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CREDIBILITY AND EXPLICIT INFLATION TARGETING

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Credibility and Explicit Inflation Targeting

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**ABSTRACT**

In his 2004 inflation targeting manifesto, Marvin Goodfriend described US monetary policy as implicit inflation targeting and advocated explicit targeting. Summarizing the 1965-2000 US inflation experience, he highlighted the importance of evolving Fed credibility, which accords with our recent work using a quantitative New Keynesian model. We define credibility as policy consistency with a publicly announced framework and develop two lessons theoretically. First, under explicit targeting, no conflict arises between flexible inflation targeting and maintaining/accumulating credibility. Second, implicit targeting reduces the effectiveness of expectations management and stabilization policy, as well as opening the door to costly inflation scare episodes

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# 1 Introduction

Marvin Goodfriend believed that low and stable inflation should be the primary objective of a modern central bank and it would lead to good real outcomes. In the early 2000s, he built a public case that the U.S. should adopt an *explicit* inflation targeting system, which had been advocated earlier – both in the FOMC and in speeches – by Richmond Fed presidents Robert Black and Al Broaddus.<sup>1</sup> In building his case, Goodfriend drew on his knowledge of monetary history and cutting-edge macroeconomic theory. He traced key episodes in US history to the lack of central bank credibility: the inflation of the 1970s, the costly disinflation of the 1980s, and the “inflation scares” of the early 1990s.<sup>2</sup>

Communication of inflation targets to the public was important for building and maintaining credibility more generally, he argued. With explicit and credible inflation policy, the Fed would be able to conduct stabilization of real activity and financial markets as necessary, without its actions being misinterpreted as inflationary or deflationary by households, price setters, and bond markets.

These views were very different from those of Fed leadership and many economists at the time. In 1994, Broaddus – with Goodfriend at his side – had repeatedly advocated that the Federal Open Market Committee should adopt a public long-run inflation objective and a public system of shorter-term explicit inflation targets. During 1996, in response, the FOMC coalesced on an internal long-run goal of 2 percent inflation, but they chose not to make it public. It also rejected public and explicit inflation targets for shorter horizons. In fact, in the mid-1990s, the FOMC settled on an “opportunistic approach” to inflation policy – in which planned future inflation was reduced

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1. He laid out his views as part of an National Bureau of Economic Research initiative on Inflation Targeting, organized by Ben Bernanke and Mike Woodford. The NBER conference was January 23-26, 2003; the published paper is Goodfriend (2004).

2. “Inflation scares” refer to sharp changes in expected inflation reflected in longer-term yields, a phenomenon that is famously labeled by Goodfriend (1993).

during recessions but left unaltered in expansions – rather than adopting the explicit, public and deliberate approach to disinflation advocated by Black, Broadus and Goodfriend.

By the early 2000s, it was possible for the FOMC to bask in the success of the Fed under Alan Greenspan: following the Volcker disinflation it had reduced core PCE inflation from the 3.5-5 percent range in 1989-1990 to between 1 and 2 percent over 1991-2001. In various speeches around 2000, Fed representatives<sup>3</sup> explained that *explicit targeting* was unnecessary because existing approaches had worked in practice. They also voiced concerns that an explicit system would unduly constrain stabilization policy.<sup>4</sup>

But, while the FOMC had turned away from explicit inflation targeting in 1996, Goodfriend was not shy in his 2004 inflation targeting manifesto, advocating a relatively strict form of inflation targeting. This is not because Goodfriend denied benefits from managing real activity. Instead, he described many situations in which there is no major trade-off between stabilization of inflation and real objectives. Further, he argued that the Fed can better manage real activity when its inflation policy is more credible.

In this essay, we review Marvin’s path to making the case that the United States should adopt an explicit inflation targeting system, as well as highlighting some key elements of his advocacy. We also consider the links between credibility and explicit inflation targeting as Goodfriend saw them in the early 2000s and as we see them today.

The organization of our discussion is as follows. We begin in section 2 by placing Marvin within the Richmond Fed tradition, specifically the expressed

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3. Greenspan, governors, regional bank presidents and leading staffers.

4. While we attribute these views to Fed officials more generally, we frequently draw on the writings of Donald Kohn in his 1996 Jackson Hole panel presentation that discusses opportunistic disinflation and his discussion of Marvin’s NBER paper (2004). In a chapter of personal reflections in this volume, Kohn notes that he was frequently paired as an adversary to Marvin, but it is striking how friendly and good natured their relationship was over many years. Kohn also notes Marvin’s influence in shaping his own later support for a form of inflation targeting.

policy views of Presidents Robert P. Black and J. Alfred Broaddus. These leaders fostered Marvin’s intellectual development and relished the aspiration and discipline that Marvin brought to their research departments. In section 3, we describe how modern monetary economics made its way into Marvin’s thinking and the Richmond Fed’s FOMC process more generally. In section 4, we summarize core elements of his 2004 inflation targeting manifesto, which notably stressed the importance of credibility and portrayed the Greenspan Fed as practicing *implicit* inflation targeting.

Reviewing his manifesto, we extract six key ideas: (i) a definition of *implicit* inflation targeting as a decision by a central bank to convey less accurate information to the private economy than under an explicit system; (ii) the importance of inflation scares to Marvin’s view of US history and to the case for an explicit inflation target; (iii) a view that 1970s inflation was to be understood as a “breakdown in the mutual understanding” between the public and the Fed; (iv) a view that, during intervals of low credibility, the Fed had been restricted in its stabilization efforts and subject to inflation scares arising from market uncertainty about its policies; (v) a view that an effective implicit inflation targeting regime would require the central bank to act preemptively but that it would be challenged to do so; and (vi) that a credible inflation policy would allow the Fed flexibility to stabilize real activity and the financial sector against undesirable shocks, as well as eliminating the real and nominal volatility that he saw the Fed as producing itself during the 1960s and 1970s.

From this early 2000s starting point, in section 5, we reconsider inflation targeting – implicit and explicit – and its link to monetary policy credibility. To begin this process, it is necessary to have a concrete definition of credibility, which we take to be the private sector’s likelihood that a specific policy plan will be carried out. This concept can be most directly applied to explicit inflation targeting regimes (such as those adopted by New Zealand, Canada, the United Kingdom, and the Riksbank during the 1990s). While these mon-

etary policy frameworks were not identical, all included transparency about central bank inflation plans and objectives as well as explanatory communication about the nature of inflation outcomes. Some also specified current and future inflation targets that varied over time, as envisioned in the early proposals of Black and Broadus. To an important extent, all involved a focus on managing expectations about inflation and real activity.

Stimulated by Marvin’s ideas, we discuss some models of expectations management with imperfect credibility and of an implicit inflation targeting regime. Both imperfect credibility and imperfectly communicated policies reduce a central bank’s leverage over expectations and reduce the effectiveness of its stabilization policies. We explain how an implicit inflation targeting system leaves the central bank open to inflation scares and even to a more complete breakdown of “mutual understanding” between it and the public.

## 2 Richmond and Inflation Targeting

While our focal point is Marvin’s “Inflation Targeting in the United States?”, we begin by documenting the Richmond Fed’s lengthy history of support for low and stable inflation as the primary objective of monetary policy.

### 2.1 Robert P. Black: 1973-1992

Black is frequently portrayed as a “monetarist” and “inflation hawk”: each element is important to understand policy analysis during his presidency.<sup>5</sup> But, like other simple characterizations, these labels mask more important underlying beliefs, notably a faith in the strength of market economies and an understanding of the limits of monetary policy.

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5. For example, at Federal Reserve History [Link](#)

### 2.1.1 Monetarism and the Mandate

In 1984, in the sixth quarter of recovery from the recession that had ended in October 1982, Black spoke to the annual convention of the Virginia Banker’s Association: he began by raising the question of whether the Fed’s dual mandate was a help or hindrance for monetary policy. He then argued that (i) the existing broad mandate was a limited practical guide and was sometimes an impediment; (ii) if the public should choose to give the Fed a narrow objective that the best choice would be price stability; and (iii) this outcome could be attained by “slowly but surely” reducing the growth rate of M1. In addition, he highlighted that such a narrow mandate would make it reasonable to hold the Fed accountable for the behavior of the price level over a period of two or three years. Finally, he noted that he was “enough of a pragmatist to have absolutely no objection to switching to some other monetary handle if it is ever demonstrated that something else has become superior to M1.”<sup>6</sup>

### 2.1.2 Inflation targeting comes to FOMC meetings

The first time that the FOMC transcripts include a mention of “inflation targets” as an explicit policy proposal is in December 1986 comments by Black within a committee discussion of difficulties with monetary targeting: he outlined the “more radical idea” of “setting inflation targets for the next three years or so,” which he described as “important when we have to take the unpopular step of tightening.” In February 1987, he returned to the theme, linking it to preserving Fed credibility in a time of rising actual and expected inflation.<sup>7</sup>

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6. Full text of the speech is available at FRBR [Link](#)

7. We searched the FOMC transcripts on this topic and others using strings such as “inflation tar”, “inflation obj” and “inflation goal” as participants sometimes used these interchangeably. We then closely read pages of text preceding and following the located string to understand the context. We thank Adam Shapiro of the FRB San Francisco for his help with this activity.

In 1989, Representative Stephen Neal offered an amendment to the Federal Reserve Act to require the Fed to transition to zero inflation within five years. Black joined four other regional bank presidents and Fed Chairman Alan Greenspan in testifying in support of the proposal.<sup>8</sup> At the time, inflation was running in the 5 percent range, having risen sharply at the end of Volcker’s term and the start of Greenspan’s. Over the course of 1989, members of the FOMC had expressed interest in a detailed staff analysis, which was presented at the December 19, 1989 meeting.<sup>9</sup> As the Fed’s staff economists assessed the real consequences of such a further disinflation, they highlighted the importance of credibility.

## **2.2 J. Alfred Broaddus: 1993-2004**

During the mid-1990s, legislators Connie Mack and Jim Saxton introduced a series of increasingly specific bills. As discussed by Fed Governor Laurence Meyer in 2001, Saxton’s proposal involved “mandating price stability as the ‘primary goal’ of the Federal Reserve and requiring the Fed to establish an explicit numerical definition of inflation.”<sup>10</sup>

During 1993-1997, Broaddus tirelessly advocated for two ideas. First, he argued that the FOMC should set a low long-run goal for inflation, as with the Mack-Sexton proposals. Second, he argued that inflation should be gradually reduced toward that goal using a publicly announced system of inflation targets, in line with Black’s earlier suggestions and the approach adopted in New Zealand, Canada, and other countries.

### **2.2.1 Advocating inflation targets at the FOMC in 1994**

When it met in September 1994, the FOMC was halfway through a tightening cycle that ultimately would take the funds rate from 3 percent in January

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8. Full text of the speech is available at FRBR [Link](#)

9. See page 1 of the 12-19-1989 meeting transcript at FRBoard [Link](#).

10. Meyer’s speech is at FRBoard [Link](#). See also Gramlich: FRBoard [Link](#).

1994 to 6 percent in January 1995.<sup>11</sup>

Broaddus opened his comments by noting that the Fed's Greenbook inflation projection was 3-3/4 percent for the first quarter of 1995 and that some private forecasts were for 4 percent or higher toward the end of the year. He also pointed to evidence of rising inflation expectations in the sharp increase of the long bond rate since summer 1993, noting that at 7.75 percent it stood at the highest level since 1991.<sup>12</sup>

Broaddus suggested that the bond rate indicated that

“the longer-term inflation expectations of market participants is something closer to 4 percent than the 3 percent rate for the CPI that the staff is projecting for the second half of 1995 and on into 1996. That says to me that we still have a credibility gap. Market participants do not yet seem to be convinced that we are going to take the actions we need to take to achieve our own internal inflation forecast. So, I think it's essential that we find a way to reaffirm our commitment to price stability at an early date.”

Broaddus highlighted that

“one way to deal with the credibility problem might be to consider announcing explicit multi-year inflation rate targets leading to price stability, as has been done in some other countries—say 3 percent for 1995, 2-1/2 percent for 1996, and so forth.”

He noted that

“If we announced explicit inflation targets and committed ourselves clearly to achieving those targets, that might buy us a little more flexibility at least with respect to the timing of our short-term policy actions. In the absence of something like this, though, I think we need seriously to consider some sort of policy action later in the meeting.”

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11. This was during an interval of “preemptive policy” for the Greenspan Fed, as discussed in Goodfriend (2004, 320) that successfully “brought the economy to virtual price stability.” We return to this topic in section 4.

