This development recalled the bond market of the late 1960s, which was confident that inflation would remain low even after economic activity moved above what was then considered its noninflationary potential.

Nominal money growth also became less reliable as an indicator of inflation. Growth temporarily in excess of historical standards might be needed to accommodate an increased demand for money due to lower nominal interest rates and growing confidence in the stability of the purchasing power of money. Even truly excessive money growth might not cause inflation if the public believed that the Fed would tighten policy to reverse inflationary money creation before too long.⁹

If the public comes to think that the economy has become "structurally" less prone to inflation, i.e., that "inflation is dead," then the risk of an unsustainable boom increases still further. Excessive optimism encourages households

⁸ These informational problems add to the real-time data problems analyzed in Orphanides (2001).

⁹ Taylor (2000) emphasizes this possibility.

and firms to expect unrealistically high future real income prospects, triggering an unsustainable spending binge. Spending is encouraged further if the central bank appears to buy into the optimism by not raising interest rates as aggregate demand accelerates. Excessively optimistic expectations for the economy's productive potential would be reflected in a run-up in equity prices, real estate values, and asset prices in general. The risk of precipitating a collapse of asset prices would in turn make a central bank more cautious than otherwise in tightening interest rate policy.

Rising Productivity Growth

From 1986Q1 until 1990Q4 nonfarm business productivity growth averaged only 0.8 percent per year, reflecting the ongoing slowdown in productivity growth that began in the mid-1970s. In the next five years productivity growth rose to 1.7 percent per year, and from 1996Q1 to 2000Q4 productivity grew on average by 2.4 percent per year. In other words, productivity growth tripled over this 15-year period. In the late 1990s it was possible to argue that the burst of productivity growth was only temporary and would soon fall back to 2 percent or less. But it was just as reasonable to argue that productivity growth would move even higher for a while as the economy continued to find new ways to employ advances in communications and information technology.

The trend productivity growth rate has enormous implications for standards of living, for perceived lifetime income prospects, and for current spending. When productivity grows at 1 percent a year, national per capita product doubles roughly every 70 years. If productivity grows at 2 percent per year, then per capita product doubles in 35 years and quadruples every 70 years. Sustained 3 percent productivity growth would double per capita income in 23 years, quadruple it in 46 years, and result in an eightfold increase in around 70 years. This last possibility seems unlikely; but sustained productivity growth between 2 percent and 2.5 percent per year well into the 21st century would match the 2.3 percent average productivity growth rate that the United States sustained between 1890 and 1970.¹⁰ These figures indicate the tremendous long-term potential that many saw in the U.S. economy in the last half of the 1990s—and still see in spite of the 2001 recession.

Real wages began to rise during the 1990s after stagnating during the productivity slowdown period. Households could count on the fact that throughout U.S. history, per capita productivity growth was transmitted to real wage growth as firms competed for ever more productive labor. Firm profits and equity values would benefit initially from the installation of more productive technology. But as the installation of that technology became widespread,

¹⁰ See Romer (1989, 56).

firms would be forced to pay up for the more productive labor. Thus, the profit share of national income rose during the 1990s, but it could be expected to return to historic norms once real wages caught up. Whether the increase in income took the form of rising profits or wages, its underlying source was the rising trend in productivity growth.

In short, the period from 1996 to 1999 was characterized by an optimism about future income prospects. This optimism gave rise to an expansion in investment and productive capacity by firms matched by an increasing willingness of households to absorb the output that the growth of productive potential made possible.

Rising productivity growth had two critical implications for monetary policy. First, rising productivity growth reinforced the perception that the economy was inflation-proof and provided an argument against more restrictive monetary policy. For a while, rising productivity growth more than offset the rising nominal wage growth associated with tight labor markets. The problem for monetary policy was that trend productivity growth was not likely to rise much above 2.5 percent or 3 percent per year. And productivity was already growing in that range by 1998. There was less reason to think that nominal wage growth would stop rising if labor markets remained as tight as they became during the period. Rising productivity growth might hold unit labor costs and inflation down for a while, but at some point unit labor costs would begin to rise, necessitating tighter monetary policy.

