

1 How Did We Get Here?

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The past three decades have seen an extraordinary transformation in the conduct of monetary policy. In the 1970s, inflation had risen to very high levels, with most countries, including the United States, experiencing inflation rates in the double digits. Today, almost all nations in the world are in a low inflation environment. Of 223 countries, 193 currently have annual inflation rates less than or equal to 10 percent, while 149 have annual inflation rates less than or equal to 5 percent.¹ Why and how has the strategy of the conduct of monetary policy changed such that it has become so successful in taming inflation?

The answer provided in the following chapters is that monetary authorities and governments in almost all countries of the world have come to accept the following ideas: 1) there is no long-run trade-off between output (employment) and inflation; 2) expectations are critical to monetary policy outcomes; 3) inflation has high costs; 4) monetary policy is subject to the time-inconsistency problem; 5) central bank independence is needed to produce successful monetary policy; and 6) a strong nominal anchor is the key to producing good monetary policy outcomes. But this list, which central bankers now subscribe to, is not where monetary policymakers started. In the 1960s, central bankers had a very different world view, which produced very bad monetary policy outcomes.

1.1 Central Banking in the 1960s

The 1960s began with a relatively benign inflation environment, particularly in the United States where inflation was running at an annual rate of just over 1 percent. (Inflation rates were at higher rates in countries such as Germany, France, Japan, and the United Kingdom but were still below 4 percent in 1960.) At the Federal Reserve and at many other central banks, the focus was on “money market conditions”: on variables such as nominal interest rates, bank borrowings from the central bank, and free reserves (excess reserves minus borrowings).² In addition, in the wake of the Great Depression of the 1930s, the economics professions became dominated by

Keynesians, the followers of John Maynard Keynes, who viewed the Depression as directly resulting from policy inaction when adverse shocks hit the economy. This led to an era of policy activism in which economists armed with Keynesian macroeconomic models argued that they could fine-tune the economy to produce maximum employment with only slight inflationary consequences. This was the intellectual environment that I was exposed to when I first started my study of economics as an undergraduate in 1969.

Particularly influential at the time was a famous paper published in 1960 by Paul Samuelson and Robert Solow, both MIT professors, which argued that work by A. W. Phillips, which became known as the Phillips curve, suggested that there was a long-run trade-off between unemployment and inflation and that this trade-off should be exploited.³ Indeed, Samuelson and Solow even mentioned that a nonperfectionist goal of a 3 percent unemployment rate could be attained at what they considered to be a low inflation rate of 4 to 5 percent per year. This thinking, not only by Samuelson and Solow, but also by the then-dominant Keynesian economists, led to increased monetary and fiscal policy activism to get the economy to full employment. However, the subsequent economic record was not a happy one: inflation accelerated, with the inflation rate in the United States and other industrialized countries eventually climbing above 10 percent in the 1970s, leading to what has been dubbed “The Great Inflation,” while the unemployment rate deteriorated from the performance in the 1950s.

1.1.1 No Long-Run Trade-Off between Output (Employment) and Inflation

The Monetarists, led by Milton Friedman, first mounted the counterattack to policy activism. Milton Friedman, in a series of famous publications in 1963, established that fluctuations in the growth rate of the money supply were far more capable of explaining economic fluctuations and inflation than nominal interest rates.⁴ In Congressional testimony, Karl Brunner and Allan Meltzer criticized the use of “money market conditions” to guide monetary policy and suggested that targeting monetary aggregates would produce better policy outcomes.⁵ In his famous 1968 presidential address to the American Economic Association, Milton Friedman along with Edmund Phelps argued that there was no long-run trade-off between unemployment and inflation rate: rather, the economy would gravitate to some natural rate of unemployment in the long run no matter what the rate of inflation was.⁶ In other words, the long-run Phillips curve would be vertical, and attempts to lower unemployment below the natural rate would result only in higher inflation. The monetarist counterattack implied that monetary policy should be focused on controlling inflation and the best way to do this would be pursuing steady growth in the money supply.

1.2 Central Banking in the 1970s

At first, the monetarist counterattack was not successful in getting central banks to increase their focus on controlling inflation and money supply growth. In the early 1970s, estimates of the parameters of the Phillips curve did not yet suggest that in the long run the Phillips curve was vertical. Economists and policymakers also were not as fully aware of how important expectations are to monetary policy's effect on the economy, a realization that would have led them to accept the Friedman-Phelps natural rate hypothesis more quickly. Also, estimates of the natural rate of unemployment were far too low, thus suggesting that increases in inflation that were occurring at then-prevalent unemployment rates were the result of special factors and not overly expansionary monetary policy.⁷

1.2.1 The Rational Expectations Revolution

Starting in the early 1970s, in a series of papers Robert Lucas launched the rational expectations revolution, which demonstrated that the public's and the markets' expectations of policy actions have important effects on almost every sector of the economy.⁸ The theory of rational expectations made it immediately clear why there could be no long-run trade-off between unemployment and inflation, so that attempting to lower unemployment below the natural rate would lead only to higher inflation and no improvement in performance in output or employment. Indeed, one implication of rational expectations in a world of flexible wages and prices was the *policy ineffectiveness proposition*, which indicated that if monetary policy were anticipated, it would have no real effect on output; only unanticipated monetary policy could have a significant impact. An implication of the policy ineffectiveness proposition was that a constant-money-growth-rate rule along the lines suggested by Milton Friedman would do as well as any other deterministic policy rule with feedback.⁹ The only result of all the policy activism advocated by Keynesian economists would be higher and more variable rates of inflation. Although evidence for the policy ineffectiveness proposition is weak,¹⁰ the rational expectation revolution's point that monetary policy's impact on the economy is substantially influenced by expectations about monetary policy has become widely accepted.