12. Later, Goodfriend (2012) would identify this interval as part of an inflation scare in a memo for the Shadow Open Market Committee. See SOMC [Link](#)

The meeting ended with no change in the funds rate target, although there was an agreement on an asymmetric upward tilt. However, this was before the FOMC began to immediately release the funds rate target and to communicate its views about the near-term evolution of the policy rate.<sup>13</sup>

In December 1994, Broaddus emphasized the credibility effects of the FOMC's preemptive policy over the year, indicating that "the recent behavior of the bond rate suggests, to me at least, that we have acquired some of late. In my view, that is the most encouraging development we have seen in some time. The trick is going to be to maintain it going forward as we move into a situation where the risks are at least a little more balanced than they have been. I might just note once again if I may that precisely in this kind of situation, something like an inflation target might be helpful."<sup>14</sup>

### **2.2.2 Speaking to the public in 1995**

Broaddus also spoke to the public regularly: an excellent example is his "Reflections on Monetary Policy" delivered to the Virginia Association of Economists in 1995.<sup>15</sup> In such presentations, he stressed that low inflation ("stable prices") should be the long-run goal of monetary policy, describing the importance of maintaining and increasing the credibility for that objective. He advocated that this objective should be publicly and unilaterally adopted by the Fed, despite the fact that the Neal amendment had not been passed by Congress. He explained that this objective is "fully consistent with the present Humphrey-Hawkins mandate since price stability would permit the economy to achieve maximum growth in output and employment over time." In fact, he argued that the explicit long-run "objective would increase the Fed's flexibility in dealing with short-term economic disturbances since appropriate short-term actions could be taken without (or with much less)

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13. The target began to be released July 6 1995. For a detailed history of evolving Fed communication policy 1975-2003, see Lindsey (2003). FRBoard [Link](#)

14. Transcript of 12-20-1994 FOMC meeting, page 16, FRBoard [Link](#)

15. Full text of speech is at FRBR [Link](#)

concern about the potential loss of long-term credibility.”

### 2.2.3 Goals and targets at the FOMC in 1996

During 1995 and 1996, special components of FOMC meetings were devoted to two major substantive questions. First, what long-run goal should it have for inflation? Second, if that required a reduction in inflation from the prevailing level – a disinflation – then what was the best path?

Having previously endorsed price stability as the long-run objective, Broadus continued to advocate for an explicit inflation target during 1995 and 1996.<sup>16</sup> By January 1996, seeing little prospect for the Mack and Saxton Bill in Congress, he pushed for Greenspan to include

“in the Humphrey- Hawkins written report and hopefully in your testimony, Mr. Chairman, a positive statement that the Committee wants and expects the CPI inflation rate to remain below 3 percent on average over the two-year 1996-1997 period and that beyond that we intend to take steps to bring the inflation rate down further over time. We could think of this, and describe this publicly, as a sort of benchmark... Such a benchmark would give the Congress and the public, and for that matter ourselves, something more concrete than we have had in the past to hold ourselves accountable for. It may seem like a small step, but I think this would be a significant departure from what we have done in the past. I believe it would get some attention and hopefully improve our credibility along with our accountability...(I)f it would make the Committee more comfortable, we could add a statement in the report that a benchmark like this would not necessarily constrain us ... or prevent us from continuing to take actions that are aimed at stabilizing employment and output in the short run. I think it would make us evaluate such short-term actions against our longer-term price stability objective rather

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16. As he built his case in 1995-1996, though in the minority, he drew support from Jerry Jordan (see the Jan 1996 meeting transcript [Link](#)) and Tom Meltzer (see the July 1996 meeting transcript [Link](#)).

than evaluating efforts to contain inflation against an implicit un-employment objective, which I think has been the case in some past years.”<sup>17</sup>

## 2.3 Opportunistic disinflation and a new goal

But during 1995 and 1996, new and very different ideas became prominent at the FOMC that would shape its policy going forward. First, to the extent that further reductions in inflation were to be necessary, it coalesced around an opportunistic disinflation strategy, as opposed to the deliberate one advocated by Broaddus. Second, after presentations by Broaddus and Yellen, it opted for a 2 percent long-run goal for inflation, although the committee did not fully settle on whether this goal was for CPI or PCE and it chose not to make the goal public.

### 2.3.1 Opportunistic disinflation

In 1989, FRB Philadelphia President Edward G. Boehne had suggested to his FOMC compatriots a strategy of disinflation that was later labeled “opportunistic disinflation.” In a speech in September 1996, new Governor Lawrence Meyer<sup>18</sup> described “opportunistic disinflation” as follows: “Under this strategy, once inflation becomes modest, as today, Federal Reserve policy in the near term focuses on sustaining trend growth at full employment at the prevailing inflation rate. At this point the short-run priorities are twofold:

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17. See pages 38-39 in the transcript of the 01-31-1996 meeting FRBoard [Link](#)

18. President Clinton announced the renomination of Greenspan, as well as nominations of Rivlin and Meyer as governors in mid-1996. Shortly before these nominations, Steven Pearlstein of the Washington Post wrote that the renomination of Greenspan promised a continuation of recent Fed policy. Pearlstein also described Meyer’s view that the Greenspan Fed had previously reduced inflation by an asymmetric policy of acting cautiously to stimulate the economy during recessions but acting early and decisively to “limit the economy’s upside potential, sacrificing a measure of extra job and income growth in a way that most people never realize they are being sacrificed. The aim is to reduce the long-term trend in inflation with the minimum of political backlash.” Washington Post [Link](#)

sustaining the expansion and preventing an acceleration of inflation. This is, nevertheless, a strategy for disinflation because it takes advantage of the opportunity of inevitable recessions and potential positive supply shocks to ratchet down inflation over time. Proponents of this strategy sometimes describe this approach as reducing inflation cycle-to-cycle or describe the economy as being one recession from price stability.”<sup>19</sup>

Some FOMC members and leading Board staff had been moving to this perspective for some time.<sup>20</sup> For the former, it must have appeared as a way to end the lengthy debates over the importance of credibility to deliberate disinflation. For the latter, it was congruent with their accelerationist model of inflation, which made *changes* in inflation negatively related to economic slack, measured either by the gap between unemployment and its non-accelerating level or by output relative to potential.

In the decisive July 1996 meeting, Broaddus said he was “uncomfortable with the opportunistic approach” and offered three reasons why. First, he challenged the accelerationist inflation approach used by its proponents:

“keeping in mind that the ultimate goal is not temporary price stability but permanent price stability, an opportunistic strategy seems to be premised on the idea that recessions are permanently rather than just temporarily disinflationary. [...] In short, I am not sure that there are autonomous recession opportunities out there, if I can use that awkward phrase, that can be counted on to reduce inflation permanently in the absence of some deliberate effort to do so on our part.”

Second, he challenged the political arguments made by its proponents

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19. Full text of speech is at FRBoard [link](#)

20. In his confirmation hearing testimony in 1994, Alan Blinder had put forward related ideas and the idea was much discussed during summer 1996 after the Wall Street Journal highlighted a working paper on the topic by Orphanides and Wilcox (1996), which included quotes from Boehne and Blinder. The topic figured prominently in that summer’s Jackson Hole symposium on “Achieving Price Stability,” particularly in the remarks of Donald Kohn concerning appropriate operating procedures to maintain price stability.

“one of the more persuasive arguments for following an opportunistic policy would be that it might deflect some of the criticism we could be expected to receive if we follow a more deliberate approach and are perceived by the public as perhaps keeping policy tight and keeping the economy slack as a way of reducing the inflation rate. But if this kind of strategy is going to work, it would seem to imply that in recessions we would not ease policy as aggressively as we would if we were not trying to reduce the inflation rate permanently. At first glance, it might look as if this approach would be less visible, less open to criticism, less of a lightning rod, and thus one that would be more likely to succeed. But I think there is a risk here that eventually the public would catch on, and then we would be open to the criticism that we are not easing policy aggressively enough in a recession. Think of the phrases that might come out – “we are kicking the economy while it is down” and so forth. If we got that kind of feedback, that could undermine the effectiveness of this strategy over time. So, it is not really clear to me what we would be gaining from this approach.”

Third, he drew attention to its label:<sup>21</sup>

“I have always thought that the word opportunistic had a mildly pejorative connotation. [...] So, if we decide to adopt this strategy, I would hope that at least we would find another name for it. Better yet, I think it would be better to follow a more deliberate, conventional policy.”<sup>22</sup>

### 2.3.2 The 2 percent long-run goal

At the July 1996 meeting, as the FOMC considered the appropriate long-run rate of inflation, various members took into account their perceived transition

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21. Broadus was harking to the conventional definition: “taking advantage of opportunities as they arise: such as exploiting opportunities with little regard to principle” but, for some, it had come to be used simply as “taking advantage of one’s opportunities.”

22. See pages 48-49 of the July 1996 transcript at [Link](#).

costs, their sense of the benefits from permanently low inflation, and their sense of the costs of permanently low inflation. There was diversity in the views reflected in the statements of various members on each of these topics.

In detailed prepared remarks, Governor Janet Yellen discussed a cost-benefit approach to determining the optimal long-run rate of inflation and the transition path. Citing research by Akerlof, Dickens, and Perry (1996) which argued that worker resistance to nominal pay cuts produced a long-run Phillips curve with a negative slope at low rates of inflation, Yellen argued for a positive rate of long-run inflation.<sup>23</sup> The idea that positive inflation was necessary “to grease the wheels of the labor market” was compelling to some FOMC members.

Broaddus pointed out, even if there were disagreements about near-zero inflation, there was a consensus that the long-run inflation rate should not be higher than 3 percent. Broaddus and then Cleveland Fed President Jerry Jordan stressed the importance of explicit public discussion of inflation objectives as a means of enhancing Fed credibility and thus lowering the cost of further reductions in inflation.

The FOMC discussed how to define “price stability” as an objective of monetary policy. Greenspan suggested that “price stability is that state in which expected changes in the general price level do not effectively alter business or household decisions,” but Yellen challenged him to translate that general statement into a specific numerical value. He responded that “the number is zero, if inflation is properly measured.” Yellen said that she preferred 2 percent “imperfectly measured.” FOMC members generally accepted the idea that there was an upward bias of about 1/2 percent in annual CPI inflation relative to PCE inflation, the measure that had begun to be more

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23. She also noted that the Board’s new model indicated a cost of 2.5 point years of unemployment for every 1 percent decline in the long-run inflation rate, under imperfect credibility. To warrant a reduction in inflation, she argued that such a cost of permanently lower inflation had to be less than the discounted value of a stream of future benefits. See page 42 of the July 1996 transcript at [Link](#).

increasingly used by the Fed. However, at the time, they never really settled on whether the 2 percent goal was for the CPI or the PCE.

Yet, the FOMC had coalesced around 2 percent as an interim goal. Presumably, some members viewed it as the natural first step toward a lower ultimate inflation objective, while others thought of it as an end point. However, in the meeting, Greenspan and others noted that PCE inflation was running in the 2 percent range.<sup>24</sup> So, they pointed out, the consensus outcome perhaps meant that the FOMC had already achieved its objective for “price stability.”

On the second day of the two-day meeting, Greenspan urged that the 2 percent objective be kept highly confidential. He noted that “the discussion we had yesterday was exceptionally interesting and important” but warned that “if the 2 percent inflation figure gets out of this room, it is going to create more problems for us than I think any of you might anticipate.” He did not elaborate on whether he was concerned about market or political reactions to the inflation goal.

## **2.4 Implicit inflation targeting at the Greenspan Fed**

The FOMC had considered explicit inflation targeting, stimulated by congressional initiatives and the constant prodding of Al Broaddus, who was armed with arguments Marvin Goodfriend had helped develop. With its opting for an internal rather than public long-run goal and opportunistic disinflation rather than pursuit of deliberate disinflation with announced targets, the Greenspan Fed’s policy differed sharply from the Richmond proposals. Goodfriend was later to describe the practice as “implicit inflation targeting” because of the limited communication by the Fed and the lack of public accountability for inflation performance. While PCE inflation was in the 2 percent range in 1996, it was to fall closer to 1 percent in 1998 and 1999, motivating Goodfriend and others to become concerned with deflationary

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24. See page 59 of the July 1996 transcript at [Link](#).

scenarios.

### 3 Evolving Research at FRBR

Al Broaddus has highlighted two elements of Marvin's time in Richmond.<sup>25</sup> First, he described the importance that Marvin attached to credibility if monetary policy was to be conducted successfully. Second, he stressed the extraordinary intellectual energy that Marvin brought to the Research Department's intellectual environment during his time in Richmond (1978-2005). In these years, Marvin grew as an economist in the intellectual environment created by Black and Broaddus. We now trace some of the evolution of his thinking, as well as that of the department more generally, as it relates to understanding the case that he made for explicit inflation targeting in 2004.

