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Risk Management in Monetary Policymaking: The 1994-95 Fed Tightening Episode

Kevin L. Kliesen[1]

ABSTRACT

The 1994-95 Fed tightening episode was one of the most notable in the Fed's history. First, the FOMC raised the policy rate by 300 basis points in a year, even though headline and core inflation were trending lower prior to the liftoff that occurred in February 1994. Second, the Fed's actions caught the Treasury market by surprise, triggering a sharp decline in long-term bond prices. Third, Fed Chair Alan Greenspan and the Federal Open Market Committee were regularly surprised that inflation was not rising by more than the forecasts suggested during the episode. This article presents some evidence that the Greenbook forecast systemically, albeit modestly, overpredicted CPI inflation during the tightening period. Greenspan eventually concluded that the nascent strengthening in labor productivity growth that was a key factor in restraining the growth of unit labor costs, and thus in keeping inflation pressures in check. At the same time, the success of the episode stemmed importantly from the decision by Greenspan and the FOMC to increase the policy rate to a level deemed restrictive for most of 1995. This effort reduced longer-run inflation expectations without triggering a recession. By that metric the 1994-95 tightening episode was a roaring success. Although not the focus of this article, the 1994-95 tightening episode holds important lessons for the FOMC in late 2023, which is attempting to defuse a sharp and unexpected increase in headline and core inflation to levels not seen since the early 1980s without triggering a recession.

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> We are not paying you to seek to lean against a wind when the real problem is to lean against a wind that has not started blowing yet. Neither you nor I nor somebody else really knows how to lean today against next year's wind. (Milton Friedman, Congressional Hearing, October 30, 1959)

> [T]he conduct of monetary policy in the United States has come to involve, at its core, crucial elements of risk management. (Greenspan, 2004)

Federal Reserve policymakers regularly confront numerous economic, financial, and political risks in their deliberations. The practice of risk management is one method of accounting for and responding (or not responding) to these risks. Historically, pre-emption has been a key tenet of the risk management approach. That is, because it takes time for monetary policy actions to influence macroeconomic outcomes, the FOMC decides to raise or lower the federal funds target rate *before* inflation or unemployment rises or falls beyond levels deemed unacceptable in response to potentially unfavorable shocks or other identifiable risks. The classic example of US pre-emptive monetary policy occurred in 1994, when the Greenspan FOMC began to raise the federal funds target rate in response to the *anticipation* of an acceleration in inflation rather than an actual acceleration in inflation. Pre-emptive policymaking can be difficult in practice because many key economic data are backward looking and/or subject to revision. To compensate for these challenges, forecasts often play an outsized role in the monetary policymaking process. But forecasting models are fallible, particularly when subject to large macroeconomic shocks.

Pre-emptive monetary policy has returned to the public discussion about US monetary policy since the COVID-19 pandemic and its aftermath when inflation rose to a more than 40 year high in June 2022. Some economists faulted the FOMC for abandoning the traditional risk management approach of "taking away the punch bowl" before the party heated up—particularly because of the highly expansionary monetary and fiscal policies adopted during the pandemic. In this regard, see Summers (2022) or Kliesen and Wheelock (2023). The rational for initially abandoning the risk management approach was the adoption of a new monetary policy framework in August 2020 that put more weight on the employment side of the dual mandate and less weight on the inflation side of the mandate. Indeed, the parameters of the new framework allowed inflation to temporarily rise above the FOMC's 2% inflation target. The implicit assumption was the inflation would revert to its previous pre-pandemic pattern of sub-2% inflation. However, the FOMC did not specify how high inflation was allowed to rise and how long the deviation could occur without raising the policy rate. As Levy and Plosser (2022) argued, this change introduced a significant inflationary bias in monetary policy. Eventually, though, the FOMC became a conventional inflation fighter in 2022 and 2023, raising the policy rate by a total of 525 basis points through July 2023.

The purpose of this article is not to litigate the FOMC's decision to adopt the new framework in 2020. Those who are interested in the Fed's policy approach during 2020-21 should see Governor Christopher Waller's speech in May 2022. Rather, this article will examine the 1994-95 tightening episode for two reasons. First, as noted above, some critics of current monetary policy argue that the FOMC should have been more pre-emptive in its approach—as in 1994-95—to prevent the sharp acceleration in inflation in 2021 and 2022.[2] Thus, there may be lessons for

[2] See Hetzel (2023) for a further elaboration.

future policymakers. Second, the 1994-95 episode was unique because unlike the majority of the other tightening episodes, the end result was not a recession. With the FOMC raising its policy rate by 425 basis points in 2022, many economists and forecasters began to raise the specter of recession. But toward the tail end of 2023, recession no longer appears to be the baseline outlook for many forecasters. Thus, it is possible that the outcome of the current Fed tightening episode will be a "soft landing" rather than a recession, which occurred in 1995. If that occurs, then all the more reason why the 1994-95 episode could be a barometer for today.

This article will begin with a conceptual discussion of risk management as practiced by the FOMC. The second section will discuss risk management in monetary policymaking during the 1994-95 tightening episode. This section will rely importantly on comments made during the FOMC meetings at the time, as detailed in the official transcripts. Most of the comments will be those of Fed Chair Greenspan, who was viewed as the key proponent of risk management during that episode. The third section will discuss the lessons learned from the 1994-95 episode. The fourth section concludes.

1 ELEMENTS OF RISK MANAGEMENT

Preemptive monetary policy is an exercise in risk management. The idea is akin to an individual insuring against a bad outcome through prudent actions to manage *known* risks. In monetary policymaking circles, this policy has been called "leaning against the wind," or, more colloquially, "taking away the punchbowl before the party is really warming up."[3] However, as suggested by Milton Friedman (1959) in the quote at the beginning of this article, to know when to lean against the wind might be an impossible task. Admittedly, Friedman's critique was motivated by his view that a money supply growth rate rule (*k*-percent) was far superior to discretionary policy that underpins the risk management approach.

Risk management is a forward-looking exercise that encompasses two considerations. First, the FOMC's preferred policy-rate path is conditioned on a strategy designed to achieve the macroeconomic goals established by Congress. This mandate incentivizes the FOMC to adjust policy in an optimal fashion to avoid unwelcome departures form the FOMC's goal variables. These goals are explicit, but imprecisely defined: price stability, maximum employment, and moderate long-term interest rates. Financial stability is often invoked as the fourth goal in the aftermath of the 2008-2009 global financial crisis (GFC). Historically, Fed Chairs have argued that the accomplishment of the first goal (price stability) helps to ensure achievement of the second and third goals. [4] Achieving the Fed's goals is often easier said than done in practice, but pre-emptive policy actions have historically been a key aspect of the Fed's strategy going back at least as far as the McChesney-Martin FOMC.[5]

The second consideration is how to cope with uncertainty about evolving economic and financial developments. This uncertainty stems importantly from the time it takes monetary policy changes to influence changes in inflation and the real economy. Greenspan appeared to be an ardent believer in the classical view of long

[3] See: https://conversableeconomist.blogspot.com/2013/06/the-punch-bowl-speech-william-mcchesney.html.
[4] See Steelman (2011) and Thornton (2012).
[5] See Hetzel (2022).

and variable lags enunciated in Milton Friedman's 1960 book, *A Program for Monetary Stability*.[6] For example, in Congressional testimony in January 1997, Greenspan argued that the lags could be six to 12 months or longer. This view, Greenspan further elaborated, meant that the FOMC not only had to assess the likely direction of the economy, but the distribution of risks around the expected outcomes. Several years later, Greenspan would go on to elaborate further on the risk management approach that undergirds this paper:

> In recognition of the lag in monetary policy's impact on economic activity, a preemptive response to the potential for building inflationary pressures was made an important feature of policy. As a consequence, this approach elevated forecasting to an even more prominent place in policy deliberations.[7]

The elevation of forecasting in the policymaking process, more so than was evident during the Volcker, Burns, and Martin tenures, presents numerous challenges. These include model specification and identification, data that is subject to revision, ongoing structural changes in the economy that necessitate continual updating of model parameters, or the structure of the model itself, and shocks that can leave lasting imprints on the supply side of the economy.[8] Because of their limitations, model-based forecasts are sometimes judgmentally adjusted, either to account for ad-hoc assumptions about the path of key conditioning variables (known as add-factoring), such as crude oil prices or stock prices, or to incorporate the effects of real-time shocks that have yet to show up in the data. Greenspan was a

[6] See Dupor (2023).
[7] See Greenspan (2004).
[8] See Reifschneider, et. al., (1997).

firm believer in add-factoring the staff's MPS forecasting model, as he noted at the July 1994 FOMC meeting:

> [T]he fact that the base case is a judgmental model tells you something about the add factors that we have to deal with in this broad MPS model. If we allow the MPS model to run with no add-factor changes, the results we'd get—I will stipulate without knowing it and Mike (Prell) can take a shot at me if he wants to—would be garbage. It would be unacceptable. If the un-add-factored model engenders results that do not seem to capture what is going on in the real world, why do we assume that a simulation coming from that model, which is supposed to capture what's going on in the real world, captures the actual scenario? I think we have this problem that is always involved in any of these simulations.[9]

In view of these persistent (and numerous) uncertainties faced by monetary policymakers, Greenspan chose to adopt a Bayesian-style risk management approach for devising the Committee's monetary policy strategy. In particular, he saw this approach as an ongoing probability-assessment exercise that: (i) identifies the sources of risks that confront policymakers at any point in time; (ii) quantifies—to the extent possible—the magnitude of the risks; and (iii) assesses the costs of responding—or not responding—to each risk.[10] Presumably, these risk assessments were also incorporated into the Greenbook forecasts.

A Bayesian framework is a process for continually adjusting beliefs about future events in view of observed data (see Poirier, 1988). But this framework, claims Efron (1986), requires "a great deal of thought about the given situation to apply sensibly." This caveat sounds like a softer critique noted earlier by Milton Friedman. There is, thus, a subjective element that cannot be ignored. Accordingly,

[9] One of the challenges this paper, and others like it, has to confront, is that the "un-add-factored" forecasts are not made available to the public (to the author's knowledge).
[10] Greenspan (2004).

the forecasting procedure adopted during the Greenspan tenure meant that the FOMC must (i) continually assesses—to the extent possible—*prior* probabilities for outcomes consistent or inconsistent with the baseline forecast, and then (ii) decide how to adjust those probabilities as the data and economy evolve.

There is a two-fold challenge for policymakers who adopt the Bayesian framework. The first is estimating *a priori* probabilities. The second is mapping these priors into a decision matrix to confront known risks. Policymakers realize that there are many possible future states of the world (known risks), each with its own subjective probability of occurrence. For tractability purposes, policymakers must decide to focus on some future states (known unknowns) and ignore others (unknown unknowns).[11] For example, risks that cannot be quantified with any accuracy, such as a catastrophic natural disaster, a pandemic, or nuclear war—are not considered, although their probabilities are non-zero at any point in time. By contrast, policymakers can estimate the probability of certain economic risks—such as above-target inflation or rising inflation expectations, an increase or decrease in the unemployment rate relative to its natural rate, stock (equity) prices that become detached from their fundamental values (to the extent the latter can be estimated), unexpected movements in the foreign exchange value of the dollar and rising or falling crude oil prices. [12]

[11] The characterization of knowns, known unknowns, and unknown unknowns was made famous by former US Defense Secretary Donald Rumsfeld during the George W. Bush Administration. However, the original source was from an essay on the known, unknown, and unknowable by Ralph E. Gomory in the June 1995 issue of *Scientific American*.
[12] The quarterly *Survey of Professional Forecasters*, which is published by the Federal Reserve Bank of Philadelphia, publishes mean probabilities for various outcomes for key economic variables in the current and future forecast years.

A key aspect of Bayesian analysis is belief updating in response to regular data flows. If new and/or revised data change the baseline forecast for the goal variables, policymakers will need to either affirm the existing policy path conditioned on the highest probability outcome or tack in a new direction based on revised probabilities. In the Bayesian approach adopted by Greenspan, then, *a priori* probabilities can, and do, often differ from *posterior* (ex-post) probabilities. Tacking in a new direction to counter potential *future* adverse outcomes based on these revised probabilities is to pre-emptively adjust policy. [13]

The next section will detail the 1994-95 episode, which remains the textbook case of a risk management strategy that, in Greenspan's view, prevented an acceleration in inflation while avoiding a recession. Using quotes from the FOMC transcripts, the section will describe how Chairman Greenspan and his colleagues managed to achieve this outcome.

