

## COMMITMENT VERSUS DISCRETION IN MONETARY POLICY

by Michael Dotsey and Charles I. Plosser

The late 1970s were arguably the nadir of post-World War II U.S. monetary policy. Accommodative monetary policy brought about rapidly rising inflation in an attempt to reduce unemployment. While the unemployment rate declined modestly, the cost was record-setting double-digit inflation. Then, between 1980 and 1984, the U.S. economy experienced two recessions in rapid succession and a number of what one prominent monetary economist has aptly called inflation scares.<sup>1</sup>

In contrast, from 1990 through 2005, the U.S. economy experienced a period of relatively stable economic growth, low unemployment rates,

discretionary monetary policy and a lack of commitment to low inflation. In contrast, we believe that the subsequent improvement in economic outcomes is, in part, attributable to the Federal Open Market Committee's (FOMC) credibility for maintaining low inflation, which it acquired through its persistent actions to achieve and maintain low inflation beginning in the 1980s.<sup>2</sup>

The debate over rules versus discretion — that is, whether it is better for a policymaker to commit to a particular course of action or to approach each situation with unconstrained flexibility — has been and continues to be a central question in the design of monetary policy. In 1977,

two Nobel Prize-winning economists, Finn Kydland and Edward Prescott, wrote the seminal article analyzing the benefits of carrying out plans based on commitment to specific goals and the systematic and predictable actions necessary to achieve them, rather than relying on discretion. Since then, the benefits of com-

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mitment have been analyzed in many settings and in many economic models. These analyses have had a profound influence on the economic profession's views regarding the implementation of monetary policy and have shaped our views and policy prescriptions. The implications of these analyses is that the more the FOMC is perceived as a committed and credible planner — as opposed to a discretionary policymaker — the better will be both

and low to moderate inflation. The two recessions during this period were both mild and short-lived by historical standards. This essay examines these contrasting episodes through the lens of commitment. In particular, we focus on the Federal Reserve's commitment to fulfilling its responsibility to maintain price stability. Our analysis places much of the responsibility for the poor economic outcomes in the 1970s on

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policy and economic outcomes. Thus, we believe it is important that policy actions serve to protect and enhance the Fed's credibility.

We begin by revisiting the late 1970s and early 1980s. The lesson we draw from that experience is that the Fed was not committed to maintaining price stability or low and stable inflation, and that lack of commitment was a major factor contributing to the rapid rise in inflation and the economic consequences that followed. We then go on to discuss the role that commitment plays in enhancing the effectiveness of monetary policy and indicate how we think a credible commitment to low inflation has helped policymakers over the last 15 years. In closing, we highlight some of the implications of our analysis for appropriate monetary policy. We acknowledge that our views, while shared by many, are our own and that there is room for further analysis and debate. However, we believe it is useful and important to share our interpretation of both theory and practice as a contribution to that ongoing discussion.

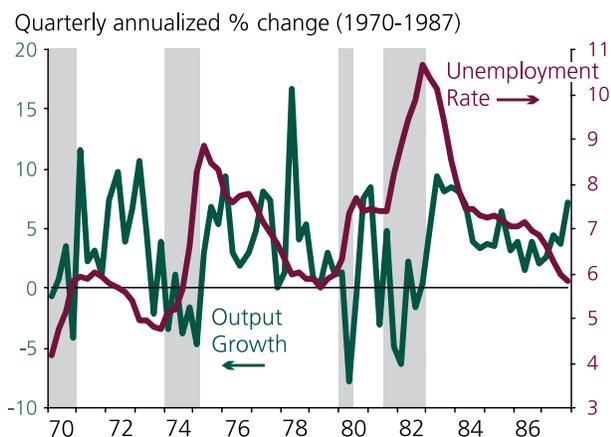
## DISCRETIONARY POLICY IN THE 1970s AND ITS AFTERMATH