Second, although *rising* productivity growth made the economy more inflation-proof in the short run, *higher* trend productivity growth would require higher real interest rates in the long run. The reason is this. At initial real interest rates, households are inclined to borrow against their improved future-income prospects to spend some of the proceeds today. Also, firms are inclined to invest more in plant and equipment to profit from improved productivity. In the aggregate, however, households and firms cannot bring goods and services from the future into the present because the future productivity growth has not yet arrived.¹¹ In such circumstances, firms accommodate the growth in aggregate demand in excess of current productivity growth by hiring more labor to meet the demand.¹² Labor markets become increasingly tight, and the economy overshoots even its faster sustainable growth path.

To enable the economy to grow faster without inflation, the central bank would have to maintain higher short-term real rates on average over time to make households and firms sufficiently patient to defer their spending to the future. Higher short- and long-term real rates bring aggregate demand down

¹¹ In part, the United States satisfied its demand for goods and services in excess of current output by importing capital from abroad (where growth prospects were not as bright) and running a current account deficit.

¹² See Goodfriend and King (1997) for a discussion of the macromodel underlying the analysis here and elsewhere in the article.

to potential output so that both can grow together and the employment rate is neither expanding nor contracting over time. In short, when an economy enjoys an increase in the rate at which productivity can grow over the long run, it requires permanently higher real interest rates on average to offset the inclination of the public to spend the proceeds prematurely.¹³

The problem for U.S. monetary policy during the period from 1996 to 1999 was to ascertain the timing and magnitude of the increase in real interest rates necessary to allow the economy to transition to a higher growth path without creating imbalances in labor utilization that could lead to an outbreak of inflation or an unsustainable expansion of real activity. This policy problem was particularly formidable because it had to be solved even as near full credibility for low inflation and rising productivity growth made the economy appear to be more inflation-proof than ever.

Interest Rate Policy 1996–1999

The Fed changed its federal funds rate target relatively little from January 1996 through June 1999. The funds rate was held at 5.25 percent for over a year from January 1996 until March 1997, when it was raised to 5.5 percent. The funds rate was then held constant for another 18 months at 5.5 percent until the fall of 1998, when it was cut by 75 basis points in three 25 basis point steps in September, October, and November in the aftermath of the Russian debt default. Core CPI inflation averaged between 2 percent and 2.5 percent during the entire period, so the real short rate was around 3 percent, except when it was lowered by 75 basis points in the fall of 1998.

The single 25 basis point adjustment in March 1997 was made as the economic expansion gathered momentum. By moving in March 1997, the Fed signaled that it was poised to act if necessary to restrain inflationary growth. However, the Fed declined to raise interest rates further for two years because two world financial crises intervened: the 1997 financial crisis in East Asia and the 1998 financial crisis following the Russian default. Alleviating financial market distress became a primary focus of monetary policy in each case.

The Fed did not actually cut its funds rate target in the second half of 1997 in response to the East Asian crisis, but it probably deferred tightening policy. The 75 basis point cut in the funds rate following the Russian default moved short-term interest rates in the opposite direction from that which would ultimately be needed to stabilize the U.S. economy. As was the case in the aftermath of the October 1987 stock market crash, the two financial crises in

¹³ For log utility, the real interest rate must rise by the increase in the productivity growth rate.

1997 and 1998 helped to delay a necessary policy tightening by as much as two years.

However, my reading of the forces acting on monetary policy during the boom—near full credibility and rising productivity growth—suggests that even without the two financial crises, the Federal Reserve would have been reluctant to tighten monetary policy very much between 1996 and 1999. Not only was inflation under control, but there was great uncertainty about the magnitude and timing of the interest rate policy actions needed to enable the economy to transition to a higher growth path without inflation. Under the circumstances, the Fed chose to wait before tightening very much until the need for restrictive policy became more obvious.¹⁴

5. JUNE 1999–DECEMBER 2000: RESTRAINING THE GROWTH OF DEMAND

By the second half of 1999, the pool of available workers—unemployed plus discouraged workers—looked to be approaching an irreducible minimum, and the growth of aggregate demand in excess of plausible potential GDP tightened labor markets further. If real interest rates were kept too low, then the expansion would end in one of two ways. The Fed could lose its credibility for low inflation and the expansion would end as it had so often in previous decades, with rising inflation, an inflation scare in bond markets, and a policy tightening sufficient to restore credibility for low inflation. Alternatively, if the Fed's near full credibility for low inflation held fast, then rising unit labor costs would result in a profit squeeze, lower equity values, a collapse in investment, and slower growth of consumer spending.