#### 3.1 The monetary instrument

Not too long after Goodfriend arrived in Richmond in Fall 1978, the Volcker-led Fed announced its famous October 1979 "regime shift" that emphasized bank reserve management and de-emphasized federal funds rate control, with the aim of combating inflation and reducing expectations of inflation.<sup>26</sup> Some of Marvin's early Fed working papers were stimulated by those changes.<sup>27</sup> However, he increasingly focused on the implications of the Fed's policies for the funds rate and the macro economy.

In a PhD class on monetary economics that Marvin took at Brown, Bill Poole had described his classic analysis of the choice between a reserve instrument and an interest rate instrument under uncertainty (Poole 1970). But Poole also explained that it was not possible to consider that choice in a rational expectations model, because Sargent and Wallace (1975) had shown

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25. See Broaddus's personal reflections in this volume.

26. Lindsey, Orphanides, and Rasche (2004).

27. Goodfriend (1982) and Goodfriend et al. 1986.

that the price level was indeterminate when the interest rate was taken as exogenous. The Sargent-Wallace finding was surprising for researchers and controversial for central bankers. It was not too long, though, before the monetarist economists Parkin (1978) and McCallum (1981) recognized that there was no indeterminacy if the interest rate instrument was part of a policy package with a well-specified nominal anchor.<sup>28</sup>

Somewhat later, Goodfriend leveraged the Parkin-McCallum insights to construct simple rational expectations models in which the central bank purposefully chose the joint behavior of a monetary quantity, the price level, and the nominal interest rate, updating the analysis of Poole (1970) and Sargent and Wallace (1975). Goodfriend found that when the central bank sought to smooth the price level and nominal interest rate, its optimal policy gave rise to determinate but non-stationary price level and non-stationary money stock. That is, there was a form of “base drift” similar to that which he and Al Broaddus had described for the Fed’s monetary targets and also forcefully critiqued (Broaddus and Goodfriend 1985). But even though he – like the Fed – was moving away from money, Marvin’s analysis featured an alternative nominal anchor: a coherent central bank objective.<sup>29</sup>

As the decade unfolded, Goodfriend increasingly cast monetary policy decisions – current and historical – in terms of interest rate policy, a perspective that he masterfully advocated in his 1991 *Carnegie Rochester* article “Interest Rates and the Conduct of Monetary Policy.”<sup>30</sup> In making the shift from bank reserves and the money stock to the funds rate and the price level, Marvin showed the intellectual flexibility evidenced in Robert Black’s 1984

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28. In the latter part of the Volcker chairmanship, some say by Fall 1982, the Volcker-led fed began to de-emphasize monetary targets in internal decision-making due to money demand instability, shifting to a borrowed reserve approach that also led to closer control of the funds rate.

29. In another essay in this volume, Michael Dotsey, Andreas Hornstein, and Alex Wolman discuss further research on “interest rate smoothing” linking to the ultimately published version of this research (Goodfriend 1987).

30. Elsewhere in this volume, John Taylor discusses this contribution, Goodfriend (1993)

speech to the Virginia bankers. While not forgetting his monetarist roots, he evolved along with many other central bankers and economists, he held on strongly to other Fisherian principles.<sup>31</sup>

### 3.2 The funds rate and the term structure

His Richmond Fed colleague Tim Cook substantially influenced Marvin's evolution, with work on the link between the funds rate and the term structure (Cook and Hahn 1989). To understand this research, one must recall that the Fed did not release information on its funds rate target decisions after FOMC meetings in the 1960s and 1970s. Based on his knowledge of Fed procedures, Cook identified the 1974-1979 period as one in which the "Desk" at the Federal Reserve Bank of New York had attained substantial day-to-day control over the funds rate. Hence, market participants were able to rapidly discern the effect of unannounced decisions about the funds rate target, but news stories in the *Wall Street Journal* cataloged the events. Based on careful collection and study of these news reports, Cook and Hahn identified 76 target change events and estimated the response of the term structure.

At the time, some were skeptical that the Fed had *any* ability to affect the term structure. Others were entranced by estimating the effects of money supply announcements. But after Cook and Hahn (1989), many changed their views of relevant mechanisms and events.<sup>32</sup>

In thinking through Cook's results and related literature, Marvin devel-

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31. These Fisherian principles were strongly in the water in Richmond due to the tireless efforts of Robert Hetzel and Thomas Humphrey.

32. There has been a recent explosion of work on estimating term structure responses to monetary policy events using high-frequency data. Cook's work continues to be highly cited, though the proponents of high-frequency identification are prone to criticize it on the grounds that his events are somewhat forecastable. While this view is econometrically correct, it misses the contribution of Cook's work, which showed non-zero term structure responses when these were thought to be absent. Of course, the "errors in variables" problem associated with partly anticipated events can be important. But it only attenuates the relevant coefficients: it does not produce significant findings when no underlying relationship is present.

oped an appreciation of the importance of learning from the term structure about evolving expectations. He viewed the short end as dominated by central bank actions and the long end as containing valuable information about long-horizon inflation expectations (Goodfriend (1998)).

### **3.3 Tracking the neutral rate**

During the late 1980s and early 1990s, real business cycle analysis grew from a few initial explorations into a vibrant – if controversial – research program. Some prominent central bankers viewed it as a negative shock, but that was not Marvin Goodfriend’s perspective nor the practice at the FRB Richmond.

Instead, as Marvin became increasingly involved in preparing the FRBR’s policy positions,<sup>33</sup> he recognized that the economy’s unobserved natural rate of interest was critical and began to use elements of RBC theory to guide his thinking.

For example, in the early 1990s, there were important changes in US tax policy. In one pre-FOMC meeting during this period, a briefing memo by a young researcher described why the real interest rate should rise as a result of various fiscal influences in a flexible price model.<sup>34</sup> To the Richmond economist this suggested that a rise in the nominal policy interest rate target was warranted, drawing on the idea that the nominal rate should track the “underlying real rate” along with a targeted amount of expected inflation.

### **3.4 Openness to New Keynesian ideas**

At Brown, Marvin had been schooled in a very unusual form of Keynesian economics, with Herschel Grossman teaching a “general disequilibrium” ap-

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33. Goodfriend was associate director of research 1990-1992, director of research 1993-1999 and policy advisor 1999-2005: in another essay, Al Broaddus discusses his FOMC contributions. He played a key role in attracting two academic consultants to FRBR: Bennett T. McCallum, then of the University of Virginia, and Robert G. King, then of the University of Rochester.

34. Cheng-Sheng Mao, now of National Taiwan University, was at FRBR 1988-1991.

proach to macroeconomics. Presented using chapters from a monograph in progress, Grossman’s lectures featured household and firm dynamic optimization in consumption, investment, and money demand in settings with gradual price and wage adjustment.<sup>35</sup> In the late 1980s and early 1990s, as New Keynesian approaches developed, Goodfriend absorbed these ideas, pouring over the twin volumes edited by Mankiw and Romer (1991b, 1991a). Inspired, he developed a theory in which the price level was sticky in a range of mark-up indeterminacy, but without other impediments to wage or price adjustment (Goodfriend (1997)). In this approach, inflation arose only when employment was sufficiently stimulated and a moderate steady-state inflation was desirable. Ultimately, though, like many others, he settled on using exogenous pricing frictions as the basis for thinking about inflation dynamics, particularly the interaction of inflation targets and central bank credibility.

### 3.5 The productivity boom

In the history of the Greenspan years, perhaps the most widely celebrated episode is his uncovering of a boom in productivity in the latter half of the 1990s.<sup>36</sup> Many FOMC members and much of the Board staff saw rapid real output growth and a declining unemployment rate as a sign of a demand shock: they sought to raise the funds rate to cool off the economy. Explaining that rising productivity growth would lead to lower inflation, Greenspan convinced the FOMC in July 1996 to hold off on an interest rate increase.

By that time, so as to study ongoing developments and alternative policy regimes, Goodfriend and others at FRB Richmond had adopted a conceptual

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35. Charles Plosser, author of another essay in this volume, received a similar exposure at Chicago in a class from Grossman’s coauthor Robert Barro. Both Barro and Grossman freely acknowledged the core weakness of their work, which was the absence of an optimizing theory of price and wage adjustment, and taught the emerging literature on market-clearing models with imperfect information and rational expectations.

36. Chapter 11 of Bob Woodward’s 2000 *Maestro* is an insider’s account of Greenspan’s unorthodox thinking and his struggle to convince the Board’s economists that there was increased growth of productivity.

and quantitative model that combined monopolistic competition and sticky prices with a real business cycle core. Complementary lessons were sometimes also taken from an “optimizing IS-LM” framework developed by Bennett T. McCallum and Edward Nelson, which featured a forward-looking IS schedule based on a representative household’s consumption Euler equation.<sup>37</sup> In the MN framework, with an explicit production function and consumption as the dominant component of output, real supply factors such as productivity and real demand factors such as government purchases affected the natural rate of interest.

The fully articulated model was used to explore consequences of a very strict inflation targeting system (a fixed price level path changing at a constant rate) by King and Wolman (1996). They began with a neoclassical core that was an RBC model with variable labor supply and capital formation with investment adjustment costs. They then added Monetarist features<sup>38</sup> and Keynesian features.<sup>39</sup> The striking conclusion was that strict price level targeting led to real activity close to that of their rich core RBC model. An exact coincidence of output with its RBC behavior could be obtained with an interest rate policy of tracking the natural rate of interest and penalizing deviations of the price level from target, with a unique rational expectations solution implied by the analysis of Kerr and King (1996).<sup>40</sup> Shifts in money

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37. In lunchtime sessions and other informal conversations with Goodfriend and others, McCallum had long been advocating such an approach, which he had sketched in his *Monetary Economics* (1989) and he had begun to develop in lectures in Vienna (McCallum 1994) using a log-linear approximation approach. His collaborative work with Nelson was ultimately published in 1999.

38. A demand for money from a “shopping time” approach.

39. Monopolistically competitive firms with a pricing friction of the Calvo (1983) form.

40. The Kerr-King analysis is sometimes cited as the first to consider Taylor-style interest rate rules in the now-familiar three equation NK model (they employed McCallum’s forward-looking IS curve and explored both the 1980s and Calvo approach to price stickiness). Leeper 1991 had developed a form of the “Taylor principle” in a flexible price model. But Kerr and King reached the same conclusion for the basic linear NK model (see, for example, the discussion on page 391 of Clarida, Gali, and Gertler 1999). More important for our discussion, however, Kerr and King also derived implications for interest rate rules with feedback to the deviations of the price level from target. In this case, the

demand would play no role under the policy of tracking the natural rate. By contrast, with a fixed money supply path, such shifts would affect real activity because of the Keynesian sticky price mechanisms.

Advocating that central bankers and macroeconomists should adopt the “new neoclassical synthesis” approach employed in FRB Richmond, Goodfriend and King (1997) wrote:

“Central banks invariably use a short-term interest rate as their monetary policy instrument. The new synthesis says that central bankers should manage a low-inflation targeting regime by making the short-term nominal rate mimic the real short rate that would be ground out by a well-specified RBC model with a low, constant markup.

As [an] example of the value of RBC reasoning, consider this. Recently, a possible pickup in productivity growth has been cited as a reason why the Federal Reserve need not raise short-term real interest rates to maintain low inflation. ...[T]he standard RBC component of the NNS model suggests, at a minimum, that real rates would have to rise one for one with an increase in trend productivity growth, e.g., a 50 basis point increase in the growth rate would be matched by a 50 basis point increase in real interest rates. Importantly, rates would have to rise even if the economy were otherwise operating at a noninflationary potential level of GDP.”

In evaluating the policy implications of productivity boom, the Richmond approach involved a sharply different form of analysis from that elsewhere in the Fed.<sup>41</sup> The Richmond analysis called for an increase in the policy rate to

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uniqueness conclusion holds irrespective of how strongly the central bank interest rate rule responds to deviations of the price level from a target path, so long as it does so positively. Interestingly in retrospect, the King-Wolman analysis of price level targeting did not assume that the neutral real rate was tracked but instead held constant at its steady state value. In that case, outcomes corresponded to the RBC solution only with an aggressive response to deviations from the target path. However, it was understood at the time that tracking the natural rate would have led to an exact replication of RBC outcomes under strict inflation targeting.

41. Donald Kohn’s oral history interview in 2011 highlights two differences. First, Kohn

keep the economy on track with its potential. Goodfriend and others stressed that keeping the interest rate low would lead economic activity to expand by more than was warranted by the productivity boom.