The oil-price shock of the early 1970s was

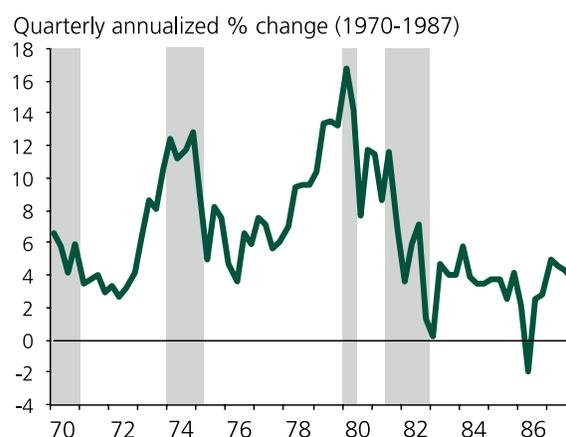
accompanied by double-digit inflation and high unemployment.<sup>3</sup> However, by the end of 1976, inflation had fallen to about 5 percent, as measured by the consumer price index (CPI), and the unemployment rate stood at roughly 7.8 percent. The primary concern of monetary policymakers in this environment was to seek to reduce unemployment. The prevailing view was that with the high unemployment rate, there was ample excess capacity in the economy, so that the danger of exacerbating inflation through accommodative monetary policy was not a concern. This view was based on the Phillips curve, a theory that posited a negative relationship between inflation and unemployment.<sup>4</sup> In conjunction with stimulus from fiscal policy, the goals of low unemployment and nonaccelerating inflation were thought to be readily attainable.<sup>5</sup> As we can see from Figure 1, the unemployment rate (Panel A) declined modestly from 1976 through the end of 1979, but inflation, over that same period (Panel B), accelerated continuously, reaching 12.4 percent based on the CPI. Further, as shown in Figure 1, the Philadelphia Fed's Survey of Professional Forecasters indicated that expectations of inflation (Panel C), as measured by survey estimates of one-year-ahead increases in the gross domestic price

FIGURE 1

### A: Output Growth and Unemployment Rate



### B: CPI



deflator, accelerated and long-term bond rates (Panel D) moved up as well, with rates exceeding 10 percent near the end of 1979.<sup>6</sup>

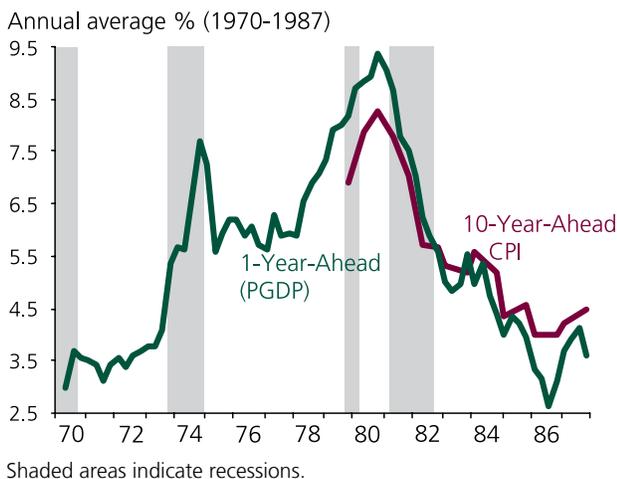
The overarching focus on managing the real economy is evident in Federal Reserve policy. Although the federal funds rate was raised from about 5 percent in 1976 to roughly 10 percent in the first half of 1979, it increased by less than the increase in inflation. Thus, the inflation-adjusted federal funds rate, or real fed funds rate, actually became negative, indicating that monetary policy was very accommodative and was not responding sufficiently to prevent the increase in inflation. Further, in achieving the decline in unemployment, monetary policy also fooled the public. Actual inflation turned out to be higher than the public expected in all but one quarter from the fourth quarter of 1976 to the fourth quarter of 1979.<sup>7</sup> In what follows, we will show that such behavior is the hallmark of a discretionary policymaker.