Real GDP grew by a spectacular 4.7 percent and 8.3 percent in Q3 and Q4 of 1999, and the unemployment rate drifted down from 4.3 percent in early 1999 to 4 percent by the end of the year. The extraordinary growth of aggregate demand outstripped even the high accompanying productivity growth rates of 3 percent and 7.4 percent, respectively.

Clearly, real short rates needed to move up further. The Fed reversed the 75 basis point easing of policy it had undertaken the previous autumn with three 25 basis point steps in June, August, and November of 1999. It also raised its federal funds rate target by another percentage point between November 1999 and May 2000 to 6.5 percent, where it was held until January 2001.

With core CPI inflation running at about 2.5 percent, real short rates were roughly 4 percent. By comparison with other occasions of concerted monetary

¹⁴ A new literature considers whether asset prices should help guide interest rate policy. See Bernanke and Gertler (2000), Borio and Lowe (2001), Cecchetti et al. (2000), Goodfriend (2002), and Goodhart (1995).

tightening, the real interest rate was not then particularly high. In part, this was due to the fact that the Fed had not yet lost credibility for low inflation and so did not need higher real rates to bring inflation down. The 4 percent real rate seemed to be enough as real GDP growth in 2000Q1 slowed from the previous quarter by 6 percentage points, to 2.3 percent. However, real growth accelerated again to 5.7 percent in 2000Q2 and the Fed stayed with its 6.5 percent funds rate target. Real GDP growth in Q3 again slowed, to 1.3 percent, but the Fed needed another quarter of evidence that the slowdown would be sustained. That confirmation was received in late 2000 and early 2001, when it became clear that real GDP grew by around 2 percent in 2000Q4.

6. JANUARY 2001–PRESENT: THE COLLAPSE OF INVESTMENT AND THE 2001 RECESSION

The problem for monetary policy in 2001 was that real GDP growth failed to find a bottom and continued to fall, from 1.3 percent in Q1, to 0.3 percent in Q2, to –1.3 percent in Q3. Personal consumption expenditure growth held up better, slowing from 3 percent, to 2.5 percent, and to 1 percent, respectively, in the first three quarters of 2001. In part, consumer spending held up reasonably well because the unemployment rate rose relatively slowly from a very low 4 percent at the end of 2000 to 4.6 percent by July 2001. The comparatively tight labor market continued to provide a sense of job security and robust real wage growth that supported consumer confidence.

The primary drag on growth in 2001 came from nonresidential fixed investment and inventory liquidation. Investment in equipment and software grew much faster than GDP during the boom years. Advances in information processing and communication technologies led investment in equipment and software to rise from about 6 percent of real GDP in 1990 to a peak of around 12 percent of real GDP in mid-2000. Real nonresidential (business) fixed investment, which includes nonresidential structures as well as equipment and software, grew at around 10 percent per year from 1995 until 2000. Growth in business investment collapsed to near zero in 2000Q4 and 2001Q1 and then contracted at more than a 10 percent annual rate in Q2 and Q3 of 2001.

The swing in inventory accumulation compounded the growth slowdown in 2001. After accumulating at an annual rate of \$79 billion, \$52 billion, and \$43 billion dollars in Q2, Q3, and Q4 of 2000, inventories were liquidated at an annual rate of \$27 billion, \$38 billion, and \$62 billion in the first three quarters of 2001, respectively.¹⁵

The developments outlined above reflect the fact that the economy overshoot its sustainable growth rate in the late 1990s. Much capacity put in place

¹⁵ GDP is around \$10 trillion, so \$100 billion is about 1 percent of U.S. GDP.

during the boom began to look excessive once the growth rate slowed. Higher trend productivity growth would eventually enable the economy to absorb that capacity, but not as soon as had been believed. Moreover, rising unemployment in the manufacturing sector caused a secondary collapse of demand that threatened to spill over to the services sector. The rising unemployment rate caused consumers throughout the economy to become more cautious, weakening aggregate demand further. This, in turn, gave businesses an additional reason to put investment plans on hold.

Financial factors significantly amplified the overshooting in investment and the painful adjustment thereafter. Excessive equity values cheapened equity finance during the boom years, and the collapse of equity values raised the cost of equity finance during the slowdown. Likewise, high net worth facilitated external debt finance during the boom, and the loss of net worth raised the cost of external debt finance thereafter. Moreover, investment could be financed readily with internally generated funds during the boom, but the decline of profits during the slowdown caused firms to become more reliant on external finance even as it became more costly.