RISK MANAGEMENT IN PRACTICE: THE FOMC IN 1994-95

Throughout 1993, the FOMC maintained its nominal federal funds target rate (FFRT) at 3%. In Congressional testimony on July 20, 1993, Chairman Greenspan noted that the FOMC had been able to maintain an accommodative stance of monetary policy because the forces "that engendered past inflationary episodes

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[13] Unconditional point forecasts converging to the steady-state outcome is nearly always the highest probability—though not necessarily the most accurate outcome. The key issue according to Poole (1998) is whether, in the presence of uncertainty, policymakers are "making a mistake that is predictable at the time the decision is being made." In Poole's view, policymakers "rarely" make "obvious" ex-ante mistakes in the presence of uncertainty given the information acted on at the time a decision is made. In this sense, policymakers are continually updating their priors. In the language adopted by many policymakers today, this is known as a data-dependent policy.

appear to have been lacking to date." [14] He cited persistent slack in labor and product markets, international competitiveness, and the absence of excessive money and credit growth as key disinflation forces. However, Greenspan also noted that there were "disturbing readings on inflation" earlier in the year and that inflation expectations had "tilted upward" by some measures despite some slack in the real economy. But Greenspan warned that slack in the macroeconomy was not a reliable indicator for future inflationary pressures—an explicit rebuke to the Phillips curve framework. Greenspan further indicated that the FOMC had shifted to an asymmetric directive at the May 1993 meeting that biased policy in the direction of a "possible firming of policy over the intermeeting period." No such firming occurred in 1993. However, as noted by Pakko (1995), many FOMC participants were concerned about building inflation pressures in 1993. Of the seven dissents that were registered during the FOMC meetings in 1993, six argued that the inflation outlook favored tighter policy.[15]

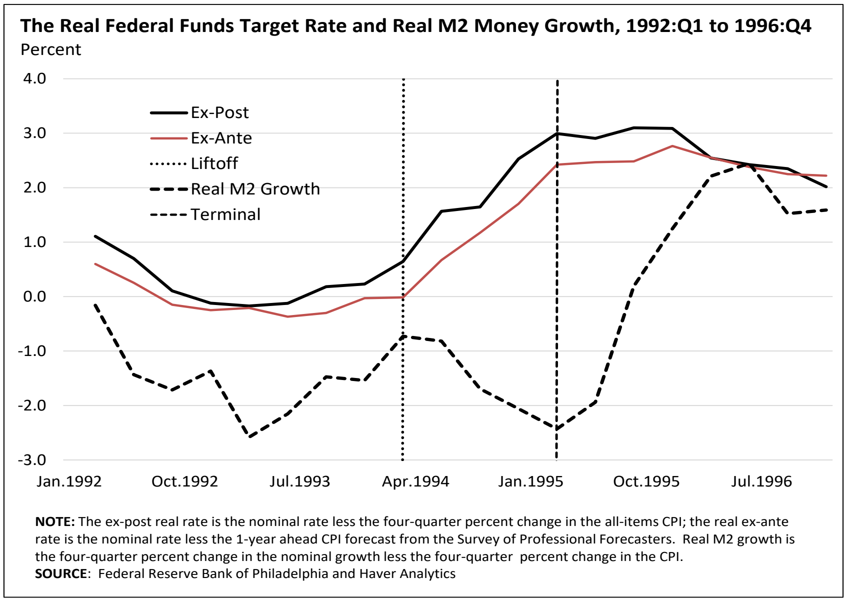
In describing his approach to policy, Greenspan warned that with short-term real interest rates near-zero, and with long-term real rates "appreciably higher," short-term rates would need to rise in order to prevent "substantial inflationary imbalances." Several weeks later, Bill Poole, the future president of the St. Louis Fed, noted in the proceedings of the September 12-13, 1993, Shadow Open Market Committee meeting that the FOMC was "discomforted" by slow M2 growth.[16] In Poole's assessment, Greenspan's focus on the inflationary consequences of low

[14] See Greenspan (1993).
[15] Two dissents occurred at the March 23, 1993, meeting; two at the May 18 meeting; one at the July 6-7 meeting; and two at the December 21 meeting.
[16] See https://www.shadowfed.org/archives/1993-2/.

short-term real rates, while a mistake, was nonetheless designed to "provide a little running room to raise the federal funds rate if necessary." But Poole suggested that the FOMC may soon need to raise the FFTR. In fact, the SOMC policy statement ignored the monetary tightening signals from weak M2 growth and warned that the Fed's "highly expansive monetary policy cannot coexist with moderate inflation and falling interest rates." Pakko (1995) subsequently argued that the FOMC was uncertain about the appropriate conduct of monetary policy in light of structural changes in US financial markets and the unreliable signals from the money various stock measures (as noted above).

As seen in Figure 1, short-term real interest rates—whether measured on an ex-ante or ex-post basis—fell modestly below zero in late 1992 and into 1993. Likewise, real M2 growth also was negative throughout 1992-93, and did not turn positive until the second half of 1995. The FOMC faced a conundrum: very low short-term real rates in relation to the equilibrium real interest rate (r*), as will be discussed later, indicated that monetary policy was exceptionally accommodative prior to the commencement of the tightening episode. However, negative real money growth indicated the opposite. Greenspan and the FOMC chose to follow the impulse from the former not the latter.

Figure 1



The Real Federal Funds Target Rate and Real M2 Money Growth, 1992:Q1 to 1996:Q4

NOTE: The ex-post real rate is the nominal rate less the four-quarter percent change in the all-items CPI; the real ex-ante rate is the nominal rate less the 1-year ahead CPI forecast from the Survey of Professional Forecasters. Real M2 growth is the four-quarter percent change in the nominal growth less the four-quarter percent change in the CPI.
SOURCE: Federal Reserve Bank of Philadelphia and Haver Analytics

Greenspan signaled that the FOMC's accommodative policy stance was nearing an end in Congressional testimony on January 31, 1994. In his testimony, Greenspan used an early version of forward guidance to signal the increasing probability of a more restrictive monetary policy:

> A number of questions will have to be addressed by the Federal Open Market Committee. Foremost will be when is the appropriate time to move to a somewhat less accommodative level of short-term interest rates. We will have to make the judgment as to how long we can continue monetary accommodation, without sowing the seeds of another bout of inflationary instability accompanied by steeply rising long-term rates. Such an outcome would bode ill for economic growth in 1995 and beyond. On the other hand, we will also have to judge whether higher rates could slow the necessary completion of balance sheet repair to a point where economic growth is inhibited.[17]

Greenspan reinforced his belief in the importance of the short-term real interest as the FOMC's key instrument by further remarking that it was "abnormally low." He then noted in his testimony that "at some point, absent an unexpected and prolonged weakening of economic activity, we will need to move them to a more neutral

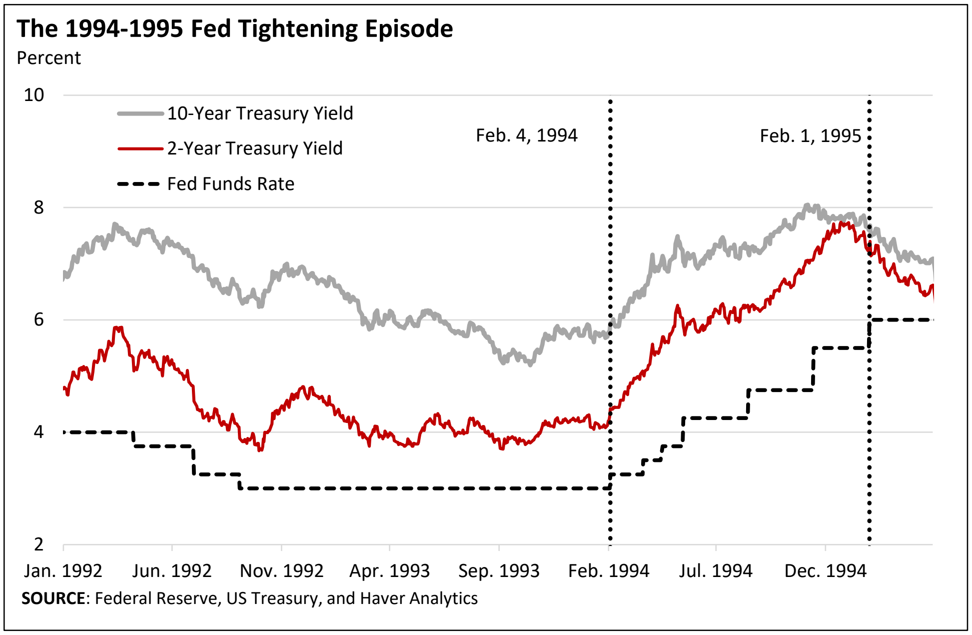
[17] See Greenspan (1994).

stance." As it turned out, the initial move to a more neutral stance occurred just a few short days later.

The 1994-95 tightening episode began on February 4, 1994, when the FOMC raised the FFTR rate by 25 basis points to 3.25% (see Figure 2). Prior to liftoff, the FOMC had maintained a 3% target rate since September 1992—an inordinately lengthy period. There is an enduring belief in financial markets and inside the Fed that the 2-year Treasury yield is a good indicator of the market's expectation of future Fed policy changes.[18] In an era that was largely devoid of the type of forward guidance that is practiced today, the 2-year Treasury rate, as well as the 10-year Treasury rate, was little changed in the lead up to the liftoff in the FFRT. After liftoff, both interest rates generally moved in lockstep with the increases in the FFTR. However, both rates also peaked in late 1994 and began to decline before the final FFTR hike on February 1, 1995.

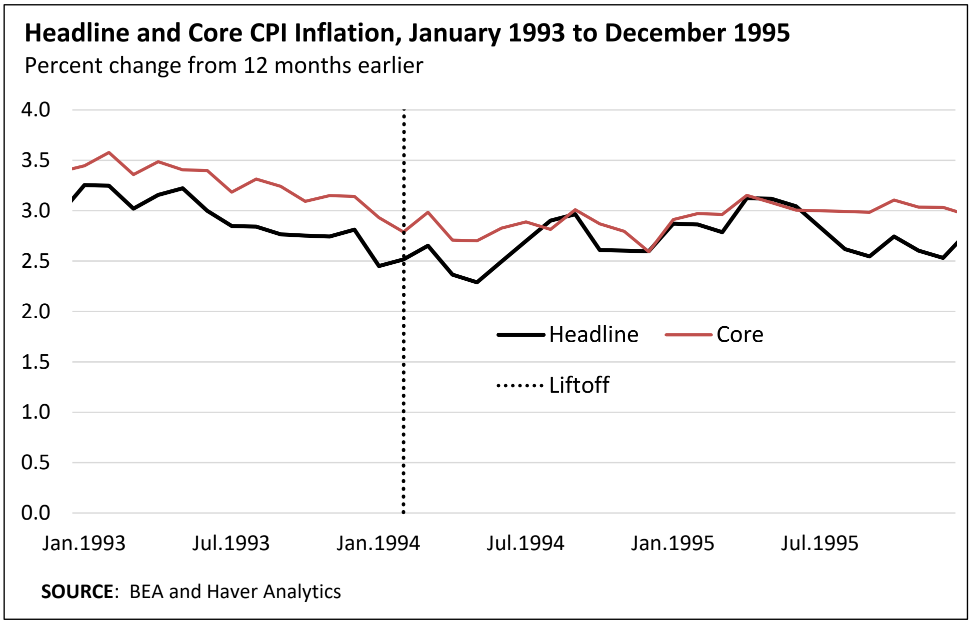
[18] See Waller (2023).

Figure 2



Recall that a key motivation for Greenspan and many FOMC participants in 1993 for lifting off in February 1994 was the potential for building inflationary pressures. But as seen in Figures 3-4, there was scant evidence of an acceleration in CPI inflation or inflation expectations prior to the beginning of the liftoff in February 1994. Indeed, the expectation of higher inflation occurred against the backdrop of a *deceleration* in both the all items (headline) and core CPI inflation prior to the tightening episode. Figure 3 shows that the headline CPI inflation rate slowed from 3.25% in February 1993 to 2.5% in January 1994 (12-month percent changes), while the core CPI inflation rate slowed from about 3.5% to about 2.75%. Thereafter, both inflation measures stabilized and, on net, by the spring of 1995 they slightly exceeded the rates that had prevailed in February 1994. In that sense, Greenspan and other FOMC participants were correct that inflation pressures were increasing, albeit modestly.