1.2.2 Recognition of the High Costs of Inflation and the Benefits of Price Stability

Events on the ground were also leading to a rejection of policy activism. Inflation began a steady rise in the 1960s and then in the aftermath of the 1973 oil price shock, inflation climbed to double-digit levels in many countries. Economists, but also the public and politicians, began to discuss the high costs of inflation.¹¹ A high inflationary environment leads to overinvestment in the financial sector, which expands to

profitably act as a middleman to help individuals and businesses escape some of the costs of inflation.¹² Inflation leads to uncertainty about relative prices and the future price level, making it harder for firms and individuals to make appropriate decisions, thereby decreasing economic efficiency.¹³ The interaction of the tax system and inflation also increases distortions that adversely affect economic activity.¹⁴

The recognition of the high costs of inflation led to the view that low and stable inflation can increase the level of resources productively employed in the economy, and might even help increase the rate of economic growth. While time-series studies of individual countries and cross-national comparisons of growth rates were not in total agreement, the consensus grew that inflation is detrimental to economic growth, particularly when inflation rates are high.¹⁵

1.2.3 The Role of a Nominal Anchor

The groundbreaking developments in economic theory coincided with the growing recognition among economists, politicians, and the public of the high costs of inflation. It also made clear why a *nominal anchor*—a nominal variable that monetary policymakers use to tie down the price level, such as the inflation rate, an exchange rate, or the money supply—is such a crucial element in achieving price stability. Adhering to a nominal anchor that keeps the nominal variable in a narrow range supports price stability by directly promoting low and stable inflation expectations. With stable inflation expectations, markets do much of the work for monetary policymakers: low and stable inflation expectations result in stabilizing price and wage setting behavior that lowers both the level and volatility of inflation.¹⁶

1.2.4 The Advent of Monetary Targeting

The three related ideas that expansionary monetary policy cannot produce higher output (employment) in the long run, that inflation is costly, and that there are advantages of a strong nominal anchor, all combined to help generate support for the idea espoused by Monetarists that central banks needed to control the growth rate of monetary aggregates. This idea led to the adoption of monetary targeting by a number of industrialized countries in the mid-1970s (see chapter 8).

Monetary targeting involves three elements: 1) the reliance on information conveyed by a monetary aggregate to conduct monetary policy, 2) the announcement of medium-term targets for monetary aggregates, and 3) some accountability mechanism to preclude large, systematic deviations from the monetary targets. The Federal Reserve started to follow weekly tracking paths for the monetary aggregate measures M1 and M2, while indicating its preferred behavior for M2. Then in response to a congressional resolution in 1975, the Fed began to announce publicly its targets for money growth. In late 1973, the United Kingdom began informal targeting of a broad monetary aggregate, sterling M3, and began formal publication of targets in

1976. The Bank of Canada instituted monetary targeting in 1975 under a program of “monetary gradualism” in which M1 growth was to be controlled with a gradually falling target range. In late 1974, both the Deutsche Bundesbank and the Swiss National Bank began to announce money stock targets: the Bundesbank chose to target central bank money, a narrow aggregate that was the sum of currency in circulation and bank deposits weighted by the 1974 required reserve ratios, and the Swiss National Bank targeted M1. In 1978, the Bank of Japan announced “forecasts” of growth rates of M2 (and after 1979, M2 plus certificate of deposits).

1.3 Central Banking in the late 1970s and the 1980s: The Failure of Monetary Targeting?

Monetary targeting had several potential advantages over previous approaches to the conduct of monetary policy. Announced figures for monetary aggregates are typically reported within a couple of weeks, and so monetary targets can send almost immediate signals to both the public and markets about the stance of monetary policy and the intentions of the policymakers to keep inflation in check. These signals can help fix inflation expectations and produce less inflation. Another advantage of monetary targets is promoting almost immediate accountability for monetary policy in order to keep inflation low.

These advantages of monetary aggregate targeting depend on one key assumption: there must be a strong and reliable relationship between the goal variable (inflation or nominal income) and the targeted aggregate. If there are large swings in velocity, so that the relationship between the monetary aggregate and the goal variable is weak, as is found in chapter 6, then monetary aggregate targeting will not work. The weak relationship implies that hitting the target will not produce the desired outcome on the goal variable and thus the monetary aggregate will no longer provide an adequate signal about the central bank’s policy stance. The breakdown of the relationship between monetary aggregates and goal variables such as inflation and nominal income was common, not only in the United States, but also even in Germany, which pursued monetary targeting for a much longer period (chapter 6).¹⁷ A similar instability problem in the money–inflation relationship has been found in emerging market countries, such as those in Latin America (chapter 14).

Why did monetary targeting in the United States, Canada, and the United Kingdom during the late 1970s and the 1980s not prove successful in controlling inflation? There are two interpretations. One is that monetary targeting was not pursued seriously, so it never had a chance to succeed (chapters 8 and 10). The Federal Reserve, Bank of Canada, and particularly the Bank of England engaged in substantial game playing in which they targeted multiple aggregates, allowed base drift (the initial starting point for the monetary target was allowed to shift up and down with realizations of the monetary aggregate), did not announce targets on a regular schedule,

used artificial means to bring down the growth of a targeted aggregate, often overshoot their targets without reversing the overshoot later, and often obscured the reasons why deviations from the monetary targets occurred.

The second reason for monetary targeting's lack of success in the late 1970s was the increasing instability of the relationship between monetary aggregates and goal variables such as inflation or nominal income, which meant that this strategy was doomed to failure. Indeed, monetary targeting was not pursued seriously because doing so would have been a mistake; the relationship between monetary aggregates and inflation and nominal income was breaking down. Once it became clear by the early 1980s that the money–income relationship was no longer strong, the United States, Canada, and the United Kingdom formally abandoned monetary targeting. Or as Gerald Bouey, a former governor, of the Bank of Canada, put it: “We didn’t abandon monetary aggregates, they abandoned us.”

The problems that an unstable relationship between the money supply and inflation create for monetary targeting is further illustrated by Switzerland’s unhappy 1989–1992 experience described in chapter 8, during which the Swiss National Bank failed to maintain price stability after it had successfully reduced inflation.¹⁸ The substantial overshoot of inflation from 1989 to 1992, reaching levels above 5 percent, was due to two factors. The first was that the Swiss franc’s strength from 1985 to 1987 caused the Swiss National Bank to allow the monetary base (now its targeted aggregate) to grow at a rate greater than the 2 percent target in 1987, and then caused it to raise the monetary base growth target to 3 percent for 1988. The second reason arose from the introduction of a new interbank payment system, Swiss Interbank Clearing (SIC), and a wide-ranging revision of the commercial banks’ liquidity requirements in 1988. The resulting shocks to the exchange rate and the shift in the demand for the monetary base arising from the above institutional changes created a serious problem for its targeted aggregate. As 1988 unfolded, it became clear that the Swiss National Bank had guessed wrong in predicting the effects of these shocks so that monetary policy was too easy even though the monetary base target was undershot. The result was a subsequent rise in inflation to above the 5 percent level. As a result of this experience, the Swiss National Bank moved away from monetary targeting first by not specifying a horizon for its monetary base target announced at the end of 1990 and then in effect moving to a five-year horizon for the target afterward, until it abandoned monetary targeting altogether in 1999.