Recognizing the contractionary forces described above, the Fed cut its federal funds rate target in 11 steps from 6.5 percent at the beginning of 2001 to 1.75 percent in December 2001. Core CPI inflation did not change much during the year, so the policy actions translated into a 4 3/4 percentage point cut in real short-term interest rates. This was a relatively large reduction in the real federal funds rate in so short a time by historical standards, though not when one considers that real GDP grew at around 5.25 percent in the year through 2000Q2 and grew at less than 1 percent in 2001. Real short rates were then negative according to the core CPI inflation rate, which was running at about 2.5 percent. The Fed was able to cut the real federal funds rate so far without precipitating an inflation scare because of the near full credibility for low inflation.

The 11 September 2001 destruction of the World Trade Center in New York made matters worse. Data for October indicated a sharp drop in consumer confidence, and a further contraction in the manufacturing sector. Most striking, roughly 800,000 jobs were lost in October and November combined. The rise in the unemployment rate in September, October, and November was the fastest three-month increase since 1982, bringing the cumulative rise since January to about 1 3/4 percentage points. In November 2001 the National Bureau of Economic Research officially declared that the United States had been in a recession since March.

The big jump in the unemployment rate had the potential to undermine consumer confidence. The unemployment rate in the United States rose sharply by at least 2 percentage points on five occasions since 1960: during and following the recessions of 1960–1961, 1969–1970, 1973–1975, 1981–1982, and 1990–1991. The cumulative rise during the 1980 recession was just 1.5

percentage points.¹⁶ The unemployment rate rose by 4.2 percentage points in 1973–1975, and by 3.6 percentage points in 1981–1982.

The big jump in unemployment carried a second risk: historically, sharply rising unemployment has been associated with falling inflation. For instance, when the unemployment rate rose by 3.6 percentage points in 1981–1982, the inflation rate fell by around 6 percentage points. Disinflation was beneficial when inflation was too high. When inflation was too high, the Fed had the leeway to cut its nominal federal funds rate target to keep the real federal funds rate from rising as the disinflation ran its course. In 2001, the Fed had only 1 3/4 percentage points of leeway before the nominal federal funds rate would hit the zero bound.

That said, there were three reasons to think that disinflation would be relatively mild this time. First, the unemployment rate might not rise much more since the Fed had already cut the real funds rate by 4 3/4 percentage points. Second, slower wage growth due to slack in the labor market might be matched by slower productivity growth. If that were the case, then unit labor costs would not fall much and there would be little downward pressure on prices. Third, the earlier recessions were set off in large part by tighter monetary policy aimed at reducing inflation. This time the Fed was not trying to bring the inflation rate down.

No one can say how the latest situation confronting U.S. monetary policy will turn out. The zero bound may yet become a problem. Hopefully, aggressive interest rate actions undertaken in 2001 have laid the foundation for a full recovery in 2002. In that regard, it is worth noting that the federal funds rate futures market believed at the end of 2001 that the funds rate had hit bottom and that the Fed would raise interest rates as the economy recovered in 2002.

7. CONCLUSION

The challenges facing monetary policy since 1987 have been surprisingly varied. Rising inflation was a problem for the Fed only briefly during the period. Restrictive monetary policy in the late 1980s and early 1990s reversed the rising inflation trend, and preemptive policy actions in 1994 secured near full credibility for low inflation in the late 1990s. The Fed dealt with three major financial crises: the October 1987 crash, the 1997 East Asian crisis, and the consequences of the Russian debt default in 1998. Monetary policy reacted to two wars: the 1990–1991 Gulf War and the 2001 War on Terrorism. The Fed became more transparent by regularly announcing its current federal funds rate target beginning in February 1994. Most importantly, monetary policy adapted to an environment in which the Fed acquired near full credibility for

¹⁶ The 1980 recession was associated with the brief imposition of credit controls. See Schreft (1990).

low inflation, and the Fed navigated a difficult transition toward higher trend productivity growth. Because the problems were so varied, it is difficult to draw overall lessons from the period, but one thing is clear. Similar challenges are likely to be encountered in the future and the experience gained in surmounting them should help the Fed improve monetary policy.

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