Several years later, in the November 1999 FOMC meeting, Broaddus noted that he “was pleased to see the explicit recognition in the Greenbook that faster trend productivity growth implies higher real interest rates. I think one of the principal policy questions we need to ask ourselves later in the meeting is whether the tightening actions we have taken to date are sufficient to allow the upward adjustment in real rates that is necessary to keep the economy in balance, given recent productivity developments. The alternative is that we may be holding rates below where they need to be to accomplish that objective, with all of the inflation risk that would imply.”<sup>42</sup>

### 3.6 The Richmond rule and the Taylor rule

During this period, monetary economists increasingly began to think about interest rate instrument settings through the lens of John Taylor’s famous rule (Taylor 1993), which involved a high policy rate when inflation exceeded a 2 percent target and a low policy rate when output fell below potential.<sup>43</sup> The intercept in the rule was a long-run nominal rate, based on the inflation target and a long-run real rate. This “rule of thumb” provides direct guidance to a central bank about its policy settings based on current data, although choices must be made about the inflation rate and the measurement of the

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stresses that Broaddus was arguing from a different perspective during the productivity surge (page 39). Second, David Small notes that it was fortuitous that the Board was able to use FRB-US, the new forward-looking model introduced in about 1996 and then sharpened over the next few years, to think about the implications of productivity shocks. Pages 60-63 of the interview discuss Greenspan, the productivity boom and thinking through things using FRB-US. Federal Reserve [Link](#)

42. See page 28 in the transcript of the 11-16-1999 meeting FRBoard [Link](#)

43. The rule specified symmetric response to inflation below target and output above potential

output gap.<sup>44</sup> Many practical monetary economists have stressed that the central bank needs to adapt it to special circumstances, with financial crises being the most frequently cited events.<sup>45</sup>

Comparison with Taylor’s rule provides additional perspective on how very different the Richmond approach was. It started with *desiderata* for real activity and expected inflation, then provided an instrument setting within the context of these broader policy objectives. In the passage cited above, GK argued that “central bankers should manage a low-inflation targeting regime” by setting the policy rate according to the Richmond rule.<sup>46</sup>

It is important to stress that advocates of the Richmond rule were not naive. They understood that a crucial component of the rule of “just track the natural rate” was that there was a credible and explicit inflation target-

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44. Poole (2007) uses the Taylor rule to explain Fed behavior during the Greenspan chairmanship, highlighting both systematic elements and special circumstances. Orphanides and Wieland (2008) draw attention to Poole’s practice as involving a “rule of thumb” and also highlight the implications for implied Fed behavior of using its own forecasts rather than historical values. It is of particular interest that their empirical rule – based on Fed forecasts – better captures the 1994 period of “preemptive policy” than does a more standard Taylor rule.

45. Some adherents of the Taylor rule would point out that the Richmond rule requires detailed information on the natural rate of interest, an unobservable time-varying construct whose behavior differs across real theories. By contrast, they would suggest, the Taylor rule has limited informational requirements and hence is more robust, noting also that the real activity term in the Taylor rule may capture some time variation in the natural rate of interest. But the case of productivity variation provides a useful setting to think about such issues. First, high productivity growth corresponds to high growth of potential output. So, with either the original “output gap” form of the Taylor rule or the “output growth” form advocated by Orphanides and Williams (2002), productivity adjustments to Taylor rule settings must be made to avoid unsustainable real activity and undesirable variations in inflation. Second, to gauge the implication of time-varying productivity growth for the policy rate as a special circumstance, it is likely be preferable to think directly in terms of implications for the natural rate of interest, while recognizing the substantial uncertainty involved in its shorter-run movements.

46. The behavior of inflation and real activity under optimal monetary policy was being examined at Richmond as well, in the benchmark sticky price models of King and Wolman (1999) and Khan, King, and Wolman (2003). Extending their earlier analysis of price level targeting (1996), King and Wolman discussed implementation of optimal outcomes – differing from those in the underlying real business cycle framework – using a generalization of the Richmond rule, in line with the literature that we discuss in section 4 below.

ing system in place. But, as highlighted by the excerpts from Broaddus’s comments in the September 1994 meeting discussed above, if the FOMC did not want to move to explicit inflation targeting then it had to undertake restrictive policy actions to combat rising actual and expected inflation, as called for by the Taylor rule. Broaddus, with Goodfriend at his side, called for raising the funds rate, at that time and over the coming meetings, to combat inflation within the policy regime that was in place.

### **3.7 High-quality policy-relevant research**

A hallmark of the development of the Richmond research department during the late 1980s and the 1990s was the relatively seamless integration of policy analysis and basic research.

#### **3.7.1 Black’s challenge to the FRBR research department**

During the late 1980s and early 1990s, the FRBR invited its consultants to participate in the “pre-FOMC” briefings when they were in residence.<sup>47</sup> Marvin Goodfriend was the impetus for this initiative, and he thought carefully about institutional design: the day-long briefing was broken into a morning session on conceptual topics that would include the consultants. Then, a staff-only afternoon session began the process of developing the positions and statement for the President to take to the FOMC.<sup>48</sup> The consultants did not prepare briefing memos or participate actively in the exchange between the President and his research team during the meeting. But, between the two sessions, at a large cafeteria round table, lessons from the morning sessions would be debated by the staff economists, with the president frequently

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47. Some sessions at the time were attended by McCallum and King. The structure was designed to protect both the Bank and the consultants against assertions that they had access to confidential information, while including their input on substantive issues of current importance.

48. Al Broaddus’s essay spells out the steps from pre-FOMC to the FOMC, highlighting how he worked with Marvin and others during his presidency.

present.

At one of these FOMC meetings, Black articulated his philosophy and posed a challenge to the research department after listening to a policy-relevant but lengthy and conceptually demanding presentation. Essentially, he said: “That was very interesting and informative. But I cannot take that message to the FOMC table, because no one will be able to absorb it during the short time available. I need you to write papers that the Board’s economists will find that they need to read. Once they have absorbed the lessons, they will be able to brief the governors. Then, our statements at the FOMC can be understood and influential.”<sup>49</sup> It was a challenge that Marvin Goodfriend and his colleagues – growing in quantity and quality – took to heart.

### **3.7.2 Internal institutions and realizing Black’s vision**

On becoming research director in 1993, Marvin Goodfriend again thought about institutional design, recognizing that the Fed required high-quality research in both money and banking to face the challenges ahead. He made Michael Dotsey the head of the team working on macroeconomics and monetary economics. At roughly the same time, he made Jeffrey Lacker the head of Richmond’s team of banking and financial economists, endorsing the concept that Richmond would combine dynamic theory and practical studies in those areas as had earlier been done in monetary economics. There were soon “banking policy briefings” to complement the “monetary policy briefings.”

Dotsey sharpened the focus of pre-FOMC research, so that it soon became routine for a briefing memo to evolve into a benchmark publication in the revamped *Economic Quarterly* and then sometimes into an article in a top journal. Applied to both money and banking, the research and policy model drew a diverse group of young, high-quality economists to Richmond. During the tenure of Al Broaddus as president and Marvin Goodfriend as research

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49. Personal recollections of Robert King from an early 1990s pre-FOMC meeting.

director, President Black's vision was realized in a low-key, high-intensity research department.

## 4 Goodfriend's Inflation Targeting Manifesto

When Goodfriend began to work on "Inflation Targeting in the United States?", more than five years had passed since the FOMC meeting where Al Broaddus made the case that the Fed should publicly adopt a low long-run inflation goal and shorter-run inflation targets. Marvin and Al had come back from Washington disappointed: like Black before them, they had been unable to convince the Fed chair and a majority of the FOMC on a topic they saw as central to monetary policy supporting good outcomes for inflation and real activity.

### 4.1 Explicit inflation targeting in theory

Explicit inflation targeting is characterized, according to Goodfriend, "by the *announcement* of an official target for the inflation rate and by an acknowledgment that *low inflation is a priority* for monetary policy. Inflation targeting also involves "*enhanced transparency of the procedures and objectives of monetary policy, and increased accountability of the central bank for attaining those objectives.*" (G2004, 311-311),"

We begin our discussion of Goodfriend's inflation targeting manifesto by considering how an explicit inflation targeting system operates when it is perfectly understood by private agents and also perfectly credible. This is one benchmark that Goodfriend employed in his 2004 contribution and other writings. For him, it was an important reference point, as it became for the literature more generally.

#### 4.1.1 EIT and the New Neoclassical Synthesis in 1997

Goodfriend first publicly built a case for an inflation targeting system at an earlier NBER conference in 1997, when he and Robert King advocated the adoption of “new neoclassical synthesis” models for macroeconomic analysis and monetary policy design. The NBER working paper abstract for the GK paper reads in part:

“We find that the New Neoclassical Synthesis rationalizes an activist monetary policy which is a simple system of inflation targets. Under this *neutral* monetary policy, real quantities evolve as suggested in the literature on real business cycles. Going beyond broad principles, we use the new synthesis to address several operational aspects of inflation targeting. These include its practicality, the response to oil shocks, the choice of price index, the design of a mandate, and the tactics of interest rate policy.”

The NNS approach rationalized stabilizing the inflation rate of an index of sticky prices at close to zero. It also rationalized central bank use a form of the Richmond rule, taking into account how various shocks would affect the natural rate of interest.

#### 4.1.2 New EIT concepts and tools in 2004

By the time Goodfriend presented his manifesto at the 2003 NBER conference, there had been many conceptual developments in the analysis of inflation targeting. One important one was the idea of *flexible inflation targeting* associated with the practice of the Reserve Bank of New Zealand and theoretical framing by Lars E.O. Svensson: an inflation target was not an ironclad simple rule but was a component of a policy package resulting from optimal choices by a central bank and government that also placed weights on real objectives.<sup>50</sup> Another innovation was the concept of *inflation forecast targeting* developed by Svensson (1997) to describe and analyze the practices of the

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50. From the earliest years of New Zealand experiment with Inflation Targeting, Svensson argued, central bankers had always stressed that they sought to bring about desirable real

Bank of England, initially in a setting where inflation is predetermined and then extended to settings with forward-looking inflation. The 2003 NBER conference contained important papers on these topics by Michael Woodford: one on forecast targeting mechanics (with Svensson) and another on optimal inflation targeting rules (with Marc Giannoni). These targeting frameworks utilized tools developed for *optimal policy under commitment with perfect credibility* and were designed for *credible explicit inflation targeting regimes* such as that in place at the Riksbank, which had regular and highly public decision processes and provided markets with a great deal of information about current and future actions and planned outcomes. Goodfriend showed some openness to lessons from the emerging synthetic theory of inflation targeting and optimal policy, although, as we will see, he expressed some reservations.

#### 4.1.3 Goodfriend’s revised long-run inflation goal

Starting from his earlier advocacy of a zero long-run inflation rate,<sup>51</sup> Goodfriend had revised up the optimal long-run target in his inflation targeting manifesto due to a recognition of the potential importance of the zero lower bound for monetary policy, a topic that had absorbed his attention in the late 1990s and early 2000s.<sup>52</sup>

His 2004 proposal was for “a range of 1 to 2 percent for core PCE inflation monthly over twelve or twenty-four months earlier would be a reasonable quantitative long-run target.” (G2004, 327)<sup>53</sup> Writing in 2004, Governor Ben

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outcomes as well as meeting inflation objectives. In 1996, when he dubbed such behavior “flexible inflation targeting”, he noted wryly that this expression is more compact than “inflation-and-output-gap targeting.” The published reference is Svensson (1999).

51. Goodfriend and King (1997, 2001)

52. He alluded to the FOMC discussion of Yellen’s 1996 case for a positive, but low goal for inflation. But he added a new twist: with a positive inflation rate of about two percent, he calculated that downward nominal wage rigidity was irrelevant when there was also trend productivity growth. Thus, if that form of wage rigidity was most prevalent, he suggested it would not provide an impediment to strict inflation targeting. (G2004, 331)

53. In 2000, the Fed had highlighted the PCE as its preferred measure of the inflation rate, as well as highlighting the stability of “core” PCE inflation relative to “headline”

Bernanke noted that “publicly expressed preferences by FOMC members for long-run inflation have ranged considerably, from less than 1 percent to 2.5 percent or more” so that Goodfriend’s range included the views of many, but was perhaps slightly lower.<sup>54</sup>

Bernanke and Goodfriend both advocated that the “long-run inflation rate” objective of the Fed be made public. Each also pointed to the continuing volatility of the long end of the term structure of interest rates, carefully documented in the work of Gürkaynak, Sack, and Swanson 2005, as an indication of the uncertainty that the public had about the Fed’s long-run objective.