The German experience with monetary targeting was generally successful, and coupled with the success of the initial Swiss experience, help us understand why monetary policy practice evolved toward inflation targeting. As argued by Jürgen von Hagen, the Bundesbank’s adoption of monetary targeting in late 1974 arose from the decision-making and strategic problems that it faced at the time.¹⁹ Under the Bretton Woods regime, the Bundesbank had lost the ability to control monetary pol-

icy, and focusing on a monetary aggregate was a way for the Bundesbank to reassert control over the conduct of monetary policy. German inflation was also very high (at least by German standards), having reached 7 percent in 1974, and yet the economy was weakening. Adopting a monetary target was a way of resisting political pressure and signaling to the public that the Bundesbank would keep a check on monetary expansion. The Bundesbank also was concerned that pursuing price stability and aiming at full employment and high output growth would lead to policy activism that in turn would lead to inflationary monetary policy. Monetary targeting had the additional advantage of indicating that the Bundesbank was responsible for controlling inflation in a longer run context, but was not trying to fight temporary bursts of inflation, particularly if these came from nonmonetary sources.

The circumstances influencing the adoption of monetary targeting in Germany led to several prominent design features that were key to its success. The first is that the monetary-targeting regimes were not bound by monetarist orthodoxy and were very far from a Friedman-type monetary targeting rule in which a monetary aggregate was kept on a constant-growth-rate path and is the primary focus of monetary policy.²⁰ The Bundesbank allowed growth outside its target ranges for periods of two to three years, and overshoots of its targets were subsequently reversed. Monetary targeting in Germany and in Switzerland was instead primarily a method of communicating the strategy of monetary policy that focused on long-run considerations and the control of inflation.

The calculation of monetary target ranges put great stress on making policy transparent (clear, simple, and understandable) and on regular communication with the public. First and foremost, a numerical inflation goal was prominently featured in a very public exercise of setting target ranges. The Bundesbank set targets using a quantity theory equation to back out the monetary-target-growth rate using the numerical inflation goal, estimated potential output growth, and expected velocity trends. The use of estimated potential output growth, and not a desired path of actual output growth, in setting the monetary targets was an important feature of the strategy because it signaled that the Bundesbank would not be focusing on short-run output objectives. Second, monetary targeting, far from being a rigid policy rule, was quite flexible in practice. As we see in chapter 8, the target ranges for money growth were missed about 50 percent of the time in Germany, often because the Bundesbank did not completely ignore other objectives including output and exchange rates.²¹ Furthermore, the Bundesbank demonstrated flexibility by allowing its inflation goal to vary over time and to converge with the long-run inflation goal quite gradually.

When the Bundesbank first set its monetary targets at the end of 1974, it announced a medium-term inflation goal of 4 percent, well above what it considered to be an appropriate long-run goal for inflation. It clarified that this medium-term

inflation goal differed from the long-run goal by labeling it the “unavoidable rate of price increase.” Its gradualist approach to reducing inflation led to a nine-year period before the medium-term inflation goal was considered to be consistent with price stability. When this convergence occurred at the end of 1984, the medium-term inflation goal was renamed the “normative rate of price increases” and set at 2 percent, continuing at this level until it was changed to 1.5 or 2 percent in 1997. The Bundesbank also responded to restrictions in the supply of energy or raw materials, which increased the price level by raising its medium-term inflation goal; specifically, it raised the unavoidable rate of price increase from 3.5 percent to 4 percent in the aftermath of the second oil price shock in 1980.

The monetary-targeting regimes in Germany and Switzerland demonstrated a strong commitment to communicating the strategy to the general public. The money-growth targets were continually used as a framework for explaining the monetary policy strategy: the Bundesbank and the Swiss National Bank expended tremendous effort, both in their publications and in frequent speeches by central bank officials, to communicate to the public what the central bank was trying to achieve. Indeed, given that both central banks frequently missed their money-growth targets by significant amounts, their monetary-targeting frameworks are best viewed as a mechanism for transparently communicating how monetary policy was being directed to achieve inflation goals and as a means for increasing the central bank’s accountability.

Many other countries envied the success of Germany’s monetary policy regime in producing low inflation, which explains why it was chosen as the anchor country for the Exchange Rate Mechanism. One clear indication of Germany’s success occurred in the aftermath of German reunification in 1990. Despite a temporary surge in inflation stemming from the terms of reunification, high wage demands, and the fiscal expansion, the Bundesbank was able to keep these temporary effects from becoming embedded in the inflation process, and by 1995 inflation had fallen below the Bundesbank’s normative inflation goal of 2 percent.

The experience of Germany and Switzerland illustrate that much of the success of their monetary policy regime’s success stemmed from their active use of the monetary-targeting strategy to clearly communicate a long-run strategy of inflation control. Both central banks in these two countries used monetary targeting to clearly state the objectives of monetary policy and to explain that policy actions remained focused on long-run price stability when targets were missed. The active communication with the public by the Bundesbank and the Swiss National Bank increased the transparency and accountability of these central banks. In contrast, the game playing that was a feature of monetary targeting in the United States, the United Kingdom, and Canada hindered the communication process so that transparency and accountability of the central banks in these countries was not enhanced.

The German and Swiss maintained flexibility in their monetary targeting approach and did not come even close to following a rigid rule. Despite a flexible approach to monetary targeting that included tolerating target misses and gradual disinflation, Germany and Switzerland demonstrated that flexibility is consistent with successful inflation control. The key to success was seriousness about pursuing the long-run goal of price stability and actively engaging public support for this task.

Despite the successes of monetary targeting in Switzerland and particularly Germany, monetary targeting does have some serious drawbacks. The weak relationship between the money supply and nominal income discussed in chapter 6 implies that hitting a particular monetary target will not produce the desired outcome for a goal variable such as inflation. Furthermore, the monetary aggregate will no longer provide an adequate signal about the stance of monetary policy. Thus, except under very unusual circumstances, monetary targeting will not provide a good nominal anchor and help fix inflation expectations. In addition, an unreliable relationship between monetary aggregates and goal variables makes it more difficult for monetary targeting to serve as a communications device that increases the transparency of monetary policy and makes the central bank accountable to the public.

1.4 The Search for a Better Nominal Anchor: The Birth of Inflation Targeting in the 1990s

The rational expectations revolution also led to a big breakthrough in our understanding of monetary policy strategy and the importance of a nominal anchor with the recognition of the time-inconsistency problem.