When the second oil-price shock of the 1970s hit in the latter half of 1979, prices continued to rise. Paul Volcker was appointed Federal Reserve Chairman in August 1979, and the Fed began to aggressively raise the funds rate to bring down the double-digit

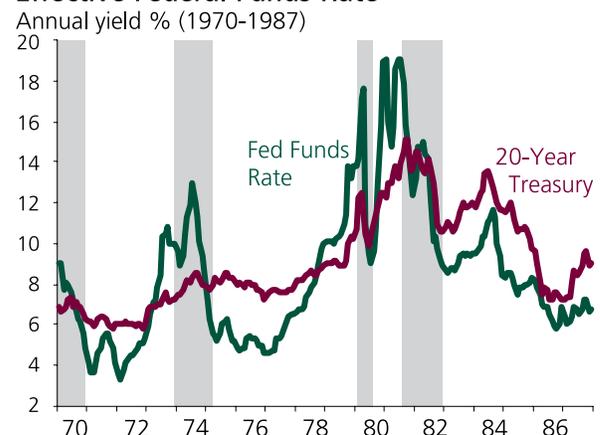
inflation. The economy officially went into recession in January 1980. Despite economic weakness, the primary concern of monetary policy remained focused on inflation as the federal funds rate rose from 10.9 percent in August 1979 to 17.6 percent by April 1980. These actions represented the most aggressive monetary policy in post-World War II history. Marvin Goodfriend attributes a significant portion of this tightening to the Fed's response to an inflation scare that occurred in the first quarter of 1980.<sup>8</sup> In particular, with the funds rate hovering between 13 and 14 percent in early 1980, long-term interest rates increased roughly 2 percentage points in the first quarter of 1980. Most of this increase in the long-term bond rate was attributed to an increase in expected inflation. The Fed's response was an additional 3 percentage points of tightening in policy, which had little effect on the long-term bond rate, an indication that inflation expectations were finally beginning to decline. Generally, the theory of the term structure implies that an increase in the short-term interest rate is accompanied by an increase in the long-term rate as well. That the long-term rate did not move is an indication that inflation expectations were declining, and this decline in

FIGURE 1 Continued

### C: Expected Inflation: SPF



### D: 20-Year Treasury Bond and Effective Federal Funds Rate



inflation expectations is also evident in the behavior of the one-year-ahead inflation expectations depicted in Figure 1 (Panel C).

Despite these aggressive policy moves, inflation continued to increase, reaching 16.7 percent in the first quarter of 1980. At this point the economy weakened considerably and the U.S. experienced the deepest recession in postwar history with second-quarter real GDP declining by 7.8 percent at an annual rate. The severity of this decline was in large part due to the Carter administration's credit controls, but it nonetheless worried the FOMC.<sup>9</sup> As a result, the Fed backed off its aggressive policy, reducing the funds rate from

over 17 percent to 9 percent by July 1980.

This aggressive easing over a mere three months was accompanied by a rise in long-term bond rates of over 2 percentage points in the second half of 1980, signaling another inflation scare. Again the Fed responded aggressively, raising the funds rate to 19.1 percent by January 1981 and holding it at very high levels through the summer of that year. This tightening once again threw the economy into recession. However, this time the Fed kept its resolve to reduce inflation. Inflation began to decline in the fall of 1981, and despite some ups and downs, the average inflation rate for 1983 was less than 4 percent.



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Eccles Building, Washington, D.C.

Interestingly, over this disinflationary period, one-year-ahead expectations of inflation systematically exceeded actual inflation as measured by the GDP deflator. Thus, the public remained dubious of the Federal Reserve's commitment to reducing inflation. This lack of credibility contributed to the loss of output that accompanied the reduction in inflation. Thus, the late 1970s and early 1980s should serve as a stern warning of the cost of low credibility.

### COMMITMENT VERSUS DISCRETION

The late 1970s were a period in which monetary policy was not committed to maintaining price stability or low inflation, and we saw the damaging economic consequences that ensued from that lack of commitment. Why is such a commitment so important? Why does commitment yield better outcomes than discretion? After all, a discretionary policymaker can make the same decisions and choices as the committed policymaker at each point in time.

To understand why commitment dominates discretion, we must first define what we mean by commitment and how it differs from discretion. Commitment is the willingness and ability to make promises and to deliver on past promises no matter what the current situation is. However, it is very important to stress that under commitment, promised behavior is generally contingent on future events. Promises are not blanket commitments to be fulfilled irrespective of future situations. The key aspect of commitment is that the policymaker keeps his promise to act in a certain systematic way when a particular future event comes to pass. The absence of this willingness or ability is called discretion. Under discretion, a policymaker does not make promises about future behavior. Since the discretionary planner does not make commitments to behave in any particular way, it would appear that discretion offers more flexibility and thus would seem preferable to a policy in which the policymaker honors past promises.