#### 4.1.4 The strict inflation targeting benchmark

Goodfriend advocated keeping inflation within its long-run explicit inflation target range even in the short run, a version of *strict inflation targeting*. In this regard, he differed substantially from Bernanke (2003), who advocated that the Fed accompany an announcement of an “optimal long-run inflation rate” of 2 percent with an explicit statement that it would place “no unwanted constraint” on the shorter-run conduct of policy.<sup>55</sup>

From the perspective of flexible inflation targeting analyses such as those just discussed and practical central bankers,<sup>56</sup> the idea of a strict inflation PCE inflation over the prior year (Monetary Policy Report [Link](#)). The earlier 1996 FOMC discussions had included the idea that a 2 percent goal for CPI inflation was a 1.5 percent goal for PCE inflation.

54. Remarks at October 2003 FRB St. Louis Inflation Targeting conference published in the 2004 *Review* [Link](#)

55. Bernanke’s specific suggestion was that the announcement be accompanied by two provisos: ”(i) The FOMC believes that the stated inflation rate is the one that best promotes its output, employment, and price stability goals in the long run. Hence, in the long run, the FOMC will try to guide the inflation rate toward the stated value and maintain it near that value on average over the business cycle and (ii) However, the FOMC regards this inflation rate as a long-run objective only and sets no fixed time frame for reaching it. In particular, in deciding how quickly to move toward the long-run inflation objective, the FOMC will always take into account the implications for near-term economic and financial stability.” (Remarks made at the 28th Annual Policy Conference [Link](#))

56. See Kohn’s (2004) discussion of Goodfriend’s proposal

target seems obviously inefficient. Many studies of optimal monetary policy are based on the central bank having a quadratic objective for inflation stabilization around a long-run goal but seeking to produce high levels of real activity. Svensson describes a “strict inflation targeter” as placing no weight on real activity, which Mervyn King memorably termed an “inflation nutter.” Using a similar quadratic objective, Clarida, Gali, and Gertler (1999) alternatively describe “extreme inflation targeting” as an outcome that is optimal when there are no “cost push” shifts in their forward-looking model of inflation dynamics, referencing only the GK NNS analysis as making such a claim. In the literature, there are no references to specific inflation nutters except to the hypothetical conservative central banker of Rogoff (1985). It is sometimes suggested that Goodfriend was such a central banker, but this is a misunderstanding.

As we will see, within an explicit inflation targeting system with the full information and full commitment assumptions of these studies, Goodfriend saw an important role for interest rate policy in real stabilization and portrayed strict inflation targeting as the anchor for necessary “constrained countercyclical stabilization policy.” (G2004, 323) He argued that core inflation was the appropriate argument in a central bank objective and worked through four prominent shocks that central banks would experience and found no reason to turn away from strict inflation targeting.

First, he considered an increase in demand which could prove inflationary.<sup>57</sup> He pointed out that the central bank can offset this pressure with an increase in the policy rate, maintaining aggregate demand equal to potential output so that no inflationary pressure arises. When this response is systematic, even a serially correlated demand shift will not bring about changes in expected inflation, so that the increase in the policy rate is real as well as nominal. (G2004, 330)

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57. An example is an increase in real government purchases of goods and services, as had been studied in the fully articulated Richmond model and also in the framework of McCallum and Nelson (1999), with the conclusion that it raised the natural rate of interest

Second, he considered variations in productivity growth, as we have described in detail previously, noting that these have little effect on inflation with an appropriate interest rate adjustment. A corollary was that time-varying productivity was no impediment to strict inflation targeting.

Third, he noted that the Greenspan Fed had been able to reduce interest rates substantially in response to financial crises, without “creating inflation or an inflation scare in bond markets.” (G2004, 329) So, he reasoned, such responses were also not an impediment to credible strict inflation targeting. Rather, by stabilizing expectations, inflation targeting would enhance the central bank’s crisis-fighting capabilities.

Fourth, most controversially, he discussed oil price shocks. There is a large and lengthy literature on the consequences of such shocks, which contains three channels: energy as a factor input, energy as a final consumption good, and the response of inflation expectations to energy. Goodfriend focused on the factor input case. He noted that applicable theory indicates that the central bank should be concerned with an index of sticky price goods, which he took as the core PCE. A rise in the real price of oil would raise production costs for firms producing sticky price goods and in turn PCE inflation. But such a rise in PCE inflation could be offset if there is a reduction in employment and wages, which he depicted as brought about by interest rate policy. So, one can see the logic of flexible inflation targeting: the central bank can avoid such labor market effects. But Goodfriend argued that these are to be understood as a change in the economy’s time-varying potential, so that a central bank concerned with output gap stabilization would not respond: once again there is no tension with strict inflation targeting. (G2004, 330) While Goodfriend’s arguments in (1997) and (2004) were based on sketches of model elements and intuitive implications of these, the development of macroeconomic theory over this period made it possible to be more precise. Aoki’s (2001) analysis of a model with one flexible price and one sticky price

sector yielded results consistent with Goodfriend’s intuition.<sup>58</sup> Aoki showed that changes in production conditions in the flexible price sector have no bearing on the desirability of stabilizing inflation in the sticky price sector, which is shown to be the appropriate argument in the utility-based objective of the monetary authority, so there is also no impediment to strict inflation targeting.

Goodfriend freely acknowledged that his strict inflation targeting conclusion was based on a sticky price model in which labor market quantities were the same as if nominal wages were flexible.<sup>59</sup> A popular framework with sticky wages and prices had been developed by Erceg, Henderson, and Levin (2000) who applied monopolistic competition and Calvo frictions to wage determination. This framework was later extended by Bodenstein, Erceg, and Guerrieri (2008), who find that energy price shocks lead to small variation in “sticky price core inflation” under optimal monetary policy: a 20 percent increase in the price of energy leads to a 0.25 increase in PCE inflation measured at an annual percent rate.

#### **4.1.5 Managing expectations: output and inflation**

A crucial feature of modern models of optimal monetary policy with full information and complete credibility is that the central bank seeks to manage inflation expectations: this is implicit in the optimal policy analysis of Clarida et al. (1999) discussed earlier and explicit in Woodford (2004). This perspective was hard wired into the chapters that Giannoni and Woodford (2004) and Svensson and Woodford (2004) contributed to the volume on “The Inflation Targeting Debate.”

One notable feature of the GW and SW studies was that they began by determining the optimal behavior of inflation and real activity within a

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58. Aoki’s paper was not discussed at the conference by Goodfriend or others.

59. He summarized literature suggesting that this was a natural consequence of efficient firm-worker arrangements.

setting of full commitment and full information, exploiting convenient specifications with quadratic objectives and constraints. Each manipulated the efficiency conditions from policy optimization to derive a history-dependent target criterion, which the authors stressed was conceptually appropriate in contrast to purely forward-looking target criteria that had been employed at the Bank of England. Another notable feature was that these analyses investigated using the short-term interest rate as the policy instrument to “support” these EIT outcomes, while working to assure that there was a unique bounded rational expectations solution.

Thus, SW and GW provide a considerable extension of the Richmond approach of the mid-1990s discussed in section 3: the important new elements are inflation forecast targeting and flexible inflation targeting. A natural question that Goodfriend surely would have asked is whether these analyses provided a direct extension of the Richmond rule discussed earlier.

#### **4.1.6 Generalizing the Richmond rule**

Our reading of Svensson and Woodford (2004) is that the unambiguous answer is “yes.” There are three components in SW that would have been congenial to Goodfriend and perhaps unsurprising to him. First, the Fisher equation expresses the nominal rate as the sum of a real rate and expected inflation. With full credibility and commitment, the central bank and the private sector have common beliefs and agree on expected inflation. Second, the central bank’s optimization delivers a unique solution for inflation and real activity, so that it also delivers a real interest rate and expected inflation. While the real rate would depart from the natural rate under flexible inflation targeting, the real and nominal rate were nevertheless governed by Fisherian principles. Third, as with the original Richmond rule, it is necessary to append a nominal anchor to assure determinacy such as responding to departures of the price level from the path implied by optimal inflation.

We suspect, though, that Goodfriend would have been intrigued and sur-

prised by the consequences of imposing an “inflation forecast targeting criterion” as in SW: the optimal nominal rate should be the natural rate of interest plus the near-term optimal inflation forecast with a coefficient of less than one.<sup>60</sup> This implication of the benchmark New Keynesian model is robust, in the sense of Giannoni and Woodford (2004), since it holds for a rich range of shocks and stochastic processes. But after some reflection on our part, we think that Goodfriend would have found this implication congenial as well, given that he saw commitment capability as enabling a central bank to pursue stabilization objectives using more modest variation in interest rate policy.<sup>61</sup>

Since the coefficient on the inflation forecast is less than one, an econometrician studying outcomes under this forward-looking rule (without taking into account the EIT regime) would be led to conclude that there was an insufficiently aggressive response to assure determinacy.<sup>62</sup>

#### 4.1.7 September 1994 once again

We earlier described Al Broaddus’s conceptual comments and his recommended policy action in the September 1994 FOMC meeting.<sup>63</sup> The Fed –

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60. This implication is displayed in SW (2004, section 2.2.3). We provide a derivation and discussion in the context of considering interest rate policy and inflation targeting in some companion research (King and Lu 2022b). Conceptually, the revised rule does require that the real rate deviate from the natural rate under optimal flexible inflation targeting. The revised Richmond rule with a textbook IS curve depends only on one period ahead central bank forecasts of optimal inflation and real output, which can be consolidated into just a response to expected inflation using the approach of SW and GW.

61. Woodford (2003), Chapter 6, considered the design of interest rate rules under optimal policy, emphasizing robustness and determinacy.

62. As with the earlier Richmond rule, determinacy is assured if one appends a small response to deviations of the price level from the path implied by optimal inflation. Giannoni (2014) reaches a similar conclusion for a simple *ad hoc* rule that is optimal with respect to the parameter on the output gap. He describes his approach as a “Wicksellian rule” following the terminology of Woodford (2003). In this essay, we abstain from discussing the controversy over interest rate rules and indeterminacy reignited by Cochrane (2011) but note his concerns applied to price level as well as inflation rules.

63. Section 2.2.1 provides the specific quotations.

facing rising actual and expected inflation – was in the midst of a tightening cycle that raised the policy rate by 3 percent over the course of a year. Broadus began by advocating instituting inflation targets to communicate policy intentions and to provide more flexibility in short-term policy actions. He noted that market participants did not seem to be convinced that the Fed would take the actions necessary to “achieve our own internal inflation forecast.”

From the perspective of optimal policy rule under EIT just discussed, the presumption is that modest real rate movements are necessary to accomplish inflation objectives, in the specific sense that the nominal rate can rise less than one-for-one with the near-term inflation forecast. In settings with commitment and credibility, the forecasts of the central bank and private agents are the same, although Broadus saw these as different in September 1994.

With the FOMC unwilling to move to explicit inflation targeting, Broadus supported the aggressive increases in the funds rate. A retrospective analysis by Orphanides and Wieland (2008) shows that a forward-looking Taylor-style rule, with a weight on the Fed’s internal forecasts of greater than one, better captures this episode than does the standard Taylor (1993) specification used by Poole (2007). Thus, this episode is best understood as preemptive policy, matching the description of FOMC participants at the time and Goodfriend’s (2002) portrayal in his narrative account of the phases of monetary policy 1987-2001. Our reading of the September 1994 meeting, though, is that Broadus portrayed aggressive preemptive policy as necessary, at least in part, due to the lack of explicit inflation targeting and imperfect Fed credibility.

#### **4.1.8 Practical limitations of flexible inflation targeting theory**

Goodfriend understood the power of expectations management in the New Keynesian model employed in Svensson and Woodford (2004) and Giannoni and Woodford (2004). In making his case for price stability at the ECB’s first

research conference in 2000, he had employed one period sticky price models capturing these ideas and discussed the consequences of more elaborate dynamic pricing models.<sup>64</sup>

At the 2003 NBER IT conference, though, Goodfriend expressed some reservations about these new concepts and tools. On GW, he “expressed concern about the degree of inflation control that the model assumed the central bank had. This feature relied on the assumption that the public was able to observe all shocks with precision. It would be important to account in the analysis for the possibility that the public might mistake movements in observed inflation for a change in the central bank’s inflation target.” Further, he noted that the SW framework “might be more valuable for analyzing future monetary policy when central banks have acquired the degree of credibility assumed in the paper. ... the central bank’s ability to fine-tune inflation and inflation expectations assumed in the paper might be unrealistically high.” He also questioned “whether identifying cost shocks with historical residuals from estimated Phillips curves may overstate their importance, as some of those residuals may not reflect cost shocks, but credibility problems.”