1.4.1 The Time-Inconsistency Problem

Papers by Finn Kydland and Edward Prescott, Guillermo Calvo, and Robert Barro and David Gordon all dealt with the time-inconsistency problem, in which monetary policy conducted on a discretionary, day-by-day basis leads to poor long-run outcomes.²² Optimal monetary policy should not try to exploit the short-run trade-off between unemployment and inflation by pursuing overly expansionary policy because decisions about wages and prices reflect expectations about policy made by workers and firms; when they see a central bank pursuing expansionary policy, workers and firms will raise their expectations about inflation, and push wages and prices up. The rise in wages and prices will lead to higher inflation, but will not result in higher output on average. Monetary policymakers, however, are tempted to pursue a discretionary monetary policy that is more expansionary than firms or people expect because such a policy would boost economic output (or lower unemployment) in the short run. In other words, the monetary policymakers will find themselves unable to *consistently* follow an optimal plan over *time*; the optimal plan is *time-inconsistent* and so will soon be abandoned.

Putting in place a strong nominal anchor can also help prevent the time-inconsistency problem in monetary policy by providing an expected constraint on discretionary policy. A strong nominal anchor can help ensure that the central bank will focus on the long run and resist the temptation or the political pressures to pursue short-run expansionary policies that are inconsistent with the long-run price stability goal.

1.4.2 Central Bank Independence

One undesirable feature of the time-inconsistency literature first addressed by Bennett McCallum and elaborated upon in chapter 2, is that the time-inconsistency problem by itself does not imply that a central bank will pursue expansionary monetary policy that leads to inflation.²³ Simply by recognizing the problem that forward-looking expectations in the wage- and price-setting process creates for a strategy of pursuing expansionary monetary policy, monetary policymakers can decide to just *not* do it and avoid the time-inconsistency problem altogether. To avoid the time-inconsistency problem, the central bank will need to make it clear to the public that it does not have an objective of raising output or employment above what is consistent with stable inflation and will not try to surprise people with an unexpected, discretionary, expansionary policy.²⁴ Instead, it will commit to keeping inflation under control.

Although central bankers are fully aware of the time-inconsistency problem, the problem remains nonetheless because politicians are able to put pressure on central banks to pursue overly expansionary monetary policy.²⁵ Making central banks independent, however, can help insulate them from political pressures to exploit short-run trade-offs between employment and inflation. Independence insulates the central bank from the myopia that is frequently a feature of the political process arising from politicians' concerns about getting elected in the near future and should thus lead to better policy outcomes. Evidence supports the conjecture that macroeconomic performance is improved when central banks are more independent. When central banks in industrialized countries are ranked from least legally independent to most legally independent, the inflation performance is found to be the best for countries with the most independent central banks.²⁶

Both economic theory and the better outcomes for countries that have more independent central banks have led to a remarkable trend toward increasing central bank independence. Before the 1990s, very few central banks were highly independent, most notably the Bundesbank, the Swiss National Bank, and, to a somewhat lesser extent, the Federal Reserve. Now almost all central banks in advanced countries and many in emerging market countries have central banks with a level of independence on par with or exceeding that of the Federal Reserve. In the 1990s, greater in-

dependence was granted to central banks in such diverse countries as Japan, New Zealand, South Korea, Sweden, the United Kingdom, and those in the Eurozone.

1.4.3 The Birth of Inflation Targeting

Putting in place a strong nominal anchor can help prevent the time-inconsistency problem in monetary policy by providing an expected constraint on discretionary policy. A strong nominal anchor can help ensure that the central bank will focus on the long run and resist the temptation or the political pressures to pursue short-run expansionary policies that are inconsistent with the long-run price stability goal. However, as we have seen, a monetary target will have trouble serving as a strong nominal anchor when the relationship between money and inflation is unstable. The disappointments with monetary targeting led to a search for a better nominal anchor and resulted in the development of inflation targeting in the 1990s, which is discussed in chapters 9 to 16.

Inflation targeting evolved from monetary targeting by adopting its most successful elements: an institutional commitment to price stability as the primary long-run goal of monetary policy and to achieving the inflation rate goal; increased transparency through communication with the public about the objectives of monetary policy and the plans for policy actions to achieve these objectives; and increased accountability for the central bank to achieve its inflation objectives. Inflation targeting, however, differs from monetary targeting in two key dimensions: 1) rather than announce a monetary aggregates target, this strategy publicly announces a medium-term numerical target for inflation, and 2) it makes use of an information-inclusive strategy, with a reduced role for intermediate targets such as money growth.

New Zealand was the first country to adopt inflation targeting. After bringing inflation down from almost 17 percent in 1985 to the vicinity of 5 percent by 1989, the New Zealand parliament passed a new Reserve Bank of New Zealand Act in 1989 that became effective on February 1, 1990. Besides moving the central bank from being one of the least independent to one of the most independent among the industrialized countries, the act also committed the Reserve Bank to a sole objective of price stability. The act stipulated that the minister of finance and the governor of the Reserve Bank should negotiate and make public a Policy Targets Agreement that sets the criteria by which monetary policy performance would be evaluated. These agreements have specified numerical target ranges for inflation and the dates by which they were to be reached.

The first Policy Targets Agreement, signed by the minister of finance and the governor of the Reserve Bank on March 2, 1990, directed the Reserve Bank to achieve an annual inflation rate of 3 to 5 percent by the end of 1990 with a gradual reduction in subsequent years to a 0 to 2 percent range by 1992 (changed to 1993), which was

kept until the end of 1996 when the range was changed to 0 to 3 percent and then to 1 to 3 percent in 2002.

New Zealand's action was followed by Canada in February 1991, Israel in January 1992, the United Kingdom in October 1992, Sweden in January 1993, and Finland in February 1993. (Chile adopted a softer form of inflation targeting in January 1991).²⁷ Since its inception, more than twenty countries have adopted inflation targeting, and new ones are added to the inflation-targeting club every year.

Inflation targeting has superseded monetary targeting because of several advantages. First, inflation targeting does not rely on a stable money-inflation relationship and so large velocity shocks of the type discussed in chapter 6, which distort this relationship, are largely irrelevant to monetary policy performance.²⁸ Second, the use of more information, and not primarily one variable, to determine the best settings for policy, has the potential to produce better policy settings. Third, an inflation target is readily understood by the public because changes in prices are of immediate and direct concern, while monetary aggregates are farther removed from peoples' direct experience. Inflation targets are therefore better at increasing the transparency of monetary policy because these make the central bank's objectives clearer. This does not mean that monetary targets could not serve as a useful communication device and increase accountability to control inflation as they did in Germany and Switzerland, but once the relationship between monetary aggregates and inflation breaks down, as it has repeatedly (and especially in Switzerland), monetary targets lose a substantial degree of transparency because the central bank now has to provide complicated discussions of why it is appropriate to deviate from the monetary target. Fourth, inflation targets increase central bank accountability because its performance can now be measured against a clearly defined target. Monetary targets work less well in this regard because the unstable money-inflation relationship means that the central bank will necessarily miss its monetary targets frequently and thus makes it harder to impose accountability on the central bank. The Bundesbank, for example, missed its target ranges more than half the time and it was the most successful practitioner of this policy regime. Inflation targeting has much better odds of successful execution.