The idea that it is better for a central bank to make commitments and to follow through on them, rather than being free to respond in any way



that seems appropriate at the time, is a subtle and perhaps surprising one. But not only are better long-run outcomes achieved under such commitments, monetary policy is also better able to respond to economic shocks. As we'll discuss later, a central bank that commits to a goal of maintaining low inflation and acts in a way consistent with that commitment can achieve the goal with no adverse consequences for employment or output. Moreover, such a policy can achieve less volatility in both inflation and output. Indeed, as we have already seen, the central bank's inability or unwillingness to commit to price stabil-

ity often leads to problems for policymakers and the economy.

The comparison of policymaking under discretion and under commitment is an analysis of two polar cases. It sidesteps the question of how a central bank can convince the public that it is operating in a manner consistent with commitment when the institutional setting places little restriction on future policies. For instance, the members of the FOMC change over time, as do the legislators who monitor the behavior of monetary policy. Full commitment requires tying the hands of future policymakers, and in reality, we don't even know who they will be.

Research analyzing ways that policy can come close to the ideal of full commitment has generally proceeded along two lines. One is institutional design. How does one set up institutions that will improve on discretionary outcomes? The other is the role of reputation and the credibility an institution can achieve by behaving like a committed planner over time. While of tremendous interest, investigations into these areas are beyond the scope of this essay. But we cannot hope to understand these more advanced investigations without first understanding the different nature of policy under commitment and under discretion.

Economists refer to the desire to alter previously made plans as the time-consistency problem because, at each date, a policymaker finds it tempting to depart from what an earlier plan dictated. The temptation to alter strategies affects how the public and market participants view a proposed plan, and it is the interaction between the public's expectations and the policymaker's decisions that leads to problems for a policymaker who cannot commit. Economics has many examples of the time-consistency problem, but we will confine our discussion to monetary policy.

## BENEFITS OF COMMITMENT IN MONETARY POLICY

What are the economic benefits arising from a central bank's commitment to price stability? Let's analyze the benefits that commitment confers on average inflation and average output. A key ingredi-

ent in the analysis is the forward-looking behavior of individuals. In particular, many people's economic decisions today are affected by their expectations about the future course of monetary policy. As a result, the central bank faces a time-consistency problem. That is, it may be tempted to pursue policies that deliver temporary economic benefits that may be inconsistent with its longer-term goals. Realizing that a discretionary central bank will have the latitude to give in to this temptation, people will make decisions today based on the central bank's discretionary behavior and the result is sub-optimal economic outcomes.

To illustrate this point, we use a simple framework of how monetary policy works. One of the fundamental tenets of monetary theory is that in the long run, monetary policy cannot raise the level of output or employment. However, it is also widely believed that because of various rigidities in the economy, the monetary authority may face a short-term tradeoff. That is, by generating unexpectedly high inflation, the central bank may be able to temporarily boost employment and output. The late 1970s appear to represent

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just such an environment. As mentioned, from the fourth quarter of 1976 through the fourth quarter of 1979, expectations of future inflation were systematically lower than the inflation that ensued, indicating that the public did not anticipate the rapid increase in inflation. As a consequence, output and employment were temporarily increased.

Similarly, unexpectedly low inflation may temporarily reduce output and employment. This is consistent with the situation in the early 1980s. As monetary

policy tightened, the public experienced an unanticipated decline in inflation, output and employment declined, and the economy suffered two recessions.

Economic analysis tells us that as long as the prospect of exploiting this short-term tradeoff exists, a central bank conducting discretionary monetary policy will not be able to achieve its desired or preferred rate of inflation. Only under commitment can the monetary policymaker deliver on its desired inflation rate.

To see why, imagine that the monetary authority announces that it is going to maintain an average inflation rate at some desired level. We could

fare will be thwarted by the behavior of individuals, who will eventually catch on to what the policymaker is doing, and he will end up producing more inflation with no sustained increase in output or employment.

If, however, individuals immediately recognize the temptation facing the policymaker, they will accurately anticipate the higher inflation and not even a temporary increase in output will be possible. All that will ensue is higher inflation. Either way, higher inflation with little or no economic gain will occur, and this type of behavior has emerged many times in many countries. Generally, the process ends with a change

in monetary regime, and a policy designed to reduce inflation is put in place.