In his inflation targeting manifesto, Goodfriend highlighted three reasons that made it “difficult...for the Fed to manage inflation once it moves outside its long-run target range.” First, “[t]he policy response would depend on all information available to the Fed affecting the conditional inflation forecast and the output gap forecast.” Second, “[a]rguably, the inflation-generating process is the weakest part of the macromodel. Among other things the cost, in terms of lost output relative to potential, of returning inflation to its long-run range depends on the credibility of the Fed’s commitment to do so. The historical record discussed [...] suggests that such credibility is sensitive to the Fed’s actions themselves in the context of other aspects of the political

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64. This case, developed in Goodfriend and King (2001), is the subject of an essay by Vitor Gaspar and Frank Smets.

economy in a way that is difficult to model.” Third, “the Fed may tend to overstate the extent to which inflation has an inherent tendency to persist after it has been shocked.”

Overall, he concluded that

“It is optimal for the monetary authority to vary its short-run inflation target deliberately in response to some shocks in some macromodels. However, that optimal variation depends sensitively on the details of the macromodel and on the size and type of shocks hitting the economy. Given our uncertainty about the structure of the economy, the difficulty in promptly and accurately identifying the shocks hitting the economy, and the complications discussed above, attempting to fine-tune the inflation target in the short run is more likely to be counterproductive than not.... In any case, the historical record suggests that the Fed’s ability to deliberately and systematically manipulate inflation in response to shocks is very limited. Moreover, such attempted manipulation would open the door to inflation scares.” (G2004, 328-329)

Hence, he was led to recommend little short-run variation in explicit inflation targets. We see his main concerns about flexible inflation targeting as fundamentally related to his recognition that the Fed’s credibility for low inflation could be at stake during the return of inflation to its long-run target.

Goodfriend also had concerns about the degree of central bank control of inflation assumed in theoretical models of flexible inflation targeting. In recent work, discussed more fully in section 5 below, we develop a variant of the standard New Keynesian optimal policy analysis with both imperfect inflation control and imperfect credibility. When the long-run goal is explicit, we show that there is no conflict between flexible inflation targeting and maintaining credibility, in a sense we define more precisely below. However, a committed central bank that begins with low credibility must alter the extent to which it is flexible as it works to build its credibility.

## 4.2 Credibility: explicit v. implicit inflation targets

Goodfriend (2004) asks: “[i]n what sense can monetary policy as currently practiced by the Federal Reserve (Fed) be characterized as inflation targeting? And what, if any, features of an inflation-targeting policy regime should the Fed adopt more formally?” (G2004 311)

He answered that the Fed monetary policy under Greenspan should be viewed as *implicit inflation targeting*. He was not alone in this view, which was shared by Bernanke and Gertler (1999) as well as others at the time. But, he argued that the US should move toward an explicit system, even though this had not been necessary for the conquest of inflation in the 1980s and the stabilization of inflation in the 1990s.

As discussed above, according to Goodfriend, explicit inflation targeting is defined “by the *announcement* of an official target for the inflation rate and by an acknowledgment that *low inflation is a priority* for monetary policy. Inflation targeting also involves *enhanced transparency of the procedures and objectives* of monetary policy.” (G2004, 311) At its core, he argued, an implicit inflation targeting regime is different because the central bank had *chosen* not to provide as much information to the private sector about its plans for inflation and real activity.

Goodfriend had long advocated for greater Fed transparency, beginning with his well-known critique of the Fed’s own arguments for not disclosing information about FOMC meetings.<sup>65</sup> Like Black and Broadus before him, he saw explicit inflation targets as important for the Fed’s communication to the public, for its acquiring and maintaining credibility, and for its accountability to the legislature and the public.<sup>66</sup>

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65. In his essay for this volume, Lars Svensson describes the importance of Goodfriend (1986) to the evolution of transparency at the Fed.

66. He wrote “Over the long run, the Fed’s credibility must be based on an understanding of how inflation targeting works rather than being based in the leadership of the Fed. Making the Fed’s inflation-targeting procedures explicit would help to achieve these ends by securing the Fed’s commitment to low inflation and improving the transparency and accountability of the Fed for attaining its monetary policy objectives,” citing Broadus

Goodfriend drew lessons from three distinct subperiods of postwar U.S. monetary history to make the case for the importance of credibility for low inflation. The go/stop period from the later 1950s to the late 1970s “illustrates the consequences of failing to make low inflation a priority for monetary policy. The Volcker period illustrates the difficulty in restoring credibility for low inflation after it has been compromised. And the Greenspan era illustrates how and why the Fed has come to target low inflation implicitly in recent years.” (G2004, 313)

#### **4.2.1 Depreciating credibility during the 1960s and 1970s**

Goodfriend attributed the go/stop monetary policy of the '60s and '70s to “the Fed’s inclination to be responsive to the shifting balance of concerns between inflation and unemployment.” The consequence was that “the trend rate of inflation tended to ratchet up with each go/stop policy cycles.”

He highlighted the interplay of Fed policy, inflation, and expectations. In the “go” phase of the policy cycle, “the Fed did not tighten policy early enough to preempt inflationary outbursts before they became a problem” and then “pricing decisions ... embodied higher inflation expectations.” In the “stop” phase of the policy cycle, “the Fed would need a recession to bring inflation and inflation expectations back down” but once the unemployment rate began to rise, the lack of public support for tighter monetary policy made it “difficult to reverse rising inflation.” (G2004, 314)

The central problem of this period “was that the Fed tended to justify its periodic inflation-fighting actions against an implicit objective for low unemployment. In doing so, the Fed made monetary policy a source of instability and wound up worsening both inflation and unemployment.” (G2004 315)

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and Roger Ferguson.

### 4.2.2 Adverse consequences of credibility depreciation

Goodfriend saw the 1970s increase in “the level and volatility of inflation and inflation expectations” as leading to “a breakdown of mutual understanding between the Fed and the public: the public could no longer discern the Fed’s policy intentions, and the Fed could not predict how the economy would respond to its policy actions.” The Volcker Fed “experienced the adverse consequences of a near total collapse of credibility for low inflation, and learned how difficult it is to pursue interest rate policy to restore credibility for low inflation once that credibility has been thoroughly compromised.” (G2004 315)

He stressed two major consequences of the credibility decline for Fed policies: it increasingly faced *inflation scares* and it became more costly to reduce inflation.

**Inflation scares** Central bank economists have long been very alert to the potential for sharp changes in expected inflation to be reflected in longer-term yields, a phenomenon that Goodfriend (1993) famously labeled as “inflation scares.” In his inflation targeting manifesto, Goodfriend attributed the “inflation scares” during the Volcker era to the Fed’s credibility problems. He saw these episodes as posing a “costly dilemma” for the Fed “because ignoring them would encourage even more doubt about the central bank’s commitment to low inflation. Yet raising real short rates to restore credibility for low inflation risked precipitating a recession.” (G2004 318) Goodfriend identified four examples of inflation scares during the Volcker era and highlighted how increased credibility for low inflation could help in resolving such a dilemma. In particular, “the Fed’s responses to the first two scares in 1980 and 1981 precipitated recessions in those years.” But the third inflation scare (1983-1984) “demonstrated that a well-timed and well-calibrated series of preemptive interest rate policy actions could defuse an inflation scare without creating a recession,” indicating that “the Fed acquired enormous additional credibil-

ity for low inflation during this period.” (G2004 318) He identified a fourth inflation scare as beginning in March 1987, suggesting that “it may have occurred in part because Volcker was near the end of his term as chairman and there was doubt about whether the Fed under Volcker’s successor would continue to place a high priority on low inflation. In any case, the 1987 scare is particularly striking evidence of the fragility of the credibility of the Fed’s commitment to low inflation.”

**Costs of restoring credibility** Goodfriend described two rounds of federal funds rate hikes by the Volcker Fed to bring down inflation. The first round started from September 1979 and ended in April 1980. The second round began in early 1981 and lasted until the summer of 1982. In both cases, he argued, the interest rate moves precipitated recessions, but inflation remained high in 1980 and stabilized in 1982. Goodfriend explained: “The difference is that in 1980 the Fed cut the federal funds rate sharply by around 8 percentage points between April and July to act against the downturn, [...] The lesson of 1980 was that the Fed could not restore credibility for low inflation if it continued to utilize interest rate policy to stabilize the output gap.” (G2004 316) This led him to assert two aspects of costs of restoring credibility. One is: “When the Fed’s credibility for low inflation is in question, the Fed loses the flexibility to use interest rate policy to stabilize output relative to its potential.” Another is: “the Fed needs a recession to restore credibility for low inflation after it has been compromised.” (G2004 316-317)

### 4.2.3 Benefits of higher credibility

Goodfriend began his description of the Greenspan Fed by describing how it had dealt with two inflation scares, one in 1987 and the other in 1994. He viewed the Greenspan Fed’s policy response to 1987 inflation scare as insufficiently preemptive in containing inflation and resulting in a minor loss of

credibility for low inflation, but he indicated that the “successful preemptive policy action in 1994 brought the economy to virtual price stability. Inflation and inflation expectations were anchored more firmly than ever before.” (G2004 320)

After reviewing these historical experiences, he followed by listing three benefits of high credibility for low inflation in the second half of the Greenspan era. “First, credibility helped the economy to operate well beyond the levels that might have created inflation and inflation scares in the past. Second, [...] [h]aving attained price stability, the Fed did not need a recession to bring inflation and inflation expectations down. ...Third, ...the fact that inflation and inflation expectations were well anchored enabled the Greenspan Fed to cut the nominal federal funds rate aggressively from 6.5 percent to 1.75 percent in 2001 to cushion (a) fall in aggregate demand and employment...without a hint of an inflation scare.”

### 4.3 Systematic policy under Greenspan

During the middle of Greenspan’s chairmanship, two important forces appear to have been pushing the FOMC toward systematic policy. These elements are important background to Goodfriend’s characterization of that period as an implicit inflation targeting regime.

#### 4.3.1 The Taylor rule

One force was the Taylor rule as an input to FOMC meetings. Interest by the FOMC and by the Board staff had been stimulated by Taylor’s (1993) finding that there was a coincidence between his proposed rule and the behavior of the Fed funds rate over the 1987-1992 period. Soon afterward, the Board staff preparation for each FOMC meeting included a memo on funds rate settings under the original rule and various modifications.<sup>67</sup> According

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67. Reaction functions had long been estimated by Federal Reserve economists, notably Stephen McNees at the FRB Boston (1986, 1992). But in the wake of Taylor (1993),

to Taylor’s (1993) presentation, the intercept in his rule was a combination of the implicit long-run inflation target  $\pi^*$  and the long-run level of the real interest rate  $r^*$ , so that an assumption about the latter allowed an identification of the former. However, investigations of empirical Taylor rules revealed considerable uncertainty attached to such estimate of  $\pi^*$ .

### 4.3.2 The FRB-US model

Another force for systematic policy was the new “consistent expectations” model FRB-US, which immediately allowed for a greater range of monetary policy scenarios and later for calculation of optimal policy. FRB-US forecasts for inflation and output at various horizons came into presentations of monetary policy alternatives (the Blue Book) by the January 1997 meeting. FRB-US was also used to explore consequences of high productivity growth and a gradual disinflation from the “stable inflation” scenario of 2 percent to “price stability” at 1 percent.<sup>68</sup>

### 4.3.3 Implicit policy and public misinterpretations

But even with the new model as a sharper tool and the Taylor approach as a rule of thumb, the FOMC and its economists had concerns about how alternative actions could affect the public’s perception of its inflation target. In the January 1997 meeting, the staff noted that the 50 basis point hike in the Fed Funds rate under the disinflation scenario would surprise market partic-

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economists investigated whether there was a similar rule for earlier periods, including Mehra (1997) in Richmond. In San Francisco, John Judd investigated interest rate policies across various periods. Initially, with Trehan (1995), he studied whether the Fed had gotten tougher after 1980. Later, with Rudebush (1998), he showed how Taylor rule estimates evolved across the Burns, Volcker and Greenspan chairmanships. At the Board, Williams (1999) explored various simple policy rules and Athanasios Orphanides built on his experience in preparing the FOMC memos on Taylor rules to study interest rate rules across chairmanships, including analysis of the Volcker and pre-Volcker periods (2003, 2004).

68. The first 5 years of the disinflation saw a decline to under 1.2 percent, while the full transition took somewhat longer.

ipants and worried that “in view of the shift in policy direction represented by such an action, intermediate- and long-term rates could rise appreciably, especially if market participants thought the Federal Reserve now saw significantly greater inflation risks than they had inferred from recent statements by FOMC members.”<sup>69</sup>

That is, the Board staff was concerned about the confounding of unobserved shifts in the long-run inflation goal and unobserved other reasons for varying the policy rate. This idea is at the heart of Erceg and Levin’s (2003) explanation of the costliness of the Volcker disinflation, within a model in which agents must learn if a disinflationary shift has taken place. It is thus important to explore whether an explicit inflation targeting system could avoid the sort of “breakdown in mutual understanding” suggested by the Erceg-Levin analysis and the FOMC discussion.