A key feature of all inflation-targeting regimes is the enormous stress put upon transparency and communication. Inflation-targeting central banks have frequent communications with the government, some mandated by law and some in response to informal inquiries, and their officials take every opportunity to make public speeches on their monetary policy strategy. Communication of this type also has been prominent among central banks that have not adopted inflation targeting, including monetary targeters such as the Bundesbank and Switzerland, as well as nontargeters such as the Federal Reserve. Yet inflation-targeting central banks have taken public outreach a number of steps further: not only have they engaged in

extended public information campaigns, even engaging in the distribution of glossy brochures, but they have engaged in publishing a type of document known by its generic name *Inflation Reports* after the original document published by the Bank of England.

The publication of *Inflation Reports* is particularly noteworthy because these documents depart from the usual, dull-looking, formal central bank reports and incorporate the best elements of college textbook writing (using fancy graphics and boxes) to better communicate with the public. *Inflation Reports* are far more user-friendly than previous central bank documents and clearly explain the goals and limitations of monetary policy, including the rationale for inflation targets: the numerical values of the inflation targets and how these were determined; how the inflation targets are to be achieved, given current economic conditions; and the reasons for any deviations from targets. Almost all *Inflation Reports* also provide inflation forecasts, while the majority provide output forecasts, and some provide a projection of the policy path for interest rates (see table 5.1 in chapter 5). These communication efforts have improved private-sector planning by reducing uncertainty about monetary policy, interest rates, and inflation; these reports have promoted public debate of monetary policy, in part by educating the public about what a central bank can and cannot achieve; and these have helped clarify the responsibilities of the central bank and of politicians in the conduct of monetary policy.

Because an explicit numerical inflation target increases the central bank's accountability in controlling inflation, inflation targeting also helps reduce the likelihood that a central bank will suffer from the time-inconsistency problem in which it reneges on the optimal plan and instead tries to expand output and employment by pursuing overly expansionary monetary policy. But since time-inconsistency is more likely to come from political pressures on the central bank to engage in overly expansionary monetary policy, a key advantage of inflation targeting is that it is better able to focus the political debate on what a central bank can do best in the long-run—control inflation—rather than what it cannot do: raise economic growth and the number of jobs permanently through expansionary monetary policy. (A remarkable example of raising the level of public discussion, as recounted in chapter 10, occurred in Canada in 1996 when a public debate ensued over a speech by the president of the Canadian Economic Association criticizing the Bank of Canada.)²⁹ Thus, inflation targeting appears to reduce political pressures on the central bank to pursue inflationary monetary policy and thereby reduces the likelihood of time-inconsistent policymaking.

Although inflation targeting has the ability to limit the time-inconsistency problem, it does not do this by adopting a rigid rule, and thus has much in common with the flexibility of earlier monetary-targeting regimes. Inflation targeting has rule-like features in that it involves forward-looking behavior that limits policymakers

from systematically engaging in policies with undesirable long-run consequences. But rather than using a rigid rule, it employs what Ben Bernanke (now chairman of the Board of Governors of the Federal Reserve) and I dubbed “constrained discretion” in chapter 9. Inflation targeting allows for some flexibility but constrains policy-makers from pursuing overly expansionary (or contractionary) monetary policy.

Inflation targeting also does not ignore traditional output stabilization, but instead puts it into a longer-run context, placing it outside the shorter-run business cycle concerns that characterized monetary policy throughout the 1960s and 1970s. Inflation-targeting regimes allow for the flexibility to deal with supply shocks and have allowed the target to be reduced gradually to the long-run inflation goal when inflation is initially far from this goal (also a feature of monetary targeters such as Germany). As Lars Svensson had shown, a gradual movement of the inflation target toward the long-run, price-stability goal indicates that output fluctuations are a concern (in the objective function) of monetary policy.³⁰ In addition, inflation targeters have emphasized that the floor of the range should be as binding a commitment as the ceiling, indicating that they care about output fluctuations as well as inflation. Inflation targeting is therefore better described as “flexible inflation targeting.”

The above discussion suggests that although inflation targeting has evolved from earlier monetary policy strategies, it does represent true progress. But how has inflation targeting fared? Has it actually led to better economic performance?

1.4.4 Has Inflation Targeting Made a Difference?

The simple answer to this question is generally yes, with some qualifications.³¹ This conclusion is derived from the following four results:³²

- Inflation levels (and volatility), as well as interest rates, have declined after countries adopted inflation targeting.
- Output volatility has not worsened, and, if anything, improved after adoption of inflation targeting.
- Exchange rate pass-through seems to be attenuated by adoption of inflation targeting.³³
- The fall in inflation levels and volatility, interest rates, and output volatility was part of a worldwide trend in the 1990s, and inflation targeters have not done better in terms of these variables or in terms of exchange rate pass-through than noninflation-targeting industrialized countries such as the United States or Germany.³⁴

The fact that inflation-targeting countries see improvement in inflation and output performance but do not do better than countries like the United States and Germany also suggests that what is really important to successful monetary policy is the estab-

lishment of a strong nominal anchor.³⁵ As is pointed out in chapters 8 and 10,³⁶ Germany was able to create a strong nominal anchor with its monetary-targeting procedure. In the United States, the strong nominal anchor has been in the person of Alan Greenspan (chapter 2). Although inflation targeting is one way to establish a strong nominal anchor, it is not the only way. It is not at all clear that inflation targeting would have improved performance in the United States during the Greenspan era, although it well might do so after Greenspan is gone (chapter 11). Furthermore, as is emphasized in chapters 13 and 18, by itself, an inflation target is not capable of establishing a strong nominal anchor if the government pursues irresponsible fiscal policy or inadequate prudential supervision of the financial system, which might then be prone to financial blow-ups.³⁷

There is, however, empirical evidence on inflation expectations that is more telling about the possible benefits of inflation targeting. Recent research has found the following additional results:

- Evidence is not strong that the adoption of inflation targeting leads to an immediate fall in inflation expectations.³⁸
- Inflation persistence, however, is lower for countries that have adopted inflation targeting than for countries that have not.
- Inflation expectations appear to be more anchored for inflation targeters than nontargeters: that is, inflation expectations react less to shocks to actual inflation for targeters than nontargeters, particularly at longer horizons.³⁹

These results suggest that once inflation targeting has been in place for a while, it does make a difference because it better anchors medium- and longer-term inflation expectations and thus strengthens the nominal anchor. Since, as argued earlier, establishing a strong nominal anchor is a crucial element in successful monetary policy,⁴⁰ the evidence on inflation expectations provides a stronger case that inflation targeting has represented real progress.