Figure 3

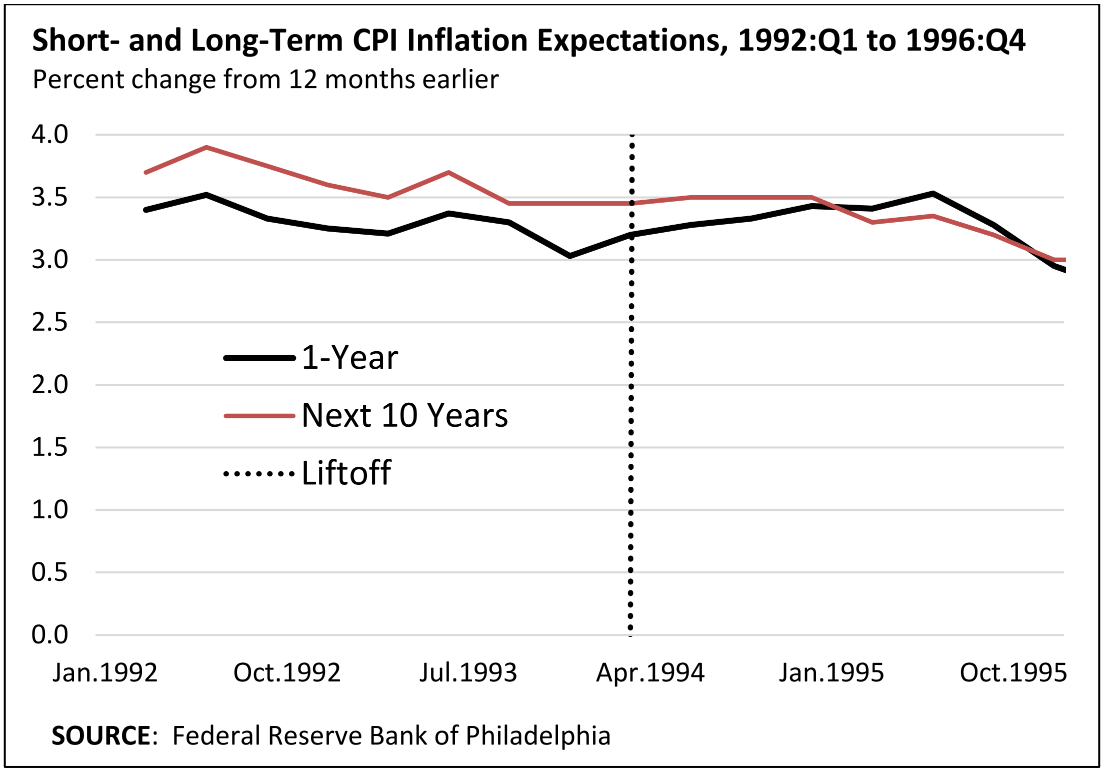


A somewhat similar pattern was evident in measures of short- and long-term CPI inflation expectations measured by the *Survey of Professional Forecasters*. Figure 4 shows that short-term (1-year ahead) inflation expectations began to increase prior to the FOMC's liftoff in February 1994—though they were still below the levels that prevailed in early 1992. Short-term inflation expectations would eventually increase by 50 basis points to 3.5% in mid-1995. Long-term inflation expectations at liftoff were at 3.5%, also modestly below the levels that prevailed in early 1992. Long-term inflation expectations remained at 3.5% from the third quarter of 1993 to the first quarter of 1995, but then they trended modestly lower thereafter. One possible interpretation is that Greenspan might have viewed the rise in long-term Treasury yields as an inflation scare, that had yet to show up in measures of inflation or inflation expectations.[19] Indeed, as seen in Figure 2, 10-year Treasury

[19] The inflation scare term originated with Goodfriend (1993), who argued that "a significant long-rate rise in the absence of an aggressive funds rate tightening an inflation scare since it reflects rising

yields fell steadily from March 1992 to October 1993, only to reverse course sharply. By early November 1994, 10-year yields were at their highest levels since late July 1991.

Figure 4



Another interpretation of the FOMC's pre-emptive policy actions in view of the inflation and inflation expectations data from 1993 to 1995 is that Greenspan was acting in an opportunistic fashion—what he termed "principled opportunism"—to inexorably, if slowly, drive inflation toward his definition of price stability: "zero, if properly measured." [20] Greenspan's belief in the benefits of low inflation, and the

expected long-run inflation." However, the rise in 10-year Treasury yields in 1994 occurred against the backdrop of a rising FFTR that was initially modest (three 25 basis point moves in February, March, and April).

[20] This statement occurred during debate between then Federal Reserve Governor Janet Yellen and Richmond Fed President Al Broaddus on the merits of inflation targeting during the July 2-3, 1996, FOMC meeting.

desire to achieve this outcome in a strategic fashion, was consistent with his risk management approach.

Discussions from the FOMC Transcripts

Economists have long studied the FOMC transcripts to ascertain the Committee's motivation for choosing to implement a specific policy at any given point in time. For example, researchers' have used the transcripts or, earlier, Memoranda of Discussion, to study how the FOMC responded to certain shocks, such as oil price shocks, to what extent the FOMC relied on economic forecasts, operating targets, or the usefulness of Phillips Curve-type rules embedded in monetary policy rules. Contributions to the literature are large. A sampling across time includes Spencer (1996), Chappell, Havrilesky, and McGregor (1997), Edison and Marquez (1998), Goodfriend and King (2005), Anderson and Kliesen (2012), Meade and Thornton (2012), Kliesen and Wheelock (2021), Shapiro and Wilson (2022), and Romer and Romer (2023). Meade and Thornton emphasize that a proper evaluation of historical monetary analysis must rely on real-time data. This is also the conclusion of others, such as Orphanides (2001). Thus, the foregoing analysis will employ both real-time data as much as possible and the use of verbatim transcripts—largely commentary from Chairman Greenspan—at both scheduled FOMC meetings and intermeeting conference calls.[21]

February 3-4, 1994, FOMC Meeting

[21] Unless noted otherwise, all pull-quotes are taken from the transcripts and Greenbooks for the meeting date listed. Thus, dates and pages will not be footnoted. The transcripts and other FOMC materials from the 1994-95 meetings cited in this article can be found on the Board of Governors website here: https://www.federalreserve.gov/monetarypolicy/fomc_historical_year.htm.

In the Greenbook prepared for this meeting, the Board staff “was impressed by the degree of upward thrust that the economy evidently is carrying into 1994.” However, the staff cautioned the Committee that 1993 also saw a “surprising surge” in activity only to be followed by “an unexpectedly pronounced slowdown—for reasons not entirely clear.” Table 1 shows Greenbook forecasts for annualized one-quarter growth rates (real-time) of real GDP and CPI inflation for the period from December 1993 to March 1995. For the February 1994 meeting, the Board staff forecast penciled in modestly stronger real GDP growth and inflation over the first half of 1994 compared with the previous Greenbook forecasts. The expectation of faster output growth and higher inflation over the near-term, along with the modest rebound in short-term inflation expectations (see Figure 4) spurred the FOMC to raise the FFTR by 25 basis points.

During the discussion at the meeting, Greenspan focused importantly on two areas: inventories and balance sheets. On the former, he cited the increasing importance of just-in-time inventories, which was dampening the traditional inventory cycle. He said that “if there's one element of tranquility in our forecast, which was gradually lulling us into considerable complacency, it's on the inventory side.” His worry, then, was the possibility of an inventory build that traditionally occurred in a business expansion, thereby leading to faster output growth. Greenspan also said he was “still puzzled by the fact that the balance sheets do not seem to be restraining activity by as much as I thought they would.” In sum, Greenspan concluded that, “as far as policy is concerned, that we are at the point where we finally have to start moving toward a somewhat less accommodative path.” He went on to say that "the presumption that inflation is quiescent is getting to be a slightly shabby notion." [22]

The only decision left for the Committee to decide was whether to increase the FFTR by 25 or 50 basis points. Greenspan urged the Committee to avoid the shock of a 50-basis point increase in the federal funds rate, citing the significant probability of an adverse reaction from the announcement effect:

> I would be very concerned if this Committee went 50 basis points now because I don't think the markets expect it. You want to hit a market when it needs to be hit; there is no significant evidence at this stage of imbalances that require the type of action that a number of us have discussed. Were we to go the 50 basis points with the announcement effect and the shock effect, I am telling you that these markets will not hold still. I've been in the economic forecasting business since 1948, and I've been on Wall Street since 1948, and I am telling you I have a pain in the pit of my stomach, which in the past I've been very successful in alluding to. I am telling you—and I've seen these markets—this is not the time to do this. I think there will be a time; and if the staff's forecast is right, we can get to 150 basis points pretty easily. We can do it with a couple of 1/2 point jumps later when the markets are in the position to know what we're doing and there's continuity. If somebody asked me if I think there is an economic case for 50 basis points, my answer is "most certainly there is a case." Do I think there is a case in the full context of where the financial markets are at this stage and what the expectations in the markets are at this stage? I would say emphatically "no." It's far too risky. We don't need to take those risks.

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[22] In the policy go-round, Governor Lawrence Lindsey argued that the FOMC should try to emulate the 1966 tightening episode that, he claimed, produced a soft-landing:

> [T]he most successful Fed move against inflation, as I recall from what I read of history, was back in 1966. At first the data showed a recession then, but that recession was revised away. The Fed was able to overcome an inflationary condition by a short, sudden rise in interest rates. The downturn was actually not a downturn but simply a slowing in the rate of growth that lasted at most six months and it brought the country another two years of high rates of economic expansion. I think the 1966 model is really what we want to emulate today.

Meltzer (2009, vol. 2, Book 1, p. 508), argued that there was "no clear relation between the measures of monetary contraction and the broad measures of real output and employment during this period," because, in his view, prices and wages adjusted faster than in later periods.

Greenspan further contended that the shock to the market of a 25 basis point hike after five years of no rate hikes, would make it "far easier to do 50 basis points in the second move." At the same time, though, Greenspan was also worried that a 25 basis point move by the FOMC might merely be viewed as a technical correction in the federal funds market by the market participants, so that information of a rate hike "will sort of dribble out." In short, he said that the Committee will "have to make our action very visible." Thus, Greenspan believed in the importance of an announcement effect, but doing so in a way "that does not set a precedent." [23] This latter concern, as will be seen, fell by the wayside in during this episode. The Fed's decision to announce this move immediately following the meeting was a surprise. Unlike the practice today, the announcement on February 4, 1994, came directly from the Chairman instead of the FOMC, was short and refrained from mentioning the federal funds target rate:

> Chairman Alan Greenspan announced today that the Federal Open Market Committee decided to increase slightly the degree of pressure on reserve positions. The action is expected to be associated with a small increase in short-term money market interest rates. The decision was taken to move toward a less accommodative stance in monetary policy in order to sustain and enhance the economic expansion. Chairman Greenspan decided to announce this action immediately so as to avoid any misunderstanding of the Committee's purposes, given the fact that this is the first firming of reserve market conditions by the Committee since early 1989.[24]

February 28, 1994, Conference Call

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[23] In the February 1994 transcript, Greenspan said the Fed preferred to have announcement effects associated with discount rate changes, since it "gives us a much more calibrated instrument."
[24] See https://www.federalreserve.gov/fomc/19940204default.htm.

The FOMC refrained from taking an additional tightening action at this conference call. During the call, Greenspan reinforced his commitment to the Bayesian approach of waiting for additional information (belief updating) and by choosing to avoid unnecessary actions that could destabilize markets after the shock of the Committee's first hiking action in five years:

> Coming off this type of operation (move three weeks earlier), my own view with respect to policy is that we're going to have to move again, obviously. I don't know when that will be, but I think it would be wise for us at this particular point to allow markets, which clearly have been shocked, to settle down before we move again.

March 22, 1994, FOMC Meeting

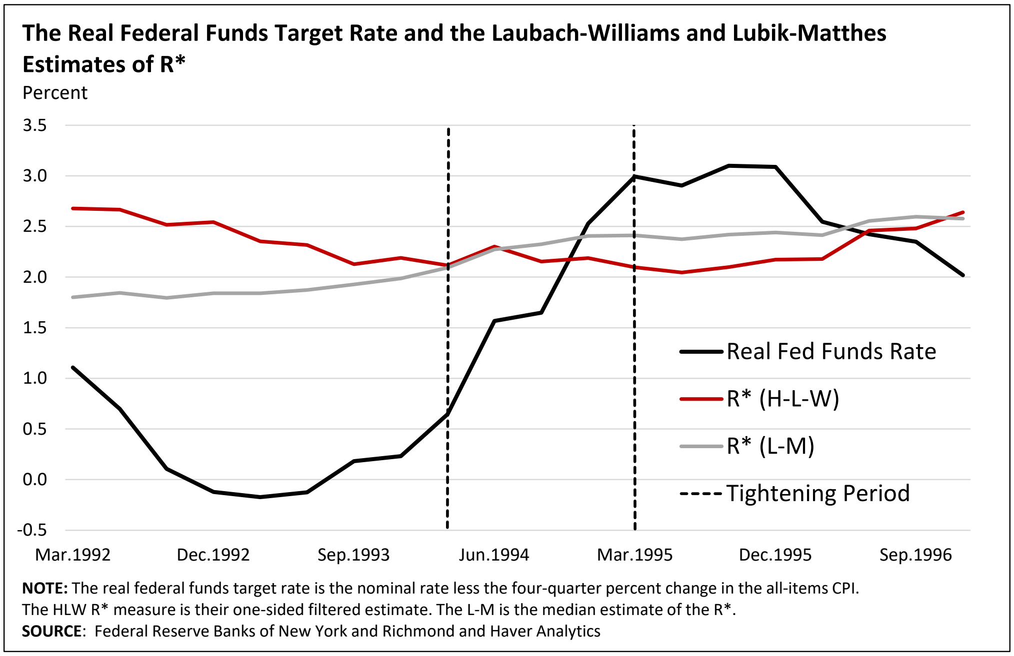
At the March meeting, the FOMC confronted an economy that had strengthened by more than expected in the fourth quarter of 1993. As seen in Table 1, real GDP growth in the fourth quarter of 1993 was revised up from 5.9% (annual rate) to 7.5%. In the Greenbook forecasts prepared for the March meeting, the Board staff marked down their estimates for real GDP growth in the first quarter of 1994 from 4% to 3.2%. In the Greenbook narrative, the staff mentioned that the forecast for weaker first-quarter output growth stemmed importantly from severe weather that likely produced a modest loss of income and output in the past two months. Developments on the real side and a modest decline in spot crude oil prices also spurred the staff to lower its first-quarter CPI inflation forecast from 3.6% to 2.1%. Although the Board staff continued to forecast real GDP growth slowing to around 2.5% by the end of 1994, they now expected a slightly faster near-term strengthening in inflation, with the CPI inflation rate averaging 3.5% in 1994:Q2 and 1994:Q3, compared with the January Greenbook forecast (3.3%). Thus, with the US economy continuing to expand at an above-trend (potential) pace, the Committee followed up the February 25-basis point move with another 25-basis point increase at the March 22 meeting.[25] This action was consistent with Greenspan's arguments at the January FOMC meeting and the February conference call that further actions were necessary.