However, at this point, implementing the new policy of reducing inflation poses a problem. It is generally not credible; the public is dubious that the new policy will be carried out. Thus, to re-establish the desired inflation rate, the policymaker must generate unexpectedly low inflation,

risking a temporary decline in output and employment and perhaps a painful recession. This seems to be the story of the early 1980s. If the policymaker decides against such action, the economy is stuck with a permanently higher inflation rate than it desires. Thus, discretionary monetary policy fails to deliver on the desired objective and places significant subsequent costs on the economy.

Now consider the outcomes if the monetary authority could credibly commit itself, in some way, to delivering the desired inflation rate that it had announced. With such a credible commitment, the public would expect the central bank to maintain inflation at the announced desired rate. There would be no policy-generated surprises to inflation that would move output and employment and so the economy would grow efficiently. So a monetary authority that could commit to its desired inflation policy would out-

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think of this as the economy's optimal rate of inflation, but it need not be, nor is it important for our purposes what that rate is.<sup>10</sup> If policy successfully maintains this desired inflation rate, output would grow at its efficient rate.<sup>11</sup>

But a discretionary policymaker will be tempted to generate a bit more output in the short run by unexpectedly increasing inflation. If it takes time for the public to catch on, the policymaker will initially be successful. However, once the higher inflation rate associated with this strategy is recognized, the public will revise upward its expectations of future inflation and push wages and prices up. At that point, the output boost will vanish. The policymaker might be tempted to try the same experiment again, but it will generate the same outcome — a temporary boost in output followed by higher inflation. Thus, the policymaker's attempt to permanently increase public wel-



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perform a monetary authority that is free to exercise discretion — that is, it would deliver the same output growth, but lower inflation.

Many people find this result counterintuitive. But we can see the importance of commitment in everyday life. Almost all of us at one time or another have said that we would like to lose weight. We know that we would be healthier and happier by doing so. Yet most of us at some point make choices inconsistent with those desirable goals. We eat that piece of cake sitting in the refrigerator, or we eat too much at our favorite restaurant. We receive some short-run enjoyment from this behavior, even though we know it is not compatible with our long-term goal to lose weight. Pretty soon the diet is abandoned. Having the discretion to yield to temptation does not yield the

desired outcome. We would be better off if we could figure out some way to commit to eating in a way that is consistent with our goal. People often look for ways to help them pre-commit to staying on their diet. For example, they go to the grocery store and buy only food that is on the diet, so they won't be tempted to snack. Some will make commitments to their spouse or friend to form some kind of mutual support group that makes it harder to deviate from the diet.

People often think that keeping monetary policy from deviating from a desired inflation goal is like tying the policymakers' hands and that doing so must yield worse outcomes. Yet, as in the case of the dieter who benefits from the ability to commit to sticking with a diet, commitment in fact results in better outcomes.

The above examples make clear the long-run benefits of commitment and of devising institutional arrangements that prevent the central bank from using discretionary policy. Some economists have argued, for example, that the gold standard was such an arrangement. Currently, there is a good deal of interest in whether explicit forms of inflation targeting help to achieve the better outcomes associated with commitment.<sup>12</sup>

## THE RESPONSE TO SHOCKS UNDER COMMITMENT AND DISCRETION

The desire to respond to economic shocks, such as sharp oil-price increases or changes in productivity, so as to limit their effects on economic volatility is one of the most difficult challenges confronting central banks. It is this aspect of monetary policy that most often elicits arguments extolling the importance and benefits of discretion. Those in favor of discretion argue that monetary policymakers must be allowed a free hand to respond in a flexible way to each situation as it arises and not be constrained by prior commitments or goals. Discretion, it is argued, is needed to adequately guide the economy through turbulent times.

However, the notion that commitment to behave in a systematic manner unduly constrains the policymaker from reacting in the best way to economic shocks is intuitively appealing but is actually mistaken. The ability to make commitments and to keep them anchors expectations, which allows a central bank operating under a policy of commitment to take actions and achieve outcomes that the discretionary planner cannot. In fact, a policy under commitment can achieve all of the outcomes of a policy under discretion and can also achieve outcomes unobtainable under discretion. The committed policymaker cannot do worse than the discretionary policymaker.<sup>13</sup>

Although policymaking that achieves perfect commitment is the ideal, we acknowledge that it is a bit unrealistic to expect that it will be achieved.