The benefits of inflation targeting have led me to advocate inflation targeting for the Federal Reserve and this topic is taken up in chapter 11.

1.5 An Alternative Nominal Anchor: Exchange-Rate Pegging

Pegging the value of the domestic currency to that of a large, low-inflation country is another potential nominal anchor for monetary policy. This monetary policy regime has a long history. Exchange-rate pegging has several advantages. It directly contributes to keeping inflation under control by tying the inflation rate for internationally traded goods to that found in the anchor country. It anchors inflation expectations to the inflation rate in the anchor country as long as the exchange-rate peg is credible. With a strong commitment mechanism, it provides an automatic rule for the conduct

of monetary policy that mitigates the time-inconsistency problem: it forces a tightening of monetary policy when there is a tendency for the currency to depreciate, or a loosening of policy when there is a tendency to appreciate.

Given its advantages, it is not surprising that exchange-rate pegging has been used to lower inflation both in advanced economies (chapter 10) and in emerging market countries (chapters 13 and 14). There are, however, several serious problems with this strategy, as pointed out in these chapters. With capital mobility the targeting country can no longer pursue its own independent monetary policy and use it to respond to domestic shocks that are independent of those hitting the anchor country. Furthermore, an exchange-rate peg means that shocks to the anchor country are directly transmitted to the targeting country, because changes in interest rates in the anchor country lead to a corresponding change in interest rates in the targeting country.

A second disadvantage of an exchange-rate peg is that it can weaken the accountability of policymakers, particularly in emerging market countries. Because exchange-rate pegging fixes the exchange rate, it eliminates an important signal that can help limit the time-inconsistency problem by constraining monetary policy from becoming too expansionary. In industrialized countries, particularly in the United States, the bond market provides an important signal about the stance of monetary policy. Overly expansionary monetary policy or strong political pressure to engage in overly expansionary monetary policy produces an inflation scare in which inflation expectations surge, interest rates rise, and long-term bond prices sharply decline. Because both central banks and politicians want to avoid this kind of scenario, overly expansionary policy will be less likely.

In many countries, particularly emerging market countries, the long-term bond market is essentially nonexistent. Under a floating exchange-rate regime, however, if monetary policy is too expansionary, the exchange rate will depreciate. In these countries the daily fluctuations of the exchange rate can, like the bond market in the United States, provide an early warning signal that monetary policy is too expansionary. Just as the fear of a visible inflation scare in the bond market constrains central bankers from pursuing overly expansionary monetary policy and constrains politicians from putting pressure on the central bank to engage in overly expansionary monetary policy, fear of exchange-rate depreciations can make overly expansionary monetary policy less likely.

The need for signals from the foreign exchange market may be even more acute in emerging market countries because the balance sheet and actions of their central banks are not as transparent as they are in industrialized countries. Pegging the exchange rate to another currency can make it even harder to ascertain the central bank's policy actions. The public is less able to keep watch on the central bank and the politicians pressuring it, which makes it easier for monetary policy to become too expansionary.

A third, and probably the most severe, problem is that an exchange-rate peg leaves countries open to speculative attacks on their currencies, and if these attacks are successful, the collapse of the domestic currency is usually much larger, more rapid, and more unanticipated than when a depreciation occurs under a floating exchange-rate regime. A pegged regime is especially dangerous for an emerging market economy because they have so much of their debt denominated in foreign currencies, a phenomenon called *liability dollarization*. Emerging market countries with pegged exchange rates are thus especially vulnerable to twin crises, in which the currency collapse destroys firms' and households' balance sheets, which in turn provokes a financial crisis and a sharp economic contraction. Emerging market countries exiting from pegged exchange-rate regimes are more prone to higher-cost financial crises and large declines in output the longer the exchange-rate peg has been in place.⁴¹

As chapter 17 points out, the dangers of pegged exchange-rate regimes for emerging market countries are so clear that most of them would be far better off avoiding exchange-rate pegs as their monetary policy strategy, and instead have a flexible exchange rate with inflation targeting. However, in emerging market countries whose political and monetary institutions are particularly weak and who therefore have a history of continual bouts of very high inflation, fixing the exchange rate relative to a sound currency may be the only way to break inflationary psychology and stabilize the economy. In addition, a pegged exchange rate may encourage integration of the domestic economy with its neighbors, which may be an important goal in its own right. These considerations have led some economists to suggest that there are times when a strong commitment to a fixed exchange rate (either through a currency board or through full dollarization in which the country abandons its currency and adopts a foreign currency like the dollar as its money) might be necessary.⁴²

However, as argued in chapter 18, the choice of exchange-rate regime, whether a fixed or flexible one, is likely to be of secondary importance to the development of good financial, fiscal, and monetary institutions in producing successful monetary policy in emerging market countries.

1.6 Where Is Monetary Policy Strategy Heading?

Just as inflation targeting evolved from earlier monetary policy strategies, monetary policy strategy will continue to evolve over time. There are four major issues under active debate regarding where monetary policy strategy should be headed in the future.

1.6.1 Inflation versus Price-Level Targeting?

Currently all inflation-targeting countries target an inflation rate rather than the price level. The traditional view, forcefully articulated by Stanley Fischer, argues

that a price-level target might produce more output variability than an inflation target because unanticipated shocks to the price level are not treated as bygones and must be offset.⁴³ Specifically, a price-level target requires that an overshoot of the target must be reversed, and this might require quite contractionary monetary policy, which, with sticky prices, could lead to a sharp downturn in the real economy in the short run. Indeed, if the overshoot is large enough, returning to the target might require a deflation, which could promote financial instability and be quite harmful.

On the other hand, in theoretical models with a high degree of forward-looking behavior, a price-level target produces less output variance than an inflation target.⁴⁴ (A price-level target was used successfully in Sweden in the 1930s.)⁴⁵ Empirical evidence, however, does not clearly support forward-looking expectations formation, and models with forward-looking behavior have counter-intuitive properties that seem to be inconsistent with inflation dynamics.⁴⁶ Thus, the jury is still out on whether the monetary policy regime should move from inflation targeting to price-level targeting. Indeed, in the future central banks might experiment with hybrid policies that combine features of an inflation and a price-level target by announcing a commitment to some error correction in which target misses will be offset to some extent in the future.⁴⁷ Evaluating these hybrid policies should be a major focus of future research, but the reasoning here indicates that monetary policy should respond to persistent undershoots or overshoots of the inflation target as is discussed in chapter 19.