At this meeting, Greenspan urged the Committee to "restore policy to neutrality as fast as we can." Recall that Greenspan judged policy based as the gap between short- and long-term real interest rates. Figure 5 shows that the real federal funds target rate was well below two Federal Reserve measures of R* since the first quarter of 1992. Figure 5 plots the *current vintage* observations (that is, as of October 2023) for the Holston-Laubach-Williams (H-L-W, 2017) and Lubik-Matthes (L-M, 2015) measures of R*. As seen in Figure 5, the real FFTR was about 0.7% at lift-off in the first quarter of 1994, whereas the both the H-L-W and L-M measures of R* were 2.1%. By this metric, policy was not restrictive prior to lift off.[26]

[25] In discussing the 1994-95 episode, Bullard (2004) used a different measure of the R* (the sum of trend productivity growth and trend labor force growth). The nominal neutral rate is the sum of R* and the inflation target, which he pegged at 2%.

[26] In late-February 1994, the Federal Reserve Bank of Philadelphia's *Survey of Professional Forecasters* pegged the expected growth of real GDP over the next 10 years at 2.65%. This is one proxy for potential output growth. In the March 17, 1994, Greenbook, Board staff calculated the high-employment budget surplus as a percent of potential GDP. In a footnote (number 4) describing this calculation, staff indicated that the economy's potential was associated with real GDP growth of 2.4% and an unemployment rate of 6%.

Figure 5



However, Greenspan was still worried about financial stability risks, saying—in his customary flowery language—that he didn't believe that "the financial system can take a very large increase without a break in its tensile strength." He went on to say that he was not concerned about the economic outlook—"the economy looks terrific to me," but with a key proviso—financial stability.

> I'm hard pressed to remember when the outlook itself looked as unequivocally expansionary as it does today. We are always able to find reasons why it's going to cave, and there are lots of different figures we can adduce. The only real danger to this economic outlook, as I see it right now, is the financial structure. And that, as I think the Vice Chairman said, has a low probability of inducing a downturn. But if the financial system were to be ruptured, it would not be terribly difficult to bring the economy down very quickly. If you want precedents for that, I suggest that you merely go back and read the business annals that go back 50 or 100 years.

Greenspan, ever the financial historian, said he was nonetheless concerned that a 50 basis point increase in the fed funds rate could, in retrospect, conjure up "the negative characteristics of some of the data in the 1920s." But he also conceded that an outcome might instead be the "benevolent" 1987 stock market crash "that actually was beneficial to the economy" because it "stripped out a high degree of overheating." Regardless, Greenspan viewed the tightening action in February as a catalyst for pricking the bubble in equity markets. In his view, the prospect of additional rate hikes was a "Sword of Damocles hanging over the market."

In terms of the inflation outlook, which was a key impetus for beginning the tightening action two months earlier, Greenspan conceded that thus far the Committee's concerns have remained unfounded.

> Everyone is concerned about a pickup in inflation, tightness and stringency picking up, and the fact that commodity prices are moving, but there is no apparent acceleration in wages or final goods prices. . . Looking strictly at what the data show to date, the inflation rate, if anything, is somewhat less than we had expected. . . We have very clearly seen some pickup in underlying commodity prices; we have seen very little evidence of accelerating inflation in any of the data on final prices. Even the February CPI, in which the core rate was up 0.3 percent, is not a clear indicator.

Uncertainty about the direction of the economy, lower-than-expected inflation, and the potential for further rate hikes to destabilize financial markets thus appeared to be a key factor in moderating the size of the rate hikes at the March meeting. Greenspan elaborated on uncertainty about the inflation outlook by listing several potential reasons for the failure of inflation pressures to increase, including a potential acceleration in trend labor productivity—an explanation he would push with great success a couple of years later.

> There is something different going on. I don't know yet what it means, but there are two facts that coincide with one another that at least should raise our awareness. One is that we are not yet getting final demand price increases, and it may very well be that we are getting extraordinary productivity increases that are keeping unit labor costs down and the competitive pressures there. That is why, of course, commodity prices, which are clearly going up, are not working their way through the system in a direct manner. This is the type of situation where we are looking at a credit picture and a lack of inflation that is more reminiscent of the '20s than of the last 30 years. And that is something we ought to keep in mind, because if we are basically going to presume that there is an automatic relationship, I think there is at least a question as to whether that is true. I'm not sure that really affects what policy should be because I don't think there is any question that at some point and in some manner, if we have accommodative monetary policy at the central bank, credit has to become excessive and it has to become inflationary or all of our concepts about how the monetary system works will have to go into a radical revision, which I can't at this stage even remotely contemplate.

The meeting concluded with a debate whether to raise the FFTR another 25 basis points or to raise the rate by 50 basis points. The implication being how fast to get to neutral—or slightly beyond neutral (restrictive). Greenspan let the Committee know in no uncertain terms where he stood and the reason for his position, which prevailed.

> That essentially leaves us, as far as I can see, with two options: moving the funds rate up 25 basis points or 50 basis points. I don't think we have an option, incidentally, of doing nothing. There is no case that I feel comfortable with for doing nothing, so I would frankly reject "B." But leaving that option aside, I do think we have an interesting choice. A 50 basis point increase would move the funds rate to 3-3/4 percent. In my judgment that would not be perceived of as neutrality or where we ultimately have to be. My own view is that eventually we have to be at 4 to 4-1/2 percent. The question is not whether, but when. If we were to move 50 basis points, I think we would create far more instability than we realize, largely because a half point is not enough to remove the question of where we ultimately are going. I think there is a certain advantage in doing 25 basis points because the markets, having seen two moves in a row of 25 basis points at a meeting, will tend almost surely to expect that the next move will be at the next meeting—or at least I think the

> probability of that occurring is probably higher than 50/50. If that is the case and the markets perceive that—and they perceive we are going to 4 percent by midyear, moving only at meetings—then we have effectively removed the Damocles Sword because our action becomes predictable with respect to timing as well as with respect to dimension.

Greenspan managed to convince all but two members to only raise the FFTR. Fed Presidents Broaddus (Richmond) and Jordan (Cleveland) both dissented because "they preferred a stronger move toward a more neutral policy stance." Both cited the large increase in longer-term nominal interest rates as an indication that inflationary expectations were rising (the inflation scare scenario noted earlier).[27] The Committee decided to follow the unprecedented step taken at the conclusion of the February 4, 1994, meeting by immediately announcing its policy decision. But the announcement this time was much shorter and with less elaboration (with no mention of the dissenting votes either):

> Chairman Alan Greenspan announced today that the Federal Open Market Committee decided to increase slightly the degree of pressure on reserve positions. This action is expected to be associated with a small increase in short-term money market interest rates.[28]

April 18, 1994, Conference Call

There were two intermeeting conference calls between the March and May FOMC meetings. The purpose of the first call on March 24 was to discuss a proposed $6 billion temporary swap facility with the central bank of Mexico. Developments in Mexico would become increasingly important for the Committee in

[27] See the Minutes of the March 22 FOMC Meeting at https://www.federalreserve.gov/fomc/MINUTES/1994/19940322min.htm.
[28] See https://www.federalreserve.gov/fomc/19940322default.htm.

late 1994 and into 1995. The second conference call focused on monetary policy developments. At the conclusion of the call, the FOMC raised the fed funds rate by 25 basis points on April 18. Greenspan indicated that the plan was to wait until the May 17 FOMC meeting to raise the FFTR, but that the combination of (1) inventory lead times moving modestly higher, signaling faster growth, and (2) a decline in stock and bond prices that "have defused a significant part of the bubble which had been previously built up."

Greenspan further indicated that the consensus of the Committee was to eventually "move in excess of 4 percent on the federal funds rate." However, he admitted that a 25 basis point increase would still leave the Committee behind the curve, as indicated by the gap between the real federal funds target rate and R* in Figure 4. Nonetheless, he wanted to "reassess any additional moves at the May meeting." Moreover, he argued that "there is a lesser danger in financial markets, although they are still precarious; this enables us to move somewhat faster than our previous planning presupposed." Such a stance implied the importance of waiting and learning about the effects on the economy and financial markets arising from the actions undertaken thus far.

Like the previous two actions to raise the FFTR, the FOMC issued a press release following the conference call. The statement was the same as the two-sentence statement issued after the March 22 FOMC meeting.

May 17, 1994, FOMC Meeting

Despite alluding to a potential pause during the April 18 conference call, the FOMC implemented the first of its three 50-basis point moves at the May 17 meeting. As seen in Table 1, the advance estimate for real GDP growth in the first quarter of 1994 was 2.6% at an annual rate. The advance estimate was modestly below the Greenbook forecast prepared for the March meeting (3.2%), and even further below the forecast made two meetings ago (4%). Similarly, CPI inflation in the first quarter was also modestly less than expected, measuring 1.9% (versus the 2.1% rate forecast in March Greenbook and 3.6% in the late-January Greenbook). In the Greenbook prepared for this meeting, the staff contended that activity was rebounding from the adverse winter weather. In the staff's view, the underlying strength of the economy over the first half of 1994 was consistent with the March Greenbook. Nevertheless, the staff continued to forecast "a substantial deceleration of activity in the second half of 1994 and only a moderate expansion in 1995." Instead of slowing real GDP growth over the second half of 1994, the economy accelerated rapidly.

Despite weaker than expected real GDP growth and lower than expected inflation, Greenspan agreed with the staff that "the economy is probably stronger than we suspect." Indeed, in the May Greenbook forecast, the staff projected that real GDP growth over the next four quarters (1994:Q2 to 1991:Q1) would average 2.8%, modestly faster than the forecast prepared at the March meeting (2.5%). At the same time, CPI inflation over the same horizon was marked down from 3.4% at the March meeting to 3.2% at the May meeting.

In view of the data and the forecasts, Greenspan said that "the chances of overdoing a tightening of monetary policy and creating a cascading down in economic activity are really not very large. If we overdo it, what we will do is push economic activity farther out." In terms of the outlook, Greenspan argued that inflation continued to surprise to the downside, a development he viewed as temporary:

> "The most interesting aspect of the economic outlook as I see it is that this far into the recovery—and it's almost immaterial whether or not you take Jerry's [Jordan] view that in effect we're only in the first year of the recovery—the actual inflation rates, wage rates, and the like are lower than one would ordinarily expect. This raises the question, which I've raised in earlier meetings, as to whether the lack of financial tinder is a relevant consideration here in holding inflation back.

Nevertheless, Greenspan argued that uncertainty in financial markets remained high, noting that that the FOMC's actions year to date have not yet eliminated the bubble in stock and bond prices. Still, he urged the Committee to continue raising rates, noting that "we have the capability I would say at this stage to move more strongly than we usually do without the risk of cracking the system." Importantly, Greenspan once again argued that doing a big move now should be followed by a wait-and-see (i.e., learning) strategy at the July meeting due to financial stability considerations:

> "My own impression is that we probably will not have to move before the next meeting if we do 50 basis points now. I find it unlikely that we are near the end of this pattern, but I do think we are now becoming more data dependent. We need to be very careful about this very large risk premium that exists in the financial markets, which basically says that this bubble is a bigger one than we had anticipated."

Moving forward, Greenspan signaled that more tightening actions were likely. However, he urged the Committee to adopt a symmetric stance in the directive, indicating no preference for tightening at the next meeting in July. The statement issued after the meeting was slightly longer and provided more clarity about the FOMC's thinking than the previous two statement, particularly with regard to the inflation outlook:

> The Federal Reserve today announced two actions designed to maintain favorable trends in inflation and thereby sustain the economic expansion. The Board approved an increase in the discount rate from 3 percent to 3-1/2 percent, effective immediately, and the Federal Open Market Committee agreed that this increase should be allowed to show through completely into interest rates in reserve markets. These actions, combined with the three adjustments initiated earlier this year by the FOMC, substantially remove the degree of monetary accommodation which prevailed throughout 1993. As always, the Federal Reserve will continue to monitor economic and financial developments to judge the appropriate stance of monetary policy. [29]

July 5-6, 1994, FOMC Meeting

In the Greenbook prepared for the July FOMC meeting, the staff downgraded their forecast for real GDP growth in the third quarter of 1994 from 4.2% to 3.5% (in the May Greenbook); however, the forecast for inflation in the third quarter remained at 2.7%, as seen in Table 1. Over the following four quarters, the forecast for real GDP growth was unchanged at 2.7%, but the forecast for inflation was increased by about a quarter of a percentage point to 3.4%. The staff expected a further tightening in policy that would prevent "any substantial rise in stock and bond prices before 1995." The staff also noted that "a key factor in the development of the forecast was our judgment that the economy is operating essentially at capacity." However, as seen in Figure 5, the real FFTR was still below both measures of R*, suggesting that policy was still accommodative by this measure.