However, when a policymaker can commit to follow through on promised actions, he can influence the public's expectations in a desirable way. People generally make plans for the future. Firms deciding on whether to expand or contract capacity think about future demand. Consumers buying cars or houses take into account their future income prospects. Thus, expectations of the future affect the current actions of households and businesses. Expectations of how policymakers will behave in the future can have an important impact on future economic conditions and thus on current behavior. As a result, influencing expectations can be a powerful policy tool. The discretionary policymaker makes decisions period by period, makes no promises regarding future behavior, and, as a result, cannot shape the public's expectations. By making well-designed promises about the goals of policy and the way policy will respond to the environment, a committed policymaker can influence expectations in ways that elicit better economic outcomes.

However, it is not just about making commitments. Along with these promises comes the constraint to honor them in the future and also to honor past promises today. In this sense, the committed policymaker is not free to base today's policy only on

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current economic conditions; he must also take account of what was promised in the past. Those promises depended on the economic situation at the time they were made and imply that the policy committed to depends on history as well as current circumstances. Put another way, the policymaker is not free to manipulate the public's expectations — rather he must act in a way consistent with previous, current, and future commitments.

But having policy constrained in this way should not be viewed as a negative attribute of commitment. These constraints, if designed appropriately, can actually lead to better outcomes through their influence on expectations that allow for better economic decisions. Moreover, this result holds true in a variety of models that economists now use to characterize the macroeconomy.<sup>14</sup> Research has shown that in a range of environments, a central bank that is committed to price stability, or low and stable inflation, has an easier time dealing with economic shocks.

For example, consider a positive shock to the inflation rate. Responding to this unexpected shock, a committed policymaker can achieve a better outcome: less inflation as a result of the shock with less variability in output while, at the same time, acting less aggressively. Thus, economic welfare is unambiguously higher under commitment than under discretion.

What makes it possible for the policymaker to accomplish this? The answer is that expectations of

future inflation affect current inflation. When policymakers make a commitment to keep inflation low and stand behind that commitment, individuals take into account the policymaker's promise to keep inflation down and to not exploit the output gains arising from an unexpected increase in inflation. As a result, expectations about inflation are stable or well-anchored and thus do not increase as much under commitment, implying that firms do not raise their current prices as aggressively as they would in an environment where expectations are not well-anchored, as would be the case when policymakers act with discretion. The stability of inflation expectations under commitment implies that policy does not have to be as aggressive in order to bring down inflation, and as a result, output does not have to decline by as much. Contrary to intuition, the constraint of abiding by past promises actually allows the committed policymaker to achieve superior economic outcomes for both inflation and output in response to economic shocks.



## AN EXAMPLE: OIL-PRICE SHOCKS

To make our point a bit more concrete, we will contrast two episodes, both involving oil-price shocks. Although we cannot give definitive proof for the following argument, one can view the differential economic impact of oil-price shocks in the late 1970s and 2000s through the lens of commitment.<sup>15, 16</sup> As we have already seen, in the first instance the Fed lacked credibility for maintaining low inflation. In contrast, we will argue that by the early years of the new century, the Fed had achieved greater credibility with the public that it would act to maintain low inflation. Economists' theoretical and empirical investigations suggest that the effects of the oil-price shocks on economic activity and inflation will be different under these two settings. In fact, they were quite different.

Recall that by the time the oil-price shock of 1979 hit, more than doubling oil prices over the course of the year, inflation had already reached 9 percent. As we discussed, these historically high inflation rates were caused by overly easy monetary policy. Moreover, the Federal Reserve had, by the time of the oil shock, lost any credibility it may have had for maintaining low inflation. The rise in oil prices further