## 5 Credibility, Inflation, and Real Activity

In his manifesto, Goodfriend advocated for making the “Fed’s inflation-targeting procedures explicit in order to secure the commitment to low inflation, enhance transparency, and improve the Fed’s accountability for attaining its monetary policy objectives.” (G2004, 313) We also have seen that Goodfriend stressed the importance of credibility for the behavior of inflation and the consequences of Federal Reserve policy for real activity. We now explore the link between explicit inflation targeting and credibility from the perspective of basic macroeconomic models, including some of our own work. We also describe some new research questions stimulated by our close reading of Goodfriend (2004).

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69. January 1997 Blue Book [Link](#).

## 5.1 What is credibility?

Various areas of economic research have proposed definitions of credibility: in this discussion, we use a definition that we think Goodfriend would have found congenial and that has been productive for us in research, while recognizing that the literature on sustainable plans <sup>70</sup> and loose commitment <sup>71</sup> provide other useful approaches.

One key ingredient for us, as for Blinder (2000), is that credibility “involves matching deeds to words: a central bank is credible if people believe it will do what it says.” Making this definition operational requires measures of a central bank’s actions and its statements about these actions. It also requires measures of private sector beliefs. We have seen that Goodfriend viewed the extent of “credibility for commitment to low inflation” as varying widely over time and responding to central bank actions and macroeconomic outcomes. To capture such evolving partial credibility of central bank announcements and actions, our work employs a reputational state variable that governs the extent of credibility at a point in time: this is a private sector likelihood that the central bank is of a type that can commit and matches deeds with words. This reputational state variable is governed by Bayesian learning.

Our definition of credibility also accords with another important aspect

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70. One prominent line of research essentially requires perfect credibility of central bank choices and macroeconomic outcomes, in order to focus on expectations as disciplining a central bank that cannot commit. Central bank actions are a part of a “sustainable plan,” in the terminology of Chari and Kehoe (1990) when these will be carried out even though the central bank cannot commit to its future actions and when it would renege on other plans. Like Goodfriend, these authors highlight the importance of credibility to low inflation, but studies adopting this approach typically do not feature time-varying credibility.

71. Another important line of research assumes that the current central bank can commit but faces a time-invariant probability of a future regime change in which a new committed central bank will reoptimize its inflation plans (Schaumburg and Tambalotti 2007, Debortoli, Maih, and Nunes 2012). This approach highlights the idea that imperfect credibility limits expectations management by a committed central bank, but does not incorporate time-varying credibility that is influenced by its decisions.

of Goodfriend's inflation targeting manifesto. He views explicit inflation targeting as a means of protecting the economy against both deflation and inflation, as a result of specifying a 1 to 2 percent range for inflation. Thus, it is credibility for policy consistency with a publicly announced framework rather than to a specific outcome such as "low inflation" that is central to Goodfriend and to us.

The importance of understanding macroeconomic equilibria when a central bank cannot commit, of course, came to the forefront with the work of Kydland and Prescott (1977) and Barro and Gordon (1983a,1983b), henceforth KPBG. In a basic equilibrium without commitment, an inflation bias arises when the central bank objective makes real stimulus desirable and the central bank (appropriately) treats inflation expectations as beyond its control. The temptation to inflate leads to excessive inflation.<sup>72</sup> We have found that models with such 1980s linkages between inflation and real activity are very tractable, and we therefore use them as starting points in thinking about imperfect credibility and its consequences.

Modern New Keynesian macro models with forward-looking price dynamics generally possess such an inflation bias, but also contain stabilization biases in equilibria without commitment (see, for example, Clarida, Gali, and Gertler 1999). Under commitment, by contrast, optimal monetary policy in such models generally leads to low and relatively stable inflation. In the basic textbook NK model and direct elaborations of it, optimal policy more specifically leads to a long-run price level path that is not much affected by various shocks.<sup>73</sup> Although these intertemporal models are more complicated, we study them because they are arguably more realistic and certainly

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72. Interestingly, the 1975 Economic Report of the President discusses the inflation process in these terms. Presumably, it was written by either Alan Greenspan (CEA chief) or William Fellner, the Yale professor who was one of the first economists to explore combining rational expectations with Keynesian mechanisms, as well as seeing a central role for policy credibility.

73. See, for example, the appendix to Clarida, Gali, and Gertler 1999), Khan, King, and Wolman 2003, and Woodford 2005.

more akin to policy models actually in use at many central banks.

## 5.2 Why does credibility evolve?

The analysis of monetary policy with evolving imperfect credibility was initiated by Alex Cukierman in the late 1980s and early 1990s using an elaboration of the KPBG model.<sup>74</sup> In our early work on managing expectations with imperfect credibility and evolving reputation, we used a KPBG-style model to examine the interplay of announcements, actions, outcomes, reputation and credibility.<sup>75</sup> Our more recent work features a forward-looking New Keynesian Phillips curve and two types of central banks, one that can commit and another that cannot.<sup>76</sup> Crucially, although only one type of central bank is present in any period, private agents do not know the type that is in place but must learn about it from macroeconomic outcomes that central banks control only imperfectly.

Central bank announcements play an important role in such theories but in a subtle manner. We assume that the committed central bank can accurately communicate its intended inflation to the private sector via an announcement, which is usefully interpreted as an inflation target.<sup>77</sup> Since the announcement is important for the beliefs of the private sector, a central bank that cannot commit must also make the same announcement or its type will be disclosed leading to adverse shifts in inflation expectations. The key state variable – reputation – rises and falls as inflation outcomes differ from announced targets.

The literature offers some specific definitions of credibility in this context. Cukierman and Meltzer (1986) define it as “the absolute distance between

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74. The best single example is Cukierman and Liviatan 1991 and his work is collected in Cukierman 1992.

75. King, Lu, and Pasten (2008).

76. Lu, King, and Pasten 2016, and King and Lu 2021.

77. Using a similar model with two types of policymaker, one who can commit and another who cannot, Lu (2013) proves that the unique equilibrium announcement is the optimal policy for the committed type.

the policymaker’s plans and agents’ beliefs about those plans.” Given that inflation is imperfectly controllable by the central bank, another definition is the likelihood that actual inflation will be within a band around planned inflation target.<sup>78</sup> In basic models, each of these credibility measures is dependent on central bank reputation for commitment: when reputation is low, there are large absolute gaps between actual and perceived plans as well as low likelihood of small inflation deviations from announced targets.

### 5.3 Managing expectations with imperfect credibility

Goodfriend saw credible disinflations as relatively costless based on both the 1980s New Classical and the 1990s New Keynesian models of inflation dynamics. Yet, in describing the conquest of inflation after the Great Inflation of the 1970s, he portrayed the Fed as “need(ing) a recession to bring inflation and inflation expectations back down,” as in the “the Volcker disinflation from 1979 to 1987.”<sup>79</sup> He described the Volcker-led Fed as having “experienced the adverse consequences of a near total collapse of credibility for low inflation” and the process of restoring its reputation (“credibility for low inflation”) as difficult “once that credibility has been thoroughly compromised.” Looking at the Volcker and Greenspan chairmanships, Goodfriend also portrayed the Fed as delicately balancing the benefits of inflation reduction with the costs imposed on the real economy as the Fed sought to lower inflation and increase its credibility.

With a committed central bank having an imperfect reputation for commitment, our theoretical models<sup>80</sup> deliver three implications related to these key ideas in Goodfriend (2004). A first implication is that its announced

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78. This latter credibility measure seems closer to Goodfriend’s narrative and is consistent with the perspective of Mervyn King (2005), who writes that “credibility is not an all-or-nothing matter. Policy is neither credible nor incredible. It is, as we say in economics, a continuous variable.”

79. Thomas Sargent reviews Goodfriend’s work (with King, 2005) on “The Incredible Volcker Disinflation” in an essay for this volume.

80. King, Lu and Pasten (2008), Lu, King and Pasten (2016), and King and Lu (2021)

policies have a lower leverage over inflation expectations, because individuals attach some likelihood to these not being carried out. This leads to a second implication that imperfectly credible disinflations are costly even when credible disinflations are not, because implementing disinflation amid high inflation expectations precipitates a recession. The third implication of these models is that it is costly to build reputation if the initial reputation is low. This is consistent with Goodfriend’s observation that “(t)he lesson of 1980 was that the Fed could not restore credibility for low inflation if it continued to utilize interest rate policy to stabilize the output gap.” (G2004, 316)

#### **5.4 Is evolving credibility relevant?**

As we discussed in section 4, Goodfriend’s historical narrative depicts US inflation history from the mid-1960s to the early 2000s, highlighting evolving credibility in various episodes. Our most recent work (King and Lu 2021) provides a model-based perspective on inflation over this period.

As discussed previously in general terms, we consider a minor variation on the standard New Keynesian model with two types of central banks: one that can commit and another that cannot. More specifically, the central bank that cannot commit is myopic, responding to inflation expectations and shifts in the NK Phillips curve. By contrast, the committed type is an explicit inflation targeter that recognizes private sector skepticism about its type and takes actions with an eye to managing its reputation. We assume a single switch in type, with commitment starting around January 1981.

To make the model quantitative, we extract two state variables (reputation and shifts to the NK Phillips curve) from one-quarter and three-quarter expected inflation based on the Survey of Professional Forecasters. Although the procedure does not make use of actual inflation data, we find that the framework gives a reasonable account of the rise, fall and stabilization of inflation over 1965-2005. Notably, the inflation of the 1960s occurs even

though the central bank has a very small amount of intrinsic inflation bias, defined as the extent to which it seeks to stimulate inflation and real activity with expected inflation held fixed. But, as an initially high reputation declines and inflation expectations rise, a large equilibrium inflation bias occurs leading to an ultimate inflation peak in the late 1970s. When the Volcker Fed moves to reduce inflation in the framework, it faces low reputation and cannot effectively manage expected inflation. Overall, the evolution of reputation, with implications for the credibility measures discussed above, is a first order feature of the period.<sup>81</sup>

Of course, such a basic exercise in quantitative theory inevitably raises as many questions as it answers, but it suggests that evolving credibility may ultimately be key to understanding the US inflation experience in a more detailed manner.

## 5.5 Perils of implicit targeting

Under an implicit inflation targeting system, the central bank does not announce its inflation and output intentions as it does in an explicit targeting regime. Private agents therefore face uncertainty about policy: it could be an unobserved long-run inflation goal (as in the analysis of Faust and Svensson 2001) or an unobserved plan for returning inflation to the long run goal. Such uncertainty is relevant for private agents directly but also for the central bank (recall the end-of-section-4 discussion of the Board staff concerns about misinterpretations in the January 1997 Blue Book [Link](#)).

Our close reading of Goodfriend (2004) for this volume has led us to confront how very different an implicit targeting regime is as well as the perils that it could represent. To investigate elements of his analysis, we were therefore led to explore basic concepts and to develop a simple model.

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81. Notably, the two credibility measures discussed above (one that captures a credibility gap and the other that captures an extent of credibility) vary dramatically but are highly correlated. Each depends positively on the reputation state variable

To fix ideas, it is useful to start with thinking about how a committed central bank chooses optimal policy in the KPBG model. It acts before private agents set their expected price level (inflation rate) and knows how they will respond to its alternative policy actions. Hence, it chooses low inflation and abstains from seeking a positive output or employment gap. In the sense familiar from microeconomics, the central bank is a Stackelberg leader and the private sector is a follower. By contrast, without commitment, the inflation bias solution obtains. As Sargent and Soderstrom (2000) have stressed, this may be viewed as a Nash equilibrium of the simultaneous game between the central bank and the private sector.<sup>82</sup>

### 5.5.1 An extreme version of peril

An important, but underappreciated, literature in game theory thus becomes relevant to thinking about implicit inflation targeting. Bagwell (1995) observes that “the advantage from commitment [springs] from a combination of two assumptions. First, moves in the game are sequential, with some players committing to actions before other players select their respective actions, and, second, the late-moving players perfectly observe the actions selected by the first movers. These assumptions are so frequently combined that it is easy to forget that they are not equivalent.”

To break apart commitment and observability, Bagwell develops a noisy-leader game, in which one player moves first and then a second player observes a signal of the first mover’s actual selection before making his own move.” He establishes a striking result: “With even the slightest degree of imperfection in the observability of the first-mover’s selection, therefore, the strategic benefit of commitment is lost.” An implication of Bagwell’s analysis is thus an implicit inflation targeting regime implemented by a committed central

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82. It is more frequently represented as a game in which the central bank moves after the private sector. Notably, Barro and Gordon (1983a) describe inflation expectations as set “at the start of the period” and the inflation action as chosen “during the period” (see pages 595-596).

bank – but one that cannot accurately communicate its intended inflation – would give rise to the same outcomes as if the central bank cannot commit.<sup>83</sup>

This is an extreme peril from implicit inflation targeting: it formally captures a complete breakdown of the mutual understanding between the Fed and the private sector that marks a commitment regime.