1.6.2 How Far Should Central Bank Transparency Go?

Inflation-targeting central banks have also been moving to greater and greater transparency over time by publishing their forecasts. The central banks in New Zealand, Colombia, and, most recently, Norway have been announcing projections of their policy path for future interest rates. Publication of forecasts and policy projections can help the public and the markets understand central bank actions, thus decreasing uncertainty and making it easier for the public and markets to assess whether the central bank is serious about achieving its inflation goal.

Lars Svensson argues that not only should central banks announce their projections of the future policy path, but also announce their objective function (the relative weights they put on output versus inflation fluctuations in their loss function).⁴⁸ I, however, argue in chapter 5 that central bank transparency can go too far if it complicates communication with the public. Announcing a policy path may confuse the public if it does not sufficiently convey that the path is conditional on events in the economy. The public may then see a deviation from this path as a central bank failure, and the central bank would then be vulnerable to attacks that it is flip-flopping, which could undermine the support for its independence and focus on price stability. This objection does not mean that providing information about the future

policy path in some form has no value. It does mean that there are nuances as to how this could be done. Providing information about the future policy path in more general terms or in terms of fan charts that emphasize the uncertainty about the future policy path might achieve most of the benefits of increased disclosure and still make clear how conditional the policy path is on future events.⁴⁹ Central banks pursuing inflation targeting are likely to experiment further with different approaches to providing more information about future policy, and I discuss possible alternatives in chapter 19.

Central banks should not only care about reducing the volatility of inflation, but should also want to lower output (employment) fluctuations. In chapter 4, I argue that monetary policy that targets inflation, but does it in a flexible manner, is the best way to produce better outcomes for both output and inflation fluctuations. Indeed, central bankers do care about stabilizing output and employment, as evidenced by their actions; they are, however, very reluctant to talk about it because they are worried that it will lead to political pressure for them to pursue overly expansionary policy that will lead to inflation. The reluctance to discuss stabilization goals is what I refer to in chapter 5 as the “dirty little secret” of central banking. I argue there that central banks do need to be more transparent about the fact that they want to stabilize output and employment fluctuations, but that they should not publish an output (potential GDP) or unemployment target. As is illustrated by chapter 7, the appropriate level of output or unemployment targets is very hard to measure, and shooting for these targets is likely to lead to poor policy outcomes. How central banks should communicate their concerns about output fluctuations is discussed further in chapter 19.

1.6.3 How Should Monetary Policy Authorities Respond to Asset Prices?

A final issue confronting central banks is how they should respond to movements in asset prices and I discuss this issue in chapters 3 and 19. It is generally agreed that monetary policy should react to asset prices when changes in these prices provide useful information about future inflation and the path of the economy. The tougher issue is whether central banks should react to asset prices over and above their effects on future inflation. Bubbles in asset prices, when they collapse, can lead to financial instability; as a result some researchers have argued that monetary policy should act to limit asset price bubbles to preserve financial stability.⁵⁰ To do this successfully, the monetary authorities would need to know when a bubble exists, yet it is unlikely that government officials, even central bankers, know better what are appropriate asset prices than do private markets.⁵¹ Ben Bernanke and Mark Gertler find that an inflation-targeting approach that does not focus on asset prices over and above their effect on the economy but does make use of an information-inclusive strategy in setting policy instruments has the ability to make asset price bubbles less likely,

thereby promoting financial stability.⁵² With the recent sharp run-up of housing prices in many countries and the possibility of bubbles, central banks' concerns about asset price movements and what to do about them are unlikely to abate.

1.6.4 How Should the Monetary Policy React to Exchange Rates in an Inflation-Targeting Regime?

Even if a central bank is targeting inflation, fluctuations in the exchange rate, which of course is another important asset price, are also a major concern to inflation-targeting central banks, particularly in emerging market countries because, as we have seen, sharp depreciations can trigger a financial crisis.⁵³ Inflation-targeting central banks therefore cannot afford to pursue a policy of benign neglect to exchange rates, as emphasized in chapter 13.⁵⁴ They may have to smooth “excessive” exchange rate fluctuations, but how they should do this is still an open question. Indeed, there is a danger that focusing on exchange rate movements might transform the exchange rate into a nominal anchor that interferes with achieving the inflation rate target. (This indeed happened in Hungary, as pointed out in chapter 15.)⁵⁵ In addition, when inflation targeters have focused on exchange rate movements, they have often made serious errors.⁵⁶ Dealing with exchange rate fluctuations is one of the most serious challenges for inflation-targeting regimes in emerging market countries.

1.7 Conclusion

The practice of central banking has made tremendous strides in recent years. We are currently in a highly desirable environment that few would have predicted fifteen years ago: not only is inflation low, but its variability and the volatility of output fluctuations are also low. This book argues that new thinking about monetary policy strategy is one of the key reasons for this success. If we learn from experience, perhaps we can replicate and refine what does work, and not repeat past mistakes.

Notes

1. See Central Intelligence Agency (2006).
2. See Mayer (1998) and Romer and Romer (2002) for a description of economic thinking and monetary policy practice in the 1960s.
3. Samuelson and Solow (1960) and Phillips (1958).
4. Friedman and Schwartz (1963a,b) and Friedman and Meiselman (1963).
5. Brunner and Meltzer (1964a,b,c).
6. Phelps (1967) and Friedman (1968).
7. Mayer (1998) and Romer and Romer (2002).