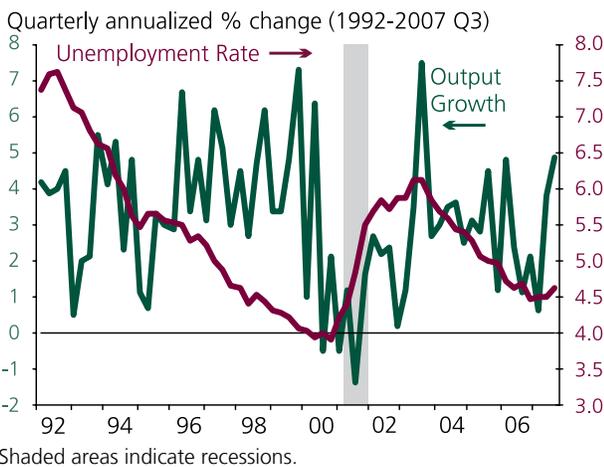
ignited inflationary pressures, and the Fed was put in the situation of ratifying the higher expected inflation or trying to contain inflation with a potentially large loss of output. Lacking credibility, the Fed also lacked the public's confidence that it would keep inflation low; therefore, the public placed significant weight on the former scenario, and by the first quarter of 1980, inflation had increased to more than 15 percent. Eventually the Fed did rein in inflation, and our previous account of this episode described the economic pain that ensued. It was a painful price to pay for the lack of credibility, but it eventually helped the Fed to earn a more believable reputation for maintaining low inflation.

Indeed, throughout the remainder of the 1980s and 1990s, the Fed continued to act in a way that reinforced and enhanced its new credible commitment to price stability. The benefits of that hard-won reputation bore fruit in the face of the renewed round of oil-price increases in the current decade, which saw the price of oil more than double from the end of 2003 to the end of 2005. During this period, inflation remained contained without any significant adverse effect on output.

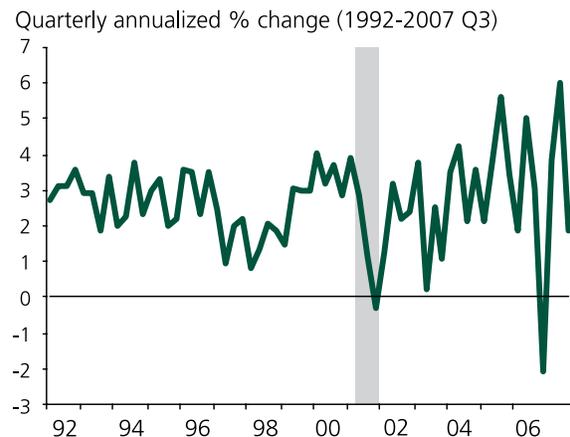
The main difference, we believe, between the

### FIGURE 2

#### A: Output Growth and Unemployment Rate



#### B: CPI



experience of the late 1970s and early 1980s and the period from 2003 through 2005 is the credibility that the Federal Reserve enjoyed in the latter period for maintaining low and stable inflation. This credibility is illustrated by the stability of various measures of inflation expectations during the period. For example, the 10-year expected inflation rate in the Survey of Professional Forecasters hardly moved over this period (Figure 2, Panel C) and expected inflation, as represented by the difference between the yield on 10-year nominal and inflation-indexed Treasury bonds, remained quite stable. In sum, as shown in Figure 2, the oil-price shock of 2003-2005 had very little impact on inflation expectations (Panel C), and as a result, there has been no need for exceedingly aggressive monetary policy actions. In turn, there was very little impact on output (Panel A).

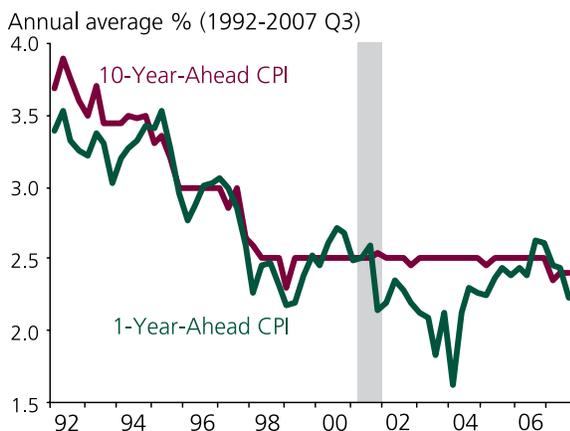
**SUMMARY**

This essay has explored the benefits of policy under commitment versus under discretion. In particular, it has highlighted the added benefits policymakers and the economy derive from making and fulfilling past promises to keep inflation low and stable. Rather than constraining policy, honoring such past promises

enables monetary policy to attain better outcomes than those achieved by a discretionary policy regime that does not make commitments and thus cannot anchor expectations. Committed policy generates lower long-run inflation without any adverse effects on economic activity and ameliorates the effects of economic shocks.