[29] See https://www.federalreserve.gov/fomc/19940517default.htm.

At the July meeting, the Committee, at Greenspan's urging, adopted a symmetric directive and emphasized a data dependent policy. Although the inflation rate forecast over the next four quarters was increased modestly, and the real economy continued to increase at a brisk pace, the FOMC voted to keep the FFTR at 4.25%. Greenspan said that the economy was "still moving ahead at a fairly good pace," though at a slower pace. Greenspan was also puzzled that "we are not seeing any more evidence of price movements in final goods." He indicated that there "is far more fuzziness out there as to where the capacity constraints are."

Greenspan's reluctance to tighten at this meeting was exchange-rate driven. In his view, raising the policy rate by 25 or 50 basis points would result in an unwelcome "hit to the exchange rate." During the intermeeting period (May 17 to July 6), the Fed's nominal effective trade-weighted exchange rate against major currencies declined by 3.4%.[30] In view of the dollar's depreciation over the intermeeting period, Greenspan was concerned that raising the policy rate would be perceived as a "fairly apparent" move to the support the dollar. Specifically, said Greenspan, "we have to be careful to recognize that if we employ monetary policy to offset normal market forces, there have to be offsetting adjustments in the rest of the system." Accordingly, "any attempt by us to use monetary policy to offset exchange rate effects has very considerable secondary, usually negative, effects on markets." In his view, the best exchange rate support policy is a low inflation rate. Despite Greenspan's urging, Richmond Fed President dissented, as he did at the March 22

[30] This is the exchange rate index based solely on trade in goods that prevailed at the time, but which is no longer in use. On February 4, 2019, the Federal Reserve Board released new dollar indexes going back to January 2, 2006, that are based on goods and services trade flows.

meeting. Broaddus contended that "additional near-term tightening was necessary to contain inflation" because the tightening actions thus far, in his view, were "moderate by historical standards." Broaddus also continued to worry about rising inflation expectations.[31]

In discussions about possible future moves, Greenspan suggested that the Committee "might possibly want to do 50 basis points in August if the economy starts to pick up." Repeating what he said at the May meeting, he argued that the cost of being too tight is not all that significant. The greater cost, he asserted, was allowing "inflationary pressures to take off," which would not only damage the Fed's credibility, but would entail considerable cost in restoring that credibility.

August 16, 1994, FOMC Meeting

The Committee convened an intermeeting conference call on July 20. Greenspan commented on the questions he received during testimony before the US Senate earlier that day. Of note, he said that "I think I surprised them a little by indicating that we were open to the possibility of moving again."

Prior to the August 16 meeting, the BEA introduced revisions to the national economic accounts. On net, the revisions were minor compared with the data vintage available at the July 6 FOMC Meeting. The BEA also reported that real GDP increased at a 3.7% annual rate in 1994:Q2 according to the advance estimate. The advance estimate was slightly stronger than the 3.5% growth rate that the staff had forecast from the July 6 meeting. CPI inflation was also slightly stronger (2.8%) than the staff forecast from the July and May meetings (2.7%). As seen in Table 1, the

[31] See the Minutes of the July 5-6 FOMC Meeting at https://www.federalreserve.gov/fomc/MINUTES/1994/19940706min.htm.

staff forecasts over the next four quarters for real GDP growth (2.3%) and inflation (3.4%) were little changed from the July Greenbook forecast (2.4% and 3.5%, respectively).

Solid real GDP growth and the prospect of near-term inflation in excess of 3% (also see Figure 4) spurred the Committee to raise the FFTR by another 50 basis points to 4.75%. At the March meeting, recall, Greenspan said that they would need to raise the FFTR to 4% to 4.5%. Thus, the building strength of the economy over the second half of 1994 was spurring a reassessment of the terminal rate. Figure 5 indicates that the real FFTR was still below R*, although the gap had been rapidly narrowing since the Committee began raising the nominal FFTR. Similar to previous meetings, a discussion ensued on the appropriate terminal rate and whether the staff's forecast that the policy will need to increase by an additional 100 basis point was appropriate. Greenspan was concerned that only going 25 basis points would raise expectations of another move, while going more than 50 might be too much:

> All in all, . . . there is an underlying momentum here that suggests there are a couple of big legs left in this business cycle. I think one has to conclude, as far as policy is concerned, that another upward notch in rates is clearly called for at some point. Therefore, the question we have to ask ourselves, which is not inconsistent with what Jerry Jordan was raising, is if we believe that, why not now? I think the question really gets to a notion of what we expect we will ultimately have to do. I frankly don't know whether or not the staff's estimate of a 100 basis point increase is the right number. I do know that there is a not insignificant probability that 50 basis points may be enough if we do it now. I don't know what the probability is but if somebody said, is it 0.1, I'd say it's a lot higher than that. Is the probability greater than 50 percent? I doubt it. I think it's a third, maybe 40 percent, but who knows. I do think that if we move 50 basis points now, the probability that we will not have to move before the end of the year probably is greater than 50 percent.

The statement issued after the meeting, which noted that a 50 basis point increase in the discount rate was expected to "show through completely into interest rates in reserve markets," was unusually informative compared with the earlier statements. One notable innovation in this statement was the mention of high levels of resource utilization, a Phillips curve connotation. This switch suggests that Greenspan, who long eschewed the Phillips curve as a basis for policy decisions, was paying more attention to the staff's output gap based forecasts.

> These measures were taken against the background of evidence of continuing strength in the economic expansion and high levels of resource utilization. The actions are intended to keep inflationary pressures contained, and thereby foster sustainable economic growth. The Federal Reserve will continue to monitor economic and financial developments to gauge the appropriate stance of policy. But these actions are expected to be sufficient, at least for a time, to meet the objective of sustained, noninflationary growth.

September 27, 1994, FOMC Meeting

There was no intermeeting conference call prior to this meeting. In the Greenbook forecasts, the staff argued that a slowing in the pace of economic activity was "probably" occurring relative to its healthy rate of gain over the first half of 1994. Despite elevated uncertainty, the staff also concluded that the pace of activity over the second half of the year was still likely to exceed the pace projected at the previous meeting. Indeed, as seen in Table 1, the staff bumped up its forecast for real GDP growth over the second half of 1994 relative to the August Greenbook. At the same time, the Board staff modestly reduced their inflation forecast over the second half of 1994 but modestly increased their inflation forecast over the first half of 1995. The net result over the next four quarters (1994:Q3 to 1995:Q2) was a 0.1 percentage point increase in both real GDP growth (to 2.4%) and inflation (3.5%)

relative to the August Greenbook. The staff concluded that "aggregate demand must moderate promptly if inflation is to be held in check." In other words, additional tightening was likely.

Although policy was still accommodative (real FFTR below R* in Figure 5), the pace of economic activity continued to exceed its potential rate of growth and inflation was expected to remain at 3.5% over the next four quarters, the Committee decided to pause for the second time in three meetings (the FFTR was at 4.75%). This was consistent with both Greenspan's view during the August meeting and the FOMC statement that that the Committee was inclined to stand pat and gauge the effects of past rate hikes. At this meeting, Greenspan raised the possibility of an inventory recession at the end of the tightening cycle (unknown at this meeting), but as at the July meeting wondered "why we are this far into the business cycle expansion without the types of price pressures that we have seen on previous occasions." In what would become a key narrative in the productivity debate in a couple of years, Greenspan said that rising profit margins was an important issue for the Committee to focus on: "productivity obviously is moving up and unit labor costs are being contained." As noted in Anderson an Kliesen (2012), there is a long history of the FOMC viewing rising profits as tantamount to rising productivity.

At the September meeting, as seen in Figure 3, the headline CPI in August 1994 was up 2.9% from a year earlier, the largest rate of increase in a little more than a year. By contrast, core inflation was up 2.8%, little changed from the previous two months. Greenspan argued that there was a "gradual progression" in the lagged effects of past actions, but nonetheless noted that the Committee will "need to move further somewhere along the line." All the while, Greenspan held out the hope of a soft landing. In the end, Greenspan the Bayesian preferred to wait for additional data in October to adjust his *a priori* convictions. Nevertheless, he admitted that the Committee should be prepared for another intermeeting move before the November 15 meeting. Once again, Richmond Fed President Broaddus dissented and argued for additional tightening, believing that a "prompt move to somewhat greater monetary restraint was needed at this point." His arguments were very similar to those made in his dissent at the July 5-6 meeting.[32]

An interesting sidebar to the September discussion, was the continued debate between those who favored a monetary approach to forecasting inflation and those who favored the Phillips curve approach. As seen in Figure 1, real M2 growth remained negative and, consistent with traditional money demand models, was falling at an increasing faster rate of growth during the tightening period. But policy was still perceived as accommodative using the R* framework in Figure 5, so Greenspan wondered if money still mattered:

> As a consequence of all of this, one has to ask why we are this far into the business cycle expansion without the types of price pressures that we have seen on previous occasions. I raised this as an issue before, and I'm beginning to suspect that we are going to find out whether or not the extraordinarily still muted money and credit aggregates really matter. In other words, we are approaching a point where we will get interesting tests as to whether inflation is a Phillips curve phenomenon or a monetary phenomenon. If we look at it from a Phillips curve point of view or its equivalent, slack in the industrial area, then we are on the edge of some severe inflationary pressure if we are getting rising inventory accumulation. If, however, we think that prices are a monetary phenomenon, we are more likely to see the types of changes that occurred prior to the 1930s where we had a noninflationary long-term environment largely locked in by the gold

[32] See the Minutes of the September 27 FOMC Meeting at https://www.federalreserve.gov/fomc/MINUTES/1994/19940927min.htm.

> standard, but periods of significant pressure during which inflation never really took hold, because the credit aggregates never really took hold, as they couldn't in that type of environment. So, this particular business cycle may be about to tell us a lot or, I fear, it may be mushy where the end result will be somewhere in between, so we won't learn very much. Reality tends to do that to us more often than not!

November 15, 1994, FOMC Meeting

There was no intermeeting move between the September and November FOMC meetings. At the November 15 meeting, the FOMC was confronted with a real economy that had expanded by more than expected in the third quarter. As seen in Table 1, the advance estimate revealed that real GDP increased at a 3.4% annual rate in the third quarter of 1994, which exceed the 3% growth rate forecasted in the September Greenbook. Accordingly, since the fourth quarter of 1993, real GDP growth had averaged 4.3%, much stronger than potential. CPI inflation also remained well above 3%, advancing at a 3.6% rate in the third quarter, though not as strong as the September Greenbook forecast (3.8%). In response to stronger-than-expected real GDP growth in the third quarter, the staff increased their forecast for fourth quarter output growth from 2.8% in the September Greenbook to 4.1% in the November Greenbook. Although the staff still expected real GDP growth to slow sharply over the coming year, to 1% in the third quarter of 1995, the outlook over the next four quarters (2.3%) was raised modestly from the September Greenbook (2.1%). The outlook for inflation over the next four quarters remained at 3.3%, unchanged from the September Greenbook. The staff continued to warn of a deterioration in trend inflation unless the growth of aggregate demand slowed.

The November FOMC meeting was memorable because the Committee voted to raise the FFTR by 75 basis points to 5.5%. Such an outsized increase during a tightening episode would not reoccur until 2022. At the meeting, Greenspan once again urged the Committee to follow inventories closely, arguing that inventories will be key to determining the economy's momentum. Nonetheless, he argued that he didn't think that policymaking was "very difficult" at this stage of the tightening cycle, chiefly because "we are behind the curve." In making the case for a 75-basis point hike, Greenspan worried that only increasing the FFTR by 50 basis points would spur markets to "immediately" price in another 50 basis points in December. Thus, increasing the FFTR by only 50 basis points would make him "very nervous." His discomfort with that outcome also stemmed from his belief that the Committee might unintentionally increase the FFTR too much once the economy started to slow—even with rising price pressures. Nevertheless, Greenspan contended that the tail end of the tightening cycle would occur when output growth was slowing and inflation was continuing to increase, suggesting a lagged response from changes in output to prices:

> We are going to be in a position where we are going to see the economy slowing and the actual inflation data picking up. And we are going to have to be able at that point to recognize that that's the tail end and continuing to ratchet rates up would be a mistake. But we are nowhere near that point as far as I can see at this particular stage. . . In my judgment, we would be risking—a low probability risk but a potentially very large outcome if it were to happen—a run on the dollar, a run on the bond market, and a significant decline in stock prices. This would be on top of a $750 billion paper loss as a consequence of the declines in bond and stock prices earlier this year. We would find out what a wealth effect can do to economic activity in a way that would make us really quite uncomfortable. So, I think that we have to be very careful at this stage and be certain that we are

> ahead of general expectations. I think we can do that with 75 basis points.