8. Lucas (1972, 1973, and 1976). The Lucas (1976) paper was already very influential in 1973, when it was first presented in 1973 at the first Carnegie-Rochester Conference. Note that although Muth (1960, 1961) introduced the idea of rational expectations more than ten years earlier, his work went largely unnoticed until resurrected by Lucas.
9. Sargent and Wallace (1975).
10. See Mishkin (1982a,b, 1983).
11. For example, see the surveys in Fischer (1993) and Anderson and Gruen (1995).
12. English (1996).
13. Briault (1995).
14. Fischer (1994) and Feldstein (1997).
15. For example, see the survey in Anderson and Gruen (1995).
16. The importance of a strong nominal anchor to successful monetary policy is also a key feature of recent theory on optimal monetary policy, referred to as the new neoclassical synthesis (Woodford, 2003, and Goodfriend and King, 1997).
17. For evidence in the United States, see Stock and Watson (1989), Friedman and Kuttner (1993), and chapter 6.
18. Also see Rich (1997).
19. von Hagen (1999).
20. Issing (1996).
21. Also see von Hagen (1995), Neumann and von Hagen (1993), Clarinda and Gertler (1997), Mishkin and Posen (1997), and Bernanke and Mihov (1997).
22. Kydland and Prescott (1977), Calvo (1978), and Barro and Gordon (1983).
23. McCallum (1995).
24. When a central bank does not pursue an objective of raising output or employment above what is consistent with stable inflation, there will be no *inflation bias* (average inflation above the optimal long-run level). In a model with a forward-looking, New Keynesian, Phillips curve, however, there will still be a problem of *stabilization bias* (too much focus on reducing output fluctuations relative to inflation fluctuations) and a lack of *history dependence* (response to initial conditions that would produce better outcomes). See Woodford (2003).
25. For an example of how the time-inconsistency problem can be modeled as resulting from political pressure, see Mishkin and Westelius (2005).
26. For example, Alesina and Summers (1993), Cukierman (1992), and Fischer (1994), and the recent surveys in Forder (2000), and Cukierman (2006).
27. The dating of adoption of inflation targeting is not always clear-cut. The dates used here are from chapter 16.
28. An unstable relationship between money and inflation could make inflation targeting more difficult because there is less information in the monetary aggregates to help forecast inflation. However, successful inflation targeting is not dependent on having a stable money-inflation relationship as long as other information enables the monetary authorities to forecast future inflation and the impact of the current monetary policy stance on the economy.
29. Also see Mishkin and Posen (1997) or Bernanke et al. (1999).
30. Svensson (1997).
31. This is the conclusion in a recent paper presented to the Executive Board of the IMF. Roger and Stone (2005).
32. There is also some mildly favorable evidence on the impact of inflation targeting on sacrifice ratios. Bernanke et al. (1999) did not find that sacrifice ratios in industrialized countries fell with adoption of inflation targeting, while Corbo, Landerretche, and Schmidt-Hebbel (2002) with a larger sample of inflation targeters have concluded that inflation targeting did lead to an improvement in sacrifice ratios. However,

defining sacrifice ratios is extremely tricky, so I would put less weight on this evidence. Sabbán, Rozada, and Powell (2003) also find that inflation targeting leads to nominal exchange rate movements that are more responsive to real shocks rather than nominal shocks. This might indicate that inflation targeting can help the nominal exchange rate to act as a shock absorber for the real economy.

33. Lower exchange rate pass-through might be seen as a drawback because it weakens this channel of the monetary policy transmission mechanism. As long as other channels of monetary policy transmission are still strong, however, the monetary authorities still have the ability to keep inflation under control.

34. For evidence supporting the first three results, see Bernanke et al. (1999), Corbo, Landerretche, and Schmidt-Hebbel (2002), Neumann and von Hagen (2002), Hu (2003), Truman (2003), and Ball and Sheridan (2005).

35. Ball and Sheridan (2005) is one of the few empirical papers that is critical of inflation targeting: it argues that the apparent success of inflation-targeting countries is just a reflection of regression toward the mean; that is, countries that start with higher inflation are more likely to find that inflation will fall faster than countries that start with an initially low inflation rate. Since countries that adopted inflation targeting generally had higher initial inflation rates, their larger decline in inflation just reflects a general tendency of all countries, both targeters and nontargeters, to achieve better inflation and output performance in the 1990s when inflation targeting was adopted. This paper has been criticized on several grounds and its conclusion that inflation targeting had nothing to do with improved economic performance is unwarranted; see Hyvonen (2004), Gertler (2005), and Mishkin and Schmidt-Hebbel (2005). However, Ball and Sheridan's paper does raise a serious question because inflation targeting is an endogenous choice and finding that better performance is associated with inflation targeting may not imply that inflation targeting causes this better performance. Mishkin and Schmidt-Hebbel (2005) does attempt to explicitly deal with potential endogeneity of adoption of inflation targeting through use of instrumental variables and continues to find favorable results on inflation targeting performance.

36. Also see Mishkin and Posen (1997), Bernanke et al. (1999), and Neumann and von Hagen (2002).

37. Also see Sims (2005).

38. For example, Bernanke et al. (1999) and Levin, Natalucci, and Piger (2004) do not find that inflation targeting leads to an immediate fall in expected inflation, but Johnson (2002, 2003) does find some evidence that expected inflation falls after announcement of inflation targets.

39. Levin, Natalucci, and Piger (2004) and Castelnuovo, Nicoletti-Altamari, and Palenzuela (2003).

40. The importance of a strong nominal anchor to successful monetary policy is also a key feature of recent theory on optimal monetary policy, referred to as the new neoclassical synthesis (Woodford, 2003, and Goodfriend and King, 1997).

41. Eichengreen and Masson (1998), Eichengreen (1999), and Aizenman and Glick (2005).

42. See chapter 13, Calvo and Reinhart (2000), and McKinnon and Schnabl (2004).

43. Fischer (1994).

44. For example, Clarida, Gali, and Gertler (1999), Dittmar, Gavin, and Kydland (1999), Dittmar and Gavin (2000), Eggertson and Woodford (2003), Svensson (1999), Svensson and Woodford (2003), Vestin (2000), Woodford (1999, 2003).

45. Berg and Jonung (1999).

46. Fuhrer (1997) and Estrella and Fuhrer (1998).

47. Research at the Bank of Canada and the Bank of England (Black, Macklem, and Rose, 1998; Battini and Yates, 2003; and King, 1999) suggests that an inflation target with a small amount of error correction can substantially reduce the uncertainty about the price level in the long run, but still generate very few episodes of deflation.

48. Svensson (2002).

49. However, announcing a specific policy path as has recently occurred in the United States when it announced that it would remove accommodation at a measured pace, and then having seventeen straight FOMC meetings starting in June of 2004 in which it raised the policy rate by twenty-five basis points each time, did not sufficiently convey the degree of uncertainty about the future path.

50. For example, Cecchetti, Genberg, Lipsky, and Wadhvani (2000), and Borio and Lowe (2002).

51. Bernanke and Gertler (2001) point out that Cecchetti et al. (2000) only find that asset prices should be included in the central bank's policy rule because they assume that the central bank knows with certainty that the asset price rise is a bubble and knows exactly when the bubble will burst.
52. Bernanke and Gertler (1999, 2001).
53. Mishkin (1996, 1999).
54. Also see Mishkin (2000).
55. It also happened in Israel (Bernanke et al. 1999).
56. For example, New Zealand and Chile in 1997 and 1998 (Mishkin, 2001).

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