In practice, achieving and maintaining the credibility of the Fed’s commitment to low inflation is not easy or straightforward. The credibility the Fed achieved in the 1980s and 1990s was due, in no small part, to the leadership of Fed Chairmen Paul Volcker and Alan Greenspan. They frequently spoke about the importance of maintaining the central bank’s commitment to low and stable inflation, as has Chairman Ben Bernanke in this decade. The benefits of following a committed plan to maintain low inflation are now so entrenched in policy-making circles that most central banks aggressively strive to maintain their credibility. They are constantly aware of the dangers of inflation expectations becoming unanchored and the loss of credibility that represents. Such a loss of credibility would pose grave problems for monetary policymakers because it puts the achievement of their dual mandate at risk and must be avoided.

**C: Expected Inflation: SPF**



**D: 20-Year Treasury Bond and Effective Federal Funds Rate**



## ENDNOTES

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<sup>1</sup> See the article by Marvin Goodfriend.

<sup>2</sup> For a discussion of the benefits of low and stable inflation, see the article by Anthony Santomero.

<sup>3</sup> Economists use the term shock to refer to unanticipated changes in economic variables.

<sup>4</sup> For an interesting and readable discussion of the theory of the Phillips curve, see the Richmond Fed's annual report essay by Jeffrey Lacker and John Weinberg.

<sup>5</sup> For a detailed discussion of the politics and deliberations surrounding Fed policy, see the article by Robert Hetzel.

<sup>6</sup> The one-year-ahead expected inflation measures come from the SPF data series. Prior to the third quarter of 1981, inflation expectations were collected only in terms of the GDP deflator. Ten-year-ahead expectations for the SPF began in the fourth quarter of 1991. Prior to that, they were taken from the Blue Chip Consensus forecasts.

<sup>7</sup> The difference between actual and expected inflation is calculated using actual one-year-ahead inflation rates as measured by increases in the gross domestic price deflator minus the corresponding expectation of inflation.

<sup>8</sup> Marvin Goodfriend defines an inflation scare as a significant rise in long-term interest rates in the absence of a rise in the federal funds rate. Thus, the rise in long-term rates is interpreted as mostly a rise in long-run inflation expectations. Goodfriend's account of the disinflation and inflation scares that plagued monetary policy even after the successful disinflation is fascinating reading for anyone interested in the consequences that low central bank credibility for maintaining low inflation has on the evolution of policy.

<sup>9</sup> See the article by Stacey Schreft for a detailed analysis of the Carter administration's credit control program.

<sup>10</sup> Depending on one's view of the structure of the economy, the optimal rate could be slightly negative, zero, or even perhaps slightly positive.

<sup>11</sup> By efficient growth we mean the rate of growth at which the economy is optimally employing resources conditional on the economic shocks occurring at the time. Thus, an economy that experienced a rapid increase in new technologies would grow faster than one that was subject to less technological innovation, and it would also use productive resources more intensely. In the absence of any economic shocks, the economy would grow at its long-term trend.

<sup>12</sup> For a survey of inflation targeting and its effects, see the 2006 article by Michael Dotsey.

<sup>13</sup> For a more formal exposition, see the article by Richard Clarida, Jordi Gali, and Mark Gertler and the forthcoming article by Michael Dotsey.

<sup>14</sup> See the article by Clarida, Gali, and Gertler and Dotsey's forthcoming article for examples.

<sup>15</sup> Recent evidence outlined in the article by Sylvain Leduc, Keith Sill, and Tom Stark is consistent with the interpretation of events described here.

<sup>16</sup> There are many other documented episodes. Some are discussed in the speech by Charles Plosser, and the history of inflation scares is documented in the article by Marvin Goodfriend. Also, for a more detailed analysis of appropriate monetary policy in the face of shocks to oil prices, see the article by Sylvain Leduc and Keith Sill.

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