Greenspan's concerns about (adverse) financial accelerator effects was consistent with his comments throughout the year. What was striking, though, was his comment about the product of a low probability event and a potentially large outcome. This Bayesian strategy would be a key foundation for the policy design during the 1998 Russian Debt default. [33] The statement issued after this meeting was, perhaps incongruous with the magnitude of the rate hike, slightly less informative than the August statement because no forward guidance language was included. Moreover, the statement again cited rising levels of resource utilization, a continuing tilt to the Phillips curve framework that Greenspan debated at the September meeting.

> These measures [including an increase in the discount rate] were taken against the background of evidence of persistent strength in economic activity and high and rising levels of resource utilization. In these circumstances, the Federal Reserve views these actions as necessary to keep inflation contained, and thereby foster sustainable economic growth.

December 20, 1994, FOMC Meeting

When the Committee convened in December, it was confronted with a strong upward revision to third-quarter real GDP growth, from 3.4% to 3.9% (see Table 1). In addition, the Board staff sharply increased the outlook for real GDP growth in the fourth quarter of 1994 from 4.1% in the November Greenbook to 5%, and from 2.5% to 3% in the first quarter of 1995. In response, the Greenbook forecast for real GDP

[33] As noted in his 2004 speech to the American Economic Association about the event, Greenspan said that "the product of a low-probability event and a potentially severe outcome was judged a more serious threat to economic performance than the higher inflation that might ensue in the more probable scenario."

growth over the following four quarters was raised by 0.5 percentage points to 2.8%. Still, Board staff continued to see a sharp deceleration in real GDP growth over the second half of 1995 because of an "inevitable" slowing in inventory investment—something Greenspan mentioned repeatedly throughout the year. The Board staff marked down their forecast for CPI inflation in the fourth quarter of 1994 from 3.1% in the November Greenbook to 2.3% in the December Greenbook. But as seen in Table 1, though, the downshift in inflation in the fourth quarter was expected to be temporary, driven importantly by a nearly 7% decline in crude oil prices over the second half of 1994. The Greenbook forecast a brief resurgence in inflation above 3% over most of 1995, but then much slower inflation once output growth slowed below potential by the middle of 1995. Board staff remained uncertain about the risks to the inflation outlook, deeming them "something of a conjecture at this point."

After the outsized move in November, the Committee voted to hold rates at 5.5% at the December meeting. But the decision was not unanimous, as Governor LaWare dissented in favor of "an immediate tightening action." His arguments were very similar to those made in earlier dissents by Fed Presidents Broaddus and Jordan.[34] Many developments in the macroeconomy continued to puzzle the FOMC, such as the strength in housing, tepid wage growth in the face of a "very rapidly tightening labor market," and inflation that remained "relatively low." Greenspan noted that the lagged effects of past tightening actions still worried him: "We are probably some 25 percent into the cumulative effects of our policy tightening at this

[34] See the Minutes of the December 20 FOMC Meeting at https://www.federalreserve.gov/fomc/MINUTES/1994/19941220min.htm.

stage." Besides the effects of past tightening actions, the municipal bankruptcy of Orange County, California and its associated turmoil was another factor that swayed Greenspan to argue for standing pat.

He also noted again the possibility that labor productivity growth was stronger than the numbers suggested, and that the Fed's credibility had "kept a cap on long-term interest rates." The latter, he argued, afforded the Committee "the time to make further adjustments if need be." The Chairman nonetheless cautioned that "if we get an unexpected breakout on the upside in inflationary expectations, the distributed lag of monetary policy will bunch up very quickly." Finally, in a bit of prescient analysis, Greenspan argued that the economy might actually be in the early stages of business expansion—which ultimately proved to be true.

> I think it is really worth recognizing that there is something quite different about the timing of this recovery. Ordinarily, a recovery has a much higher rate of growth in the early stages and slows in the later stages. Probably what is happening here is that we really didn't have the classic movement to a cyclical recovery until well into the cycle, and we are probably now at effectively the earlier stages in a geriatric sense as distinct from the calendar. What this suggests is that we probably still have quite significant momentum in the system, and it is not clear just when it will ease off. I wonder to what extent we can attribute all of this to monetary policy and monetary policy lags. Surely, we can attribute some of it; there is no question that that is the case. But there is an internal dynamic in the economy that is wholly independent of the business cycle.

There were two additional conference calls after the December 20 meeting: On December 30 and on January 13, 1995. In each case, the discussion centered on developments in Mexico and the associated effects stemming from the devaluation of the peso. In both instances, the Committee left the policy rate unchanged at 5.5%.

January 31-February 1, 1995, FOMC Meeting

As seen in the Greenbook forecasts in Table 1, Board staff continued to expect considerable strength in real GDP growth over the next two quarters, followed by a sizable stepdown in growth over the second half of 1995. Besides the effects of Mexico's financial difficulties, Board staff assumed that the Japanese earthquake in Kobe would also contribute to weaker growth in 1995—chiefly through less US net exports. However, with the pace of activity continuing to surprise to the upside, Board staff nonetheless raised their forecast for real GDP over the next four quarters to 3%, about 0.25 percentage points stronger than forecast in the December Greenbook (2.8%). Board staff also raised their forecast for real GDP growth in 1996 by about 0.5 percentage points to 2.5% (not shown in the table). According to the Greenbook, the upward revision to growth in 1995 and 1996 reflected a revised policy path for the FFTR—that is, Board staff assumed that the rate would be kept constant at 5.5% through 1996 (implicitly, then, the staff assumed no change in the FFTR at this meeting). On the inflation front, Board staff admitted that the data was coming in better than expected, but this partially offset by higher levels of "resource utilization." The end result, reflecting their growth assumptions for the second half of 1995, as seen in Table 1, was a 0.1 percentage point decrease in CPI inflation projected over the following four quarters (2.9% to 2.8%).

This FOMC meeting was notable for two reasons. First, the Committee formally debated the feasibility of adopting an inflation target. The meeting was structured so that Richmond Fed President Al Broaddus argued in favor of an inflation targeting regime, and Federal Reserve Governor Janet Yellen arguing against the Fed adopting an inflation target. Second, the meeting concluded with another 50 basis point hike in the FFTR. This increase brought the 1994-95 tightening episode to a conclusion. In all the FOMC raised the nominal FFTR by 300 basis points in a year's time.

Chairman Greenspan (and the Committee) was heartened by a strong capital goods market that, in his view, suggested that "there is a long way to go before this economy tilts down," despite the fact that "we have taken a lot of the bubble out of the market." Indeed, Greenspan said that the lack of instability in the equity market was one of the Committee's successes. Still, Greenspan and the Committee continued to worry about an unsustainable rate of inventory accumulation, with Greenspan noting that "there is little evidence that we have accumulated levels that have to be readjusted. Like the Greenbook, he argued that an adjustment would occur at some point, which "may very well be the trigger of the next downturn." Interest-sensitive sectors—housing and retail sales—remained an area of concern. Greenspan argued that the expected decline in single family home sales would have a two-pronged effect on the economy:

> [Falling home sales] "will tend to reduce the capital gains realized on the sale of homes and will contract spending in the retail areas because a substantial amount of the realized capital gains, which are essentially financed by increases in mortgage debt, goes into consumer markets."

In fact, said Greenspan, the Committee should not expect strong retail sales in the next few months, but they also "should not hope for" a further strengthening in sales. If that were to occur, "then the notion that the expansion is slowing becomes very seriously in doubt." In conclusion, Greenspan argued once again that the Committee should be very wary of going against market expectations:

> [A]n argument can be made to stay where we are at this particular time. That argument would have considerable force were it not for the fact that the markets expect a 50 basis point rise in the context of an exchange market for the dollar that has not been all that impressive. We know that to the extent we choose to go against market expectations, we create a degree of volatility; indeed, that is the purpose of going against the market. But there are times when doing so is probably unwise. And were we to hold still at this point, we would in my view be taking unnecessary and undue risks. The risk on the exchange rate side is that the dollar would undoubtedly fall. The problem is not so much a decline as how quickly and how far it would decline in the context of the way world markets have been behaving, where countries that are viewed as slightly suspicious find the foreign exchange vigilantes running at them. The United States is just barely investment grade, if I may put it that way. I don't think we have much leeway on the downside to take those risks.

Keeping with the past practice of issuing statements following increases in the FFTR since the February 1994 meeting, the FOMC issued the following statement at the conclusion of the meeting.

> Despite tentative signs of some moderation in growth, economic activity has continued to advance at a substantial pace, while resource utilization has risen further. In these circumstances, the Federal Reserve views these actions as necessary to keep inflation contained, and thereby foster sustainable economic growth.

MONETARY POLICY IN THE AFTERMATH OF THE TIGHTENING EPISODE

Both 10-year and 2-year Treasury yields peaked before the last FFTR increase on February 1, 1995. The Minutes of the December 20, 1994, FOMC meeting noted that the decline in long-term rates over the intermeeting period reflected (i) more favorable inflation data, (ii) a view “held by many market participants . . . that monetary policy would be sufficiently firm to hold inflation in check,” and (iii) concerns about potential financial market contagion effects stemming from the Orange County municipal bankruptcy. Although the advance estimate from the Bureau of Economic Analysis in late January 1995 showed that real GDP growth rose at a strong 4.6% annual rate in the fourth quarter of 1994 (modestly below the Jan. 25, 1995, Greenbook forecast), the staff in the March 1995 Greenbook continued to expect real GDP growth to slow—from an average of 4.3% over the second half of 1994 to 2.1% over first half of 1995 to under 2% over the second half of 1995. However, slowing CPI inflation to 2.2% in the fourth quarter of 1994 (from 3.6% in 1994:Q3) was projected to reverse in 1995, with inflation averaging slightly more than 3% over the four quarters 1995; this rate was slightly higher than projected in the January Greenbook.

At the March 28, 1995, FOMC meeting, the initial discussion centered on developments in Mexico. When the discussion turned to US economic developments and monetary policy, some questioned whether the Board staff's soft landing-type forecast was inconsistent with a FFTR that was forecast to remain at 6% for the next eight quarters. In fact, several Reserve Bank presidents noted strength in their District economy, but indicated their belief that the pace of activity at the national economy was moderating. Still, many FOMC participants questioned whether the forecast of higher inflation should not lead to further increases in the FFTR. Governor Blinder summarized the situation well:

> If Bill McDonough and several of the others are correct in the sense that inflation is likely to be higher in 1997 than in 1994--and I think he probably is correct in that—and if we are adamantly opposed to that, this Committee should not be voting an asymmetric directive. We should be raising interest rates, probably by 100 basis points today. I do not advocate that policy, but I think that is the implication.

As Governor Blinder indicated, the possibility of further increases in the FFTR in 1995 were a live option, despite the staff's forecast. In terms of possible future changes to the FFTR, Don Kohn, who was the Director of the Division of Monetary Affairs at the time, urged the Committee to be flexible when considering future moves, as this exchange with NY Fed President McDonough revealed:

> VICE CHAIRMAN MCDONOUGH. Don, am I right in thinking that one of the messages from your very interesting presentation is that we may have reached a point at which quarter point changes in the funds rates would be appropriate again? When we were going through the tightening exercise, we went 25, 25, 25, then a couple of 50s, then 75, then 50. If we are as balanced as you say we are, and based on your presentation, would you not feel that 25 basis point moves are quite appropriate now?
>
> MR. KOHN. I think they would be more appropriate now, particularly if in order to make 50 basis point moves, the Committee felt it had to wait for more information. I thought the lesson of my sermon was that it is better to be a little flexible, and maybe even have to reverse after going in one direction or another, than to get stuck on a particular rate that gets harder to change the longer the Committee is stuck on it. One can see a little of this in Germany and Japan right now, I think.

In his commentary, Greenspan said that the pace of the economy is "moving down in the direction that we had hoped." Greenspan further commented that he thought a "mini inventory recession" was occurring but he did not believe it was concerning. Like some others, the Chairman said that the Committee was "looking at the possibility that there is an element of euphoria about a soft landing." Greenspan also made a *mea culpa* of sorts, when he said that he should not have raised the possibility of a rate cut in his Humphrey-Hawkins testimony on February 23, 1995. In his testimony, Greenspan said:

> Because the effects of monetary policy are felt only slowly and with a lag policy will have a better chance of contributing to meeting the

> nation's macroeconomic objectives if we look forward as we act—however indistinct our view of the road ahead. Thus over the past year we have firmed policy to head off inflation pressures not yet evident in the data. Similarly, there may come a time when we hold our policy stance unchanged, or even ease despite adverse price data, should we see signs that underlying forces are acting ultimately to reduce inflation pressures. Events will rarely unfold exactly as we foresee them, and we need to be flexible—to be willing to adjust our stance as the weight of new information suggests it is no longer appropriate. [35]

At the March FOMC meeting, Greenspan was also concerned that the markets had an unwarranted belief in the FOMC's crystal ball: "markets truly believe that we know what is going on in the economy to a degree that no one else really does." This trust, while burnishing the FOMC's credibility with the markets, nonetheless worried Greenspan, who said it was a double-edged sword "basically because we could be our own worst enemies in this regard."