### 5.5.2 Noisy signals about Fed intentions

Explicit inflation targeting regimes frequently have featured high visibility, quarterly “Inflation Reports” that were not part of the Greenspan regime. But, in his comments on Goodfriend’s manifesto, Kohn (2004) stressed that the Fed did provide considerable information about monetary policy in its January and July “Humphrey Hawkins” reports to Congress.

We therefore next explore the possibility that such limited reports are noisy signals about the Fed’s planned actions that would be reported more precisely and more frequently under an explicit targeting regime. We make use of an important paper by Maggi (1999), who developed a leader-follower game with two types of randomness: (i) noise as in Bagwell; and (ii) a privately observed shock to the leader’s objectives. Maggi establishes that a small amount of noise is no longer totally destructive to the first-mover advantage in the same duopoly game studied by Bagwell. In an example with linear decision rules and normal shocks, he shows that a reduction in the amount of noise pushes the outcome toward the Stackelberg outcome in the duopoly game.

Analyzing the basic KPBG model using a similar approach, we have been able to study the effects of changing the extent of noise about the central bank’s planned actions when its long-run inflation target is subject to a privately observed shock.<sup>84</sup> In examples when the equilibrium is unique, low

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83. It was to avoid this implication that King, Lu and Pasten (2008) assumed that the committed type could make an accurate announcement about its inflation intention (see footnote 24, page 1650) with a relevant game theory reference.

84. We report them in greater detail in King and Lu (2022a).

noise cases resemble the commitment solution and high noise cases resemble the solution without commitment.

Thus, an implicit inflation targeting system works better when it more closely resembles an explicit inflation targeting system. This conclusion dovetails nicely with increasing transparency of instrument choices under Greenspan and also with ideas in Goodfriend's manifesto:

“Openly clarifying the priority for price stability would reinforce the Fed’s commitment to low inflation and enhance the credibility of that commitment. It would balance the recently increased transparency of the Fed’s interest rate instrument with greater transparency of its low-inflation goal. And it would act to defuse further the idea that secrecy has any role to play in monetary policy (see Goodfriend 1986). In this regard, the Fed could go further and publicly acknowledge its quantitative working definition of long-run price stability. If a 1 to 2 percent range for core PCE inflation is it, then the Fed could acknowledge that it intends to keep core PCE inflation in or near that range indefinitely.” (G004, 332)

Another finding of our simple KPBG example with noisy signals is that multiple equilibria are present when the Phillips curve is flat or the central bank places high weight on output losses. The nature of these equilibria is quite intuitive: if private agents place little weight on the noisy signals about planned central bank actions, their expectations are less manageable; but if the central bank views expectations as less responsive to its planned actions, its optimal actions become less responsive to shocks in its long-run inflation target and, in turn, the signals are less informative for the private sector. Such equilibria with low information transmission appear to capture a less extreme “breakdown of mutual understanding between the Fed and the public.” There is a decline in the credibility of central bank statements and weakened effect of its actions even when the central bank has full commitment capacity.

### 5.5.3 Scares and misinterpretations

A framework with noisy policy messages also appears to provide a simple explanation of inflation scares, which were introduced in Goodfriend (1993) and are much discussed in his manifesto. In the simple model outlined earlier, we assume that the private sector receives a message that is the policymaker's planned inflation plus a zero mean random noise. That random noise could be given an economic interpretation as vagueness in Humphrey-Hawkins testimony; accidents of language by a Fed chairman, governor or regional bank president; misinterpretation of the Fed communication by market observers; etc. When such a noise occurs, it will appear to the Fed that private sector inflation expectations have become irrationally scared. But, fundamentally, the problem arises from the Fed's own lack of explicitness.

The problem is not just "inflation scares." Goodfriend (G2004, 326) sees the potential for "destabilizing deflation scares," suggesting that "announcing an explicit lower bound on inflation would make the public more confident that the Fed will not allow the United States to fall into a Japanese-style deflation, zero-bound trap."

If one were to move beyond a simple one-period model, then it would become possible to confront the concerns that the Board's economists expressed in the January 1997 Bluebook, which was that a rise in the funds rate – a tightening of monetary policy at the start of a disinflation – would be misinterpreted as reflecting heightened Fed concerns about near-term inflation that had to be preempted. An explicit targeting mechanism could well reduce or eliminate such misinterpretations.

## 5.6 Explicit targeting and credibility, again

Our theoretical review of Goodfriend's inflation targeting manifesto has led us to conclude that noisy policy messages in an implicit inflation targeting regime have similar, if not more serious, detrimental effects as other forms of

imperfect credibility, by reducing the central bank’s leverage over inflation expectations and the effectiveness of its stabilization policies.

Explicitly committing to inflation targets – including flexible inflation targeting – avoids the perils of implicit targeting and helps the central bank to acquire and maintain credibility for attaining its monetary policy objective. This is a form of central bank credibility that both Goodfriend and our recent work have shown to play an important role in the history of US monetary policy and, very likely, in the challenging times of today.

## 6 Concluding Thoughts

In the nearly two decades since Marvin Goodfriend’s inflation targeting manifesto, there have been important changes in the Fed’s monetary policy framework and practice. Continuing the trend toward improvement in communications about policy actions and intentions, the Fed in 2003 began forward guidance with respect to the funds rate, with an eye to influencing the short end of the term structure of interest rates.<sup>85</sup> In the fall of 2007, after Ben Bernanke became chair, the Fed started to publish quarterly summaries of policy projections made by FOMC members, providing their views about how output, inflation, and the funds rate would evolve over three years under their preferred policy actions. This was a welcome and important step toward the communication practices of inflation targeting, consistent with Marvin Goodfriend’s call for increased transparency, although the FOMC did not consolidate these “straw votes” into a committee consensus. Fed officials also stressed that the projections were “not a commitment” at the time and have continued to do so more recently. Rather, as Bernanke stressed in 2016, “If the FOMC as a whole is going to make a commitment or provide explicit guidance about future rate policy, it will do that in its post-meeting

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85. See Poole (2007), page 10.

statement, or the chair will communicate it.”<sup>86</sup> In 2012, the Fed formally introduced a 2 percent inflation target, not too different from the median longer-run PCE inflation projections by FOMC members over 2009-2011.<sup>8788</sup>

During the global financial crisis and its aftermath, with the funds rate near zero, the Fed used forward guidance about future interest rates with the objective of raising real activity, inflation, and inflation expectations. Bernanke (2020) provides an overview of the application of “new tools of monetary policy” during this period. Despite extensively applying these new tools, the Fed’s expansionary policies led to inflation that tracked below the long-run goal of 2 percent for much of a decade. The theory of optimal monetary policy at the zero lower bound as developed in Eggertsson and Woodford (2003) highlighted the desirability of price level (path) targeting, as inflation lower than target would need to be matched with higher future inflation.<sup>89</sup> But, combining theory and evidence, Bodenstein, Hebden, and Nunes (2012) found that the benefits were substantially curtailed by credibility difficulties in both the U.S. and Sweden. In December 2012, the Fed moved to “threshold-based forward guidance” that specified that the policy rate would remain near zero until unemployment was reduced below 6.5 percent, so long as near-term inflation expectations did not run much above the 2 percent long-run inflation target and long-term inflation expectations continued to be well anchored.<sup>90</sup>

In August 2020, the Fed moved to flexible average inflation targeting (FAIT).<sup>91</sup> As it moved toward the new regime, the Fed had a very open

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86. These quotations are taken from a 2016 blogpost by Bernanke (Brookings Link)

87. See FRED. Shapiro and Wilson (2021) estimate that the FOMC had an implicit inflation target of 1.5 percent over a baseline sample of 2000-2011.

88. Lacker (2020) provides an insider’s account of the FOMC adoption of the target.

89. Federal Reserve economists had earlier explored interest rate rules of the form suggested by their analysis, including Wolman (1998) using a forward-looking staggered pricing model and Reifschneider and Williams ((2000) using the FRB-US model.

90. FRB Link

91. Nessén and Vestin 2005 introduce average inflation targeting, which provides an intermediate policy between basic inflation targeting, with target misses being bygones,

process in which some noted economists and well-known former senior Fed staffers called for a permanently higher inflation target to decrease the likelihood of zero lower bound events. The consideration of a higher long-run target for inflation was mainly motivated by declining estimates of  $r^*$ , as the work of Laubach and Williams (2003) was updated by Fed and other economists.

Ultimately, though, the new policy framework reaffirmed that 2 percent PCE inflation in the long run was “most consistent with the Federal Reserve’s statutory mandate”<sup>92</sup>. Yet, the Fed also announced that “in order to anchor longer-term inflation expectations at this level, the Committee seeks to achieve inflation that averages 2 percent over time, and therefore judges that, following periods when inflation has been running persistently below 2 percent, appropriate monetary policy will likely aim to achieve inflation moderately above 2 percent for some time.” At the time, senior Fed officials also signaled that there would no longer be a preemptive approach to inflation management and that there would be an increased priority attached to “mitigating short falls of employment from its maximum level.”<sup>93</sup>

The description of the new policy regime made clear that the Fed would seek or tolerate above 2 percent inflation for some time, after periods in which inflation ran below 2 percent, as it frequently did between 2008 and 2020. However, the Fed’s policy announcement did not specify how much higher than 2 percent inflation might run or for how long it would tolerate inflation above that level. In advance of the first FOMC meeting of the new regime in September 2020, a well-informed economics team at IHS Markit wrote in their pre-FOMC briefing: “[The Statement] was vague in key respects, beginning with the definition of what constitutes a ‘moderate’ overshoot of 2 percent inflation. Is  $2\frac{1}{4}\%$  sufficient?  $2\frac{1}{2}\%$ ? 3%? For how long? How much of the previous inflation undershoot does the committee intend to offset? In

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and price level (path) targeting, with misses being fully offset subsequently.

92. FRB statement on revisions.

93. See, for example, a September 2020 speech by Lyle Brainard.

other words, how far does the look-back period extend? What is the horizon for making up past inflation misses?” Later, in January 2021, the IHS Markit team summarized a clarification of the new regime’s nature by Vice Chairman Richard Clarida: it was “temporary price-level targeting (TPLT) at the effective lower bound that reverts to flexible inflation targeting (FIT) once the conditions for lift-off have been reached.”<sup>94</sup> They also highlighted the part in Clarida’s speech that “Inflation averaging 2% over time is an ‘ex ante aspiration’, not an ex post commitment.”

The lack of explicit commitment to a path of inflation leading back to the long-run goal and the fuzziness of the average inflation targeting mechanism are sources of ambiguity and confusion that will be reflected in market expectations about real activity and inflation. In turn, these features of the new policy framework open the door to erosion of credibility, especially in light of recent calls for a higher long-run inflation target.

As we write in spring 2022, the most recent Summary of Economic Projections shows that the median FOMC member sees a path of declining PCE inflation under their preferred policy: 4.3 percent for 2022, 2.7 percent for 2023, 2.4 percent for 2024, and a longer run goal of 2 percent.<sup>95</sup> The most recent breakeven inflation rates on standard Treasury instruments and their inflation-indexed counterparts, on the other hand, are standing at 2.85 percent for the 10-year rate, 2.81 percent for the 20-year rate, and 2.49 for the 30-year rate. Relative to their Dec 2021 levels,<sup>96</sup> the 10-year rate is up by 39 bps, the 20-year rate by 30 bps, and the 30 year-rate by 22 bps. We view this as likely an increase in long-run inflation expectations by market participants that differs from the stable long-run projection by the Fed.

We end this essay with another quote from Goodfriend’s inflation targeting manifesto: “if inflation moves outside its long-run target range, [...]

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94. This led the IHS team to refer to the new regime as asymmetric flexible average inflation targeting. See also Speech by Clarida.

95. The December 2021 projections were 2.6, 2.3, 2.1 and 2.0. Link

96. The Dec 2021 levels were, 2.46, 2.51, and 2.27.

the cost, in terms of lost output relative to potential, of returning inflation to its long-run range depends on the credibility of the Fed's commitment to do so. The historical record [...] suggests that such credibility is sensitive to the Fed's actions themselves [...] In any particular case the Fed must judge the extent to which drawing out the return of inflation to its long-run target might be counterproductive by reducing the credibility of its intention to bring inflation all the way back down. That consideration must be balanced against attempting to bring inflation down before the credibility for doing so has been built up. An error in either direction would increase the output cost of restoring price stability." (G2004, 327-328)

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