Meanwhile, as shown in Figure 5, policy finally turned restrictive in late 1994, with the real FFTR finally surpassing both measures of R*. Monetary policy would remain restrictive throughout 1995 according to this metric, which Greenspan favored. However, as seen in Figure 1, real M2 growth was accelerating rapidly after the final FFTR increase. Recall from Table 1 that the Greenbook forecast a sharp slowing in real GDP growth over the first half of 1995 relative to the second half of 1994. By June 1995, it was clear that the economy was indeed slowing sharply. However, the FOMC kept the FFTR at 6% at the March 28 and May 23 FOMC meetings.

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[35] See https://fraser.stlouisfed.org/files/docs/historical/greenspan/Greenspan_19950223.pdf?utm_source=direct_download.

During the discussion at the November 1994 meeting, Greenspan made the comment that the tail end of the of the tightening cycle would occur when output growth was slowing and inflation was continuing to increase. This turned out to be a prescient comment, since this was situation that the Committee confronted at the July 1995 FOMC meeting, when the Board staff forecast that real GDP would *decline* at a 0.5% annual rate in the second quarter after increasing at a 2.7% rate in the first quarter. But the Committee was on the horns of a dilemma because inflation was expected to accelerate from 3.2% in the first quarter to 3.5% in the second quarter—albeit then slow to slightly less than 3% over the second half of 1995. By the time of the August 22 FOMC meeting, the advance estimate of second quarter real GDP growth that was released by the BEA in late July 1995 instead showed modestly positive real GDP growth (0.5% at an annual rate). Nonetheless, the FOMC in July decided to begin moving monetary policy toward a more neutral position under the belief that the economy was at the front end of a marked slowdown in the real economy, but with inflation still expected to exceed 3%.

In the statement that followed the July 6 meeting, the FOMC noted that "as a result of the monetary tightening initiated in early 1994, inflationary pressures have receded enough to accommodate a modest adjustment in monetary conditions." There was one dissent, as Kansas City Fed President Thomas Hoenig argued in favor of no change in policy. In Hoenig's view, the pace of economic activity was likely to return to trend growth later in 1995 and with inflation likely to be higher than it was in 1994. At the August meeting, the CPI inflation forecast for the second half of 1995 was marked down from about 2.9% in July Greenbook to 2.4% in the August

Greenbook. However, the staff continued to show inflation reaccelerating to more than 3% over the first half of 1996.

The FOMC remained on hold until the December 19, 1995, meeting, when it announced another 25 basis point reduction in the FFTR to 5.5%. In the press release, the Committee again noted that "inflation has been somewhat more favorable than anticipated, and this result along with an associated moderation in inflation expectations warrants a modest easing in monetary conditions." In the December Greenbook, the staff forecast inflation at 2.9% for each of the four quarters of 1997. The Committee followed up the December rate cut with another 25 basis point rate cut at the January 31, 1996, meeting, noting that moderating growth has "reduced potential inflationary pressures going forward." Again, another tilt toward the Phillips curve. As it turned out, the economy was on much stronger footing than what the Greenbook and the Committee believed. The advance GDP estimate for the third quarter that was released in late October 1995, showed that the growth in the second quarter had been revised up to 1.3% and that growth in the third quarter had accelerated sharply, to a 4.2% annual rate. Thereafter, with 75 basis points of cuts in the nominal FFTR, the real FFTR drifted back below R* in the second half of 1996; real GDP growth would rebound smartly, posting above-trend growth from 1996 through 1999. After rising 3.2% in 1996 (Q4/Q4), CPI inflation would slow to 1.9% in 1997, 1.5% in 1998, but then rise to 2.6% in 1999 on the heels of rising oil prices.

Undergirding the twist and turns in the economy and inflation was a relatively healthy labor market. In January and February 1994, the unemployment rate measured 6.6%. During the 1994-95 tightening episode the unemployment rate would slowly decline rather than increase. By February 1995, the unemployment rate was 1.2 percentage points lower than a year earlier, when the tightening cycle began. Moreover, the unemployment rate would steadily decline on net, thereafter, falling to under 5% on a continual basis in the third quarter of 1997. There is no agreed upon measure of a soft-landing in the midst of a Fed tightening episode, but a steady decline in the unemployment rate and continued positive growth in real GDP in the absence of no persistent acceleration in inflation or inflation expectations suggests that the Greenspan FOMC achieved its soft-landing.

LESSONS FROM THE 1994-95 EPISODE

Reading the FOMC transcripts from this episode is illuminating because it reveals a few key aspects of Greenspan's version of risk management during this tightening episode. [36] First, the FOMC moved cautiously during the early stages. Second, the FOMC paused several times to evaluate the cumulative effects of their actions. Of the nine FOMC meetings and six conference calls from February 3, 1994, to February 1, 1995, the FOMC raised the FFTR at six meetings and during one conference call. These actions were consistent with the Bayesian framework of belief updating, particularly when uncertainty about future macroeconomic developments was high. Third, Greenspan was also willing to move expeditiously and aggressively, if necessary, as indicated by an intermeeting move and the large 75 basis point increase at the November meeting. Overall, this tightening episode was the shortest

[36] Blinder and Reis (2005) offer a longer list of Greenspan's key principles for monetary policymaking.

of the Greenspan era. In fact, the Greenspan tightening episodes were about a third shorter in duration compared to those from Volcker's last tightening episode (1983-84), and the Yellen (2015 to 2018), and Powell (2022 to the present) episodes. [37]

Fourth, Greenspan regularly focused on inventory investment as a key indicator of the economy's momentum. He also was keenly focused on financial market developments ("pricking the bubble") but was not averse to tightening despite a "large risk premium in financial markets." In fact, at the May 1994 meeting, Greenspan was unconcerned about overtightening, believing it would only temporarily slow the economy. Fifth, Greenspan was regularly surprised by that the subdued nature of inflation pressures. This sentiment was expressed at the March, May, July, September, and December 1994 meetings. Finally, Greenspan initially focused on the gap between short- and long-term real rates as an indicator of future inflation pressures, but with the real economy continuing to surprise to the upside in 1994, he began to pay more attention to high levels of resource utilization—an explicit shift to a Phillips curve framework—to keep inflation in check (July, September, and November 1994 FOMC Press Releases). Moreover, as the economy slowed sharply in the first half of 1995, despite little material change in the near-term inflation outlook, Greenspan and the Committee chose to enact three rate cuts.

[37] The elongated 2004-2006 tightening episode, which overlapped with the start of the Bernanke era in March 2006, was a notable exception. As FOMC Chairman, Ben Bernanke presided over three 25-basis point increases in the FFTR at the March, May, and June 2006 FOMC meetings. They were the last tightening actions of his tenure as FOMC Chair. See Kliesen (2023) for an analysis of the Fed tightening episodes from 1983 to 2018.

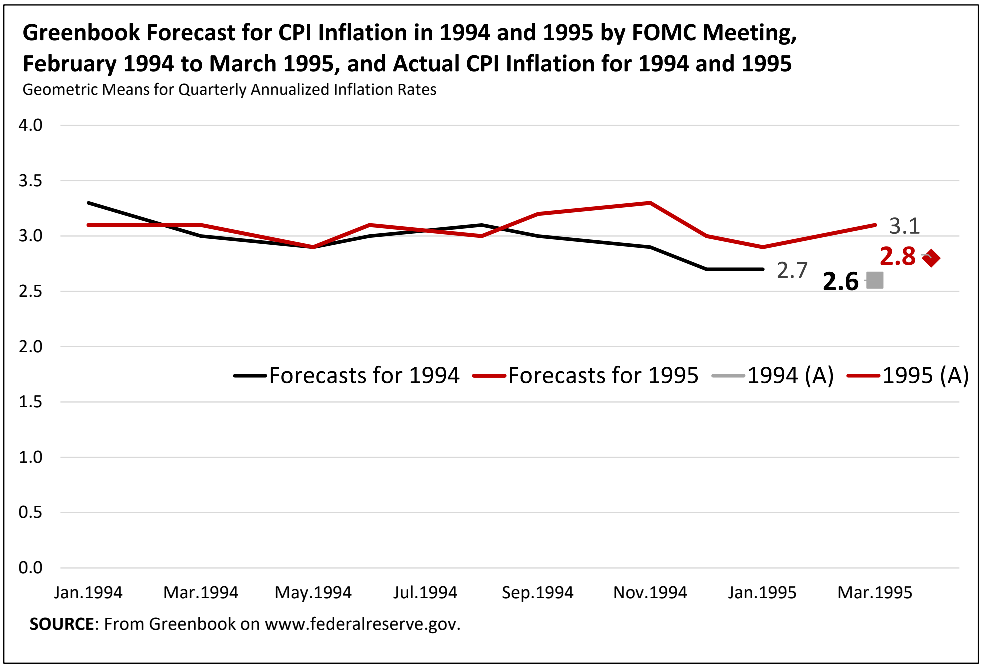
Years later, Chairman Greenspan, repeating the view expressed during his Humphrey Hawkins Congressional testimony in February 1995, would recount the key lesson from this episode:

> [I]t became clear that underlying price pressures were again building. If we had left those pressures unchecked, we would have put at risk some of the hard-won gains that had been achieved over the preceding decade and a half. So, starting from a real federal funds rate that was close to zero, a preemptive tightening was initiated. The resulting rise in the funds rate of 300 basis points over 12 months apparently defused those nascent inflationary pressures.[38]

As documented in this article, Greenspan and the Committee were regularly surprised that inflation pressures were not more evident. And yet, as documented in Figure 6, the Greenbook forecasts for CPI inflation for 1994 and 1995 remained roughly constant at about 3% through the first eight months of 1994. But while the forecasts for 1994 began to drift lower the forecasts for 1995 began to drift higher. The widening gap in the 1994 and 1995 inflation forecasts likely were an important factor in the FOMC's decision to raise the FFTR by 175 basis points from August 1994 to February 1995. In both cases, actual inflation turned out to be modestly lower than the forecasts from the beginning of the tightening episode. So, perhaps that is what Greenspan meant by his contention that underlying price pressures were "apparently defused."

[38] Greenspan (2004).

Figure 6



But there might be another way to gauge Greenspan's contention that the FOMC's actions successfully defused these "nascent inflationary pressures." Recall from Figure 3 that beginning in mid-1994, there was a modest upward drift in headline inflation and, less so, core CPI inflation that persisted until mid-1995. But whereas headline inflation began to drift lower in summer 1995 to around 2.5%, core inflation remained roughly constant at 3%. That the FOMC implemented rate cuts with a higher core inflation was interesting. Figure 4 showed that one-year ahead inflation expectations also drifted modestly upward beginning in early 1994, but then peaked at 3.5% in mid-1995 and began to drift lower. Longer-run inflation expectations, by contrast, remained unchanged at about 3.5% from fall 1993 to early 1995, but they then began to drift lower. So, in that sense, the tightening episode appeared to succeed in reducing inflation expectations. Thus, this might have been the source of Greenspan's contention that underlying price pressures were "apparently defused."

Although counterfactuals are hard to prove, Table 2 provides some evidence that inflation fears were slightly overwrought during the tightening period. Table 2 reports forecasts errors (actual less forecast) for the first estimates for real GDP growth and CPI inflation for the quarter. Forecast errors are calculated for the period 1994:Q1 to 1995:Q1, using Greenbook forecasts reported in Table 1 for (1) two meetings before the first estimates were available to the FOMC and (2) for the meeting immediately prior to the first estimate. For example, the first estimate for real GDP growth and CPI inflation for the first quarter of 1994 was available at the May 17, 1994, FOMC meeting. At the January FOMC meeting, the Greenbook forecast that real GDP would increase at a 4% annual rate in the first quarter and that inflation would increase at a 3.6% annual rate. Approximately six weeks later, with an additional month of source data, the Greenbook forecast for real GDP growth was lowered to 3.2% and the inflation forecast was lowered to 2.1%. When the actual numbers were released in mid- to late-April 1994, and available at the May 17 FOMC meeting, the advance estimate showed that real GDP increased at a 2.6% annual rate in the first quarter of 1994 and that the CPI increased at a 1.9% annual rate. As seen in Table 2, this resulted in negative forecast errors for Greenbooks published one and two meetings ahead.

Table 2 indicates that, on average, the Greenbook forecast error for real GDP growth was -0.4% for the Greenbook prepared two meetings in advance, but then 0% on average for the Greenbook one meeting in advance. For inflation, the average forecast error two meetings ahead was also -0.4% but was only -0.1% on average for the one-meeting ahead Greenbook. These findings are not too surprising, since additional source data should result in a more accurate forecast the closer to the actual release date of the series in question. Admittedly, the forecast errors are not terribly large, and, moreover, this evidence must be viewed as tentative given the small sample size. Still, one question that may be reasonably posed is whether the modest overestimate of inflation pressures in the Greenbook forecasts were ad-factored to fit Greenspan's priors? Regardless, the big picture outcome was this: The FOMC successfully lowered longer-term inflation expectations without driving the economy into a recession.

Table 2

Table 2

Greenbook Forecast Errors (A-F) for Real GDP Growth and CPI Inflation

	1994:Q1	1994:Q2	1994:Q3	1994:Q4	1995:Q1	Average
Two-GBs Ahead						
Real GDP	-1.4	-0.5	0.6	-0.4	-0.4	-0.4
CPI Inflation	-1.7	0.1	-0.4	-0.1	0.3	-0.4
One-GB Ahead						Error
Real GDP	-0.6	0.2	0.4	-0.4	0.3	0.0
CPI Inflation	-0.2	0.1	-0.2	-0.2	0.0	-0.1

SOURCE: Data from Table 1

Evidence of Success from the Taylor Rule

The one question that remains is why did inflation and inflation expectations turn lower in 1995? One method for assessing the Greenspan Fed's success in avoiding a recession during this tightening episode is through the lens of a policy rule. One popular rule that has endured over time—albeit with several modifications—is the Taylor rule. However, Taylor's paper that described his ubiquitous rule was not published until 1993.[39] In the publicly available FOMC documents, the first mention of the Taylor rule appeared to occur during an FOMC Briefing presentation by Don Kohn in November 1995.[40] Kohn's presentation discussed and summarized several versions of the Taylor rule. According to Judd and Rudebusch (1998), the Taylor rule gained the attention of some monetary policymakers in 1996, including then Governors Alan Blinder, Laurence Meyer, and Janet Yellen. It was also reported in *Business Week*. The Taylor rule thus appeared to play little, if any, role in the policy deliberations during the 1994-95 tightening episode.[41]

Since then, several economists have estimated Taylor rules using data that was available at the time to gauge whether the Fed policymakers' decisions aligned with the rule. These include papers by Judd and Rudebusch (1998), Orphanides (2001, 2003), and Mehra and Minton (2007). As noted above, there are many versions of the rule, but the original 1993 version is the one that will be used here. Specifically, from Judd and Rudebusch (1998), the 1993 rule is the following:

$$i_t = \pi_t + r^* + 0.5(\pi_t - \pi^*) + 0.5(y_t);$$

where i = federal funds rate;

r^* = equilibrium real federal funds rate;

[39] See Taylor (1993).
[40] See https://www.federalreserve.gov/monetarypolicy/files/FOMC19951115material.pdf.
[41] It is possible that earlier analysis of the Taylor rule and its implications for monetary policy were written by the staff in memos to FOMC participants. However, most of these memos are not publicly available.

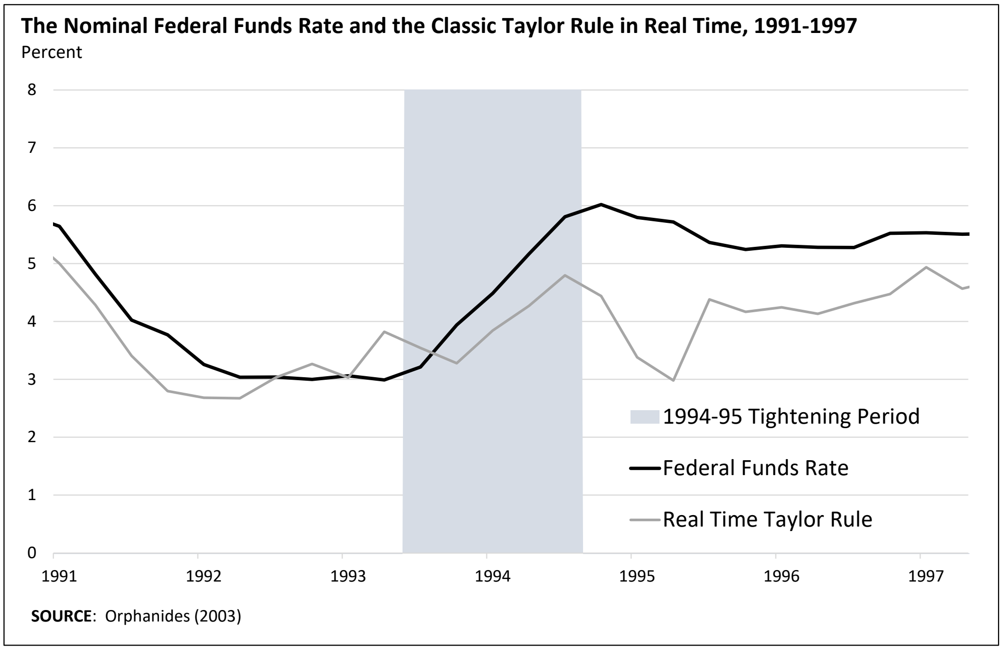
π = average inflation rate over the contemporaneous and prior three quarters (GDP deflator);

π^*= target inflation rate;

y = output gap (100x(real GDP – potential GDP) ÷ potential GDP).

Figure 7 shows the actual FFTR rate and the predicted FFTR from the original 1993 Taylor rule from the beginning of 1991 to the end of 1997. The chart uses data from Orphanides (2003). Throughout most of 1991-92, the actual FFTR followed the rule. Beginning in early 1993, the Taylor rule began to prescribe a modestly higher FFTR. From the fourth quarter of 1993 to the first quarter of 1995, the rule prescribed an increase in the FFTR from 3.8% to 4.8%. However, the actual FFTR rose from 3% to 6%. The Taylor rule then suggested a temporary reduction in the FFTR in the second quarter of 1995, as actual inflation began to slow, whereas the FOMC did not reduce the FFTR until the beginning of the third quarter of 1995. Throughout the rest of this period, the actual FFTR was above the rule-based estimate, suggesting that policy was tighter than suggested by the Taylor rule. Also recall that the real FFTR fell below R* in 1996, which signaled tighter policy in 1995, but then a modestly accommodative policy in 1996.

Figure 7



CONCLUSION

The 1994-95 Fed tightening episode was one of the most notable in the Fed's history. First, the FOMC raised the policy rate by 300 basis points in a year, even though headline and core inflation were trending lower prior to the liftoff that occurred in February 1994. Second, the Fed's actions apparently caught the Treasury market by surprise, triggering a sharp decline in long-term bond prices. Third, Greenspan contended that the motivation for the tightening action was to defuse building underlying price pressures. And indeed, both headline and core CPI inflation began to increase modestly in mid-1994, less so for core inflation. However, this article showed that Greenspan and the Committee was regularly surprised by that inflation was not rising by more than the forecasts suggested. Indeed, this article presented some evidence that the Greenbook forecast systemically, albeit modestly, overpredicted CPI inflation during the tightening period.

Ultimately, headline inflation would begin to decelerate in mid-1995, as concerns about the strength of the real economy emerged. Although, core inflation remained at 3% for the remainder of 1995, slightly higher than the rate that prevailed at the start of the tightening episode, the Committee shifted tack over the second half of 1995 and into early 1996 by cutting the FFTR by a total of 75 basis points.

Greenspan eventually concluded that the nascent strengthening in labor productivity growth that was a key factor in restraining the growth of unit labor costs, and thus in keeping inflation pressures in check. At the same time, the success of the episode stemmed importantly from the decision by Greenspan and the FOMC to increase the policy rate to a level deemed restrictive for most of 1995. This effort reduced longer-run inflation expectations without triggering a recession. In that sense, the 1994-95 tightening episode was a roaring success.

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TABLE 1

Greenbook Forecast for Real GDP Growth and CPI Inflation, December 1993 to March 1995

Actual and forecast values are quarterly percent changes at annual rates; actual values are in bold.

Greenbook Date (Italics)	Forecast Horizons 1992:Q3	1992:Q4	1993:Q1	1993:Q2	1993:Q3	1993:Q4	1994:Q1	1994:Q2	1994:Q3	1994:Q4	1995:Q1	1995:Q2	1995:Q3	1995:Q4	1996:Q1	1996:Q2	1996:Q3	1996:Q4
12/21/1993																		
Real GDP	**3.4**	**5.7**	**0.8**	**1.9**	**2.7**	5.0	3.6	2.0	2.5	2.5	2.5	2.5	2.5	2.5				
CPI	**2.9**	**3.2**	**3.7**	**2.8**	**1.4**	2.9	2.9	3.5	3.2	3.0	3.0	2.9	2.9	2.9				
1/28/1994																		
Real GDP	**3.4**	**5.7**	**0.8**	**1.9**	**2.9**	**5.9**	4.0	3.0	2.5	2.5	2.4	2.4	2.4	2.4				
CPI	**2.9**	**3.2**	**3.7**	**2.8**	**1.4**	**2.8**	3.6	3.6	3.0	2.8	3.4	3.1	2.9	2.9				
3/22/1994	**Revisions to CPI Inflation**																	
Real GDP	**3.4**	**5.7**	**0.8**	**1.9**	**2.9**	**7.5**	3.2	2.5	2.7	2.4	2.3	2.3	2.4	2.4				
CPI	**2.9**	**3.5**	**2.8**	**3.1**	**2.0**	**3.1**	2.1	3.6	3.4	3.0	3.4	3.1	2.9	2.9				
5/17/1994																		
Real GDP	**3.4**	**5.7**	**0.8**	**1.9**	**2.9**	**7.0**	**2.6**	4.2	2.7	2.1	2.2	2.2	2.3	2.4				
CPI	**2.9**	**3.5**	**2.8**	**3.1**	**2.0**	**3.1**	**1.9**	2.7	3.5	3.3	3.1	2.9	2.8	2.7				
7/6/1994																		
Real GDP	**3.4**	**5.7**	**0.8**	**1.9**	**2.9**	**7.0**	**3.0**	3.5	2.9	2.4	2.0	2.2	2.3	2.4				
CPI	**2.9**	**3.5**	**2.8**	**3.1**	**2.0**	**3.1**	**1.9**	2.7	3.7	3.6	3.4	3.1	3.0	2.9				
8/16/1994	**Revisions to Real GDP**																	
Real GDP	**3.5**	**5.7**	**1.2**	**2.4**	**2.7**	**6.3**	**3.3**	**3.7**	2.8	2.3	1.9	2.1	2.2	2.3				
CPI	**2.9**	**3.5**	**2.8**	**3.1**	**2.0**	**3.1**	**1.9**	**2.8**	4.0	3.5	3.3	2.9	2.9	2.9				
9/27/1994																		
Real GDP	**3.5**	**5.7**	**1.2**	**2.4**	**2.7**	**6.3**	**3.3**	**3.8**	3.0	2.8	1.9	1.7	1.8	2.0	2.2	2.3	2.3	2.3
CPI	**2.9**	**3.5**	**2.8**	**3.1**	**2.0**	**3.1**	**1.9**	**2.8**	3.8	3.3	3.7	3.2	3.1	3.0	3.0	3.0	3.0	3.0
11/15/1994																		
Real GDP	**3.5**	**5.7**	**1.2**	**2.4**	**2.7**	**6.3**	**3.3**	**4.1**	**3.4**	4.1	2.5	1.4	1.0	1.5	1.8	2.2	2.3	2.4
CPI	**2.9**	**3.5**	**2.8**	**3.1**	**2.0**	**3.1**	**1.9**	**2.8**	**3.6**	3.1	3.7	3.3	3.1	2.9	2.9	2.9	2.9	2.9
12/20/1994																		
Real GDP	**3.5**	**5.7**	**1.2**	**2.4**	**2.7**	**6.3**	**3.3**	**4.1**	**3.9**	5.0	3.0	2.0	1.3	1.2	1.4	1.8	2.0	2.1
CPI	**2.9**	**3.5**	**2.8**	**3.1**	**2.0**	**3.1**	**1.9**	**2.8**	**3.6**	2.3	3.1	3.2	3.0	2.8	2.9	2.9	2.9	2.9
2/1/1995																		
Real GDP	**3.5**	**5.7**	**1.2**	**2.4**	**2.7**	**6.3**	**3.3**	**4.1**	**4.0**	5.0	3.2	2.0	1.7	1.7	2.0	2.5	2.6	2.6
CPI	**2.9**	**3.5**	**2.8**	**3.1**	**2.0**	**3.1**	**1.9**	**2.8**	**3.6**	2.4	2.9	2.9	3.0	3.0	3.0	3.1	3.1	3.2
3/28/1995	**Revisions to CPI Inflation**																	
Real GDP	**3.5**	**5.7**	**1.2**	**2.4**	**2.7**	**6.3**	**3.3**	**4.1**	**4.0**	**4.6**	2.5	1.7	2.1	2.3	2.3	2.4	2.3	2.2
CPI	**2.9**	**3.5**	**3.1**	**2.8**	**1.7**	**3.4**	**2.2**	**2.5**	**3.6**	**2.2**	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0

SOURCE: Board of Governors of the Federal